



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September 14, 1994

LICENSEE: Washington Public Power Supply System

FACILITIES: Washington Nuclear Projects 1 and 2

SUBJECT: MEETING SUMMARY - MIXED-OXIDE FUEL PROPOSAL

On August 30, 1994, the Washington Public Power Supply System (the Supply System) met with members of the NRC staff in Rockville, Maryland, to discuss the Supply System's proposal to use mixed-oxide (MOX) fuel at Washington Nuclear Projects 1 and 2 (WNP-1 and WNP-2). A list of attendees is provided as Attachment 1 and the Supply System's handouts are provided as Attachment 2.

Mr. Joe Burn, Director of Projects for the Supply System, reviewed highlights of the proposal, which had been previously discussed with members of the NRC staff on January 28 and February 23, 1994. Under the current proposal, the Supply System would operate WNP-1 and -2 as "dual purpose" plants; they would function as commercial electrical generating facilities, while also using MOX fuel to deplete plutonium stockpiled from the U.S. nuclear weapons program. The proposal calls for the U.S. Department of Energy (DOE) to fund the completion of WNP-1 (currently 70% complete), the modification of WNP-2, and the fuel, operating and maintenance costs for the lifetime of both units. These costs would be offset to some degree by the sale of the power produced and fees collected for the disposal of plutonium. The Bonneville Power Administration's financial interest in WNP-1 and -2 would be bought out as part of this plan, and the Supply System would retain ownership of both units and would remain the NRC licensee for both units.

Mr. Burn stated that, under the Supply System proposal, the entire process would be conducted on the Hanford reservation; both WNP-1 and WNP-2 are located there, and existing facilities on the reservation could be modified to convert plutonium to oxide form and to fabricate the MOX fuel. The spent MOX fuel would not be reprocessed and would be handled in the same manner as existing fuel, stored in the spent fuel pools prior to ultimate disposal. He acknowledged that a competitive venture had made a similar proposal to DOE. In that proposal, both WNP-1 and Washington Nuclear Project 3 (WNP-3) would be completed and used to burn MOX fuel. He pointed out that WNP-3 is not located on the Hanford reservation and that the Supply System's projected demand for power did not support completing WNP-3 as well as WNP-1.

Mr. Burn stressed that the Supply System is awaiting the resolution of critical public policy issues before committing significant resources to address the technical and licensing issues associated with this proposal. These public policy issues include a decision by the U.S. Government concerning options for the disposition of nuclear weapons material, and possibly the need for Federal legislation to permit the use of plutonium as fuel in commercial power reactors.

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September 14, 1994

The NRC staff identified some general technical and licensing issues concerning the use of MOX fuel that the Supply System would need to address in applying for license amendments for WNP-2 and an operating license for WNP-1. These issues include revised Chapter 15 accident analyses for the Final Safety Analysis Reports, an evaluation of thermal-hydraulic stability of the WNP-2 core, other core physics and reactivity control issues, and possible changes to the previously considered environmental impacts. The staff pointed out that the Supply System's projection that they could be ready to burn MOX fuel in WNP-2 within 2 years appeared to be optimistic, considering all the policy issues that need to be resolved before the staff would even begin to review technical issues.

The meeting was adjourned with an agreement to periodically discuss the progress of the Supply System's proposal.

ORIGINAL SIGNED BY:
Sheri R. Peterson, Project Manager
Project Directorate IV-2
Division of Reactor Projects - III/IV
Office of Nuclear Reactor Regulation

Docket Nos. 50-397 and 50-460

- Attachments: 1. List of Attendees
2. Licensee's Handout

cc w/atts: See next page

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OFC	LA:DRPW <i>D-C</i>	PM:PD4-2 <i>SP</i>	D:PD4-2
NAME	DFoster-Curseen	SPeterson:pk	TQuay <i>TQuay</i>
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Washington Public Power Supply System

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(WNP 1 & 2)

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August 30, 1994

Meeting with the Washington Public Power Supply System

Mixed-Oxide Fuel Proposal

Attendees

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Jim Clifford	NRC/NRR/DRPW
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FOR IMMEDIATE RELEASE -- January 7, 1994
Mary H. Ace, Information Specialist

Release No. 94-06
Page 1 of 2

SUPPLY SYSTEM TO EXPLORE OPERATING PLANT 2, WNP-1 WITH MIXED OXIDE FUEL

RICHLAND--The Washington Public Power Supply System announced today that it will explore the potential of fueling two of its nuclear power plants with mixed oxide fuel comprising a mixture of uranium and surplus weapons-grade plutonium from U.S. stockpiles. "By fueling these plants with a mixture of weapons-grade plutonium and commercially available uranium fuel, the United States could begin within a two-year period the timely disposal of its stockpiled plutonium--material targeted for destruction through the arms reduction program," said William Council, Supply System managing director.

"Our Executive Board, Board of Directors, and Bonneville Power Administration believe that it is prudent and appropriate for the Supply System to study the concept of using mixed oxide fuel in Plant 2, our operating power plant, and in WNP-1, one of our partially constructed nuclear power plants, which would be completed under new arrangements with the U. S. Department of Energy," said Council. "This concept also involves termination of the existing contracts with BPA on WNP-1/3.

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The plants are adjacent to each other on DOE's Hanford site, which is about 12 miles from the city of Richland in the southeastern portion of Washington state.

"Implementation of this concept could significantly benefit the nation as well as electricity users throughout the Pacific Northwest. For BPA and the Northwest ratepayer, we would provide a continued supply of competitively priced electricity from Plant 2, and additional competitively priced electricity following completion of WNP-1--projected to be about 850 average megawatts. This electricity would help meet the forecasted need for additional power, and reduce BPA's reliance on their hydroelectric system which has been impacted due to low water levels and fish conservation programs," said Council.

Drawing board assessments show that it would be about two years before mixed oxide fuel could be delivered to Plant 2. "Since this is a proven technology, there would be minimal impact on plant operations. Supply System plants are designed to operate on either uranium or mixed oxide fuel. The minor modifications to Plant 2's reactor hardware and loading the new fuel assemblies would be done during one of the plant's annual maintenance and refueling outages," Council said. Completing construction on WNP-1 and its preparation for electrical generation would take about six years, and cost about \$2 billion.

"With this concept the federal government, not BPA, would pay a plutonium disposal fee which would cover plant modifications and completion activities, fuel, and annual operations and maintenance costs," said Council. There would be an annual average of 4,000 new jobs associated with completion and operational readiness of WNP-1, and permanent plant staffing of WNP-1 would be about 1,000 persons.

"The Supply System will work to garner the support of the state and federal governments, as well as other significant audiences, to fully explore the specifics of this concept," he said.

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WASHINGTON PUBLIC POWER SUPPLY SYSTEM

P.O. Box 965 • 3700 George Washington Way • Richland, Washington 99352-0968 • (509) 372-5000

BACKGROUND INFORMATION
PLANT 2 & WNP-1 DUAL PURPOSE OPERATION

- ▶ The Executive Board's April 9, 1993, letter to BPA Administrator Randy Hardy asked for BPA and Supply System staff to "investigate all of the ramifications of termination or potential modification of Projects 1 and 3." In response to that request, staff began studying various other uses for the plants, including fissioning (burning) plutonium in our reactors in the form of mixed oxide fuel.
- ▶ After thorough consideration, the Supply System's Full Board, Executive Board and BPA believe it is prudent and appropriate to explore the possibility of using Supply System plants to fission surplus weapons plutonium.
- ▶ The concept involves keeping the generation of electricity through the fissioning (burning) of plutonium at one location--the Hanford site. This will allow the Supply System to maximize efficiencies in maintenance and refueling of the reactors, and maximize other operational efficiencies, such as shared training and security for both plants.
- ▶ This concept involves termination of the existing contracts with BPA on WNP-1/3, and completion of WNP-1 as an electrical generating station under new arrangements with the U.S. Department of Energy. The Supply System would remain the licensee for both Plant 2 and WNP-1.
- ▶ The Hanford site is already dedicated to nuclear operations and waste clean-up. This concept involves an activity (operation of a nuclear power plant) that the Supply System has conducted in that location for many years. We believe this concept will be acceptable to the residents of the Tri-Cities in particular, and to residents elsewhere in the state and region.
- ▶ The concept involves modification of Plant 2, our operating nuclear power plant, and completing WNP-1, as plutonium/uranium-fueled plants. Under this proposal, the cost of power from the two plants (Plant 2 & WNP-1) will be set based upon the cost of competing sources of power.
- ▶ The concept provides the Department of Energy and the Department of Defense with a cost-effective, safe, and efficient way to reduce U.S. stockpiles of weapons-grade plutonium, and should be explored and studied to the maximum extent possible.

Background Information

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- ▶ The concept involves addition of associated construction jobs and operations/support jobs to the Tri-Cities area. We estimate that there would be an annual average of 4,000 jobs a year involved in completion and operational readiness of WNP-1. The plant would require an operations staff of about 1,000 persons.
- ▶ Other cost-savings will be experienced by the Department of Energy. DOE's costs for fuel and plant modifications and completion will be reduced by the sale to BPA of power generated by the two plants.

- ▶ There are benefits to BPA with this proposal:

---BPA will receive \$2 billion as reimbursement for capital improvements made to the two plants, as well as for relinquishing BPA oversight of plant operations, with oversight transferring to the Department of Energy.

---BPA will receive only the amount of power it needs from the plants. BPA will receive and pay for greater flexibility in power planning and marketing of power within its territory, as well as elsewhere in the United States and in Canada.

---BPA will receive 850 average megawatts of additional thermal power from WNP-1 operation to supplement generation from the hydroelectric system, which has been significantly inhibited due to low water levels and fish conservation programs for the past several years.

---The cost of power from Plant 2 will be reduced and stabilized.

- ▶ How BPA, the Supply System and DOE would work together:

We envision the federal government (DOE) would pay for modifications to Plant 2, and completion costs for WNP-1; provide the mixed oxide fuel for both plants; and pay for the operating and maintenance costs of both plants. The Supply System would operate the plants. BPA would purchase the power and handle its distribution and marketing. Revenue from power sales would offset the federal government's costs to destroy surplus weapons plutonium.

- ▶ Plant 2, WNP-1, and WNP-3 were designed to operate on either uranium fuel or a mixed oxide fuel. The mixed oxide fuel would consist of plutonium oxide and uranium oxide.
- ▶ The process of generating heat by fissioning plutonium in a controlled manner is identical to the process using uranium fuel that generates heat in commercial power production reactors today.
- ▶ The Supply System is a viable candidate to develop this concept because of our experience operating our Plant 2 nuclear power plant.

REMARKS OF JOSEPH BURN
Director of Projects
Washington Public Power Supply System

to be presented at the

INTERNATIONAL POLICY FORUM CONFERENCE:
The Disposition of Weapons Grade Plutonium and HEU

Leesburg, Virginia
March 10, 1994

I. Introduction

Good afternoon, ladies and gentlemen. It is a pleasure to be here at this most timely and important conference on the management and disposition of weapons grade plutonium and high enriched uranium, and an honor to be here with the other distinguished participants on this panel. I should note that written copies of my remarks are available at the registration table for those of you that are interested.

By way of background, I am Director of Projects for the Washington Public Power Supply System. In this capacity, I am responsible for the evaluation that the Supply System is currently undertaking of the feasibility and benefits of using our nuclear power plants for the purpose of burning excess plutonium from the dismantlement of this country's nuclear weapons. Supply System is the only organization with NRC licensed facilities to come forward and entertain the use of plutonium in commercial reactors. Several of the unique factors I will discuss should explain why we have taken this position.

II. The Washington Public Power Supply System

For those of you who may not be familiar with the Supply System, we are a municipal corporation and joint operating agency of the State of Washington that is empowered to finance, acquire, construct, and operate facilities for the generation and transmission of electric power.



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The Supply System currently operates an 1,120 megawatt nuclear power plant, WNP-Unit 2, located on the Hanford Reservation, as well as a 27.5 megawatt hydroelectric facility, the Packwood Lake Project. The Supply System also owns two partially completed nuclear power plants, including WNP-Unit 1, which is a 65% complete nuclear power plant located adjacent to the operating WNP-Unit 2 plant on the Hanford Reservation.

All electricity produced by Supply System projects is delivered to electrical distribution facilities owned and operated by the Bonneville Power Administration (BPA), which in turn distributes the electricity to utility systems throughout the Pacific Northwest.

Earlier this year, the Supply System announced its intention to explore the possibility of fueling two of our nuclear power plants with mixed oxide (MOX) fuel, comprising a mixture of uranium and surplus weapons-grade plutonium from U.S. stockpiles. The concept which we are currently evaluating, and which will be the focus of my remarks this afternoon, entails using the two Supply System nuclear power plants located on the Hanford Reservation in Washington State -- the WNP-2 facility, a General Electric boiling water reactor currently in operation, and the WNP-1 facility, a partially completed B&W pressurized water reactor -- to assist the federal government in disposing of weapons-grade plutonium. Under the approach, as we envision it, the WNP-2 reactor would be converted, and the WNP-1 reactor completed, to "burn" surplus weapons-grade plutonium in the form of mixed oxide (MOX) fuel, while simultaneously generating electricity for commercial consumption, thereby offsetting much of the cost to taxpayers of disposing of this excess weapons material.

III. Background -- Reactor-Use Option For Pu Disposition

Before getting into the details of the Supply System concept, I would like to briefly explain where the Supply System concept falls within the overall discussion of plutonium disposition.

By now, those of you participating in this conference are aware from our earlier speakers of the range of options being considered for plutonium



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disposition. The Supply System's concept is a near-term disposal option which falls under the general heading of "reactor-use options."

As the National Academy of Sciences and other knowledgeable participants in the plutonium disposition discussion have recognized, the use of weapons-grade plutonium as MOX fuel in existing commercial reactors is among the most viable and desirable options for disposition of this material. The reactor-use option would invoke a conventional technology -- MOX fuel use -- to convert weapons-grade plutonium into a highly diversion-resistant and environmentally manageable form (spent nuclear fuel), while at the same time extracting the economic value of the material by using it to produce electricity.

The Supply System's concept is fully consistent with this approach. In fact, the concept of using WNP-2 and WNP-1 as plutonium burners was specifically discussed by the National Academy of Sciences in its recent study of plutonium disposition as a viable reactor-use option.

IV. Dual Purpose Concept

I would like to take a few minutes to explain the details of the Supply System concept -- the "Dual Purpose Concept", as we refer to it -- currently under evaluation by the Supply System, beginning with a brief discussion of the technical capability of the WNP-Unit 1 and WNP-Unit 2 reactors to use mixed oxide fuel.

As presently envisioned, the Supply System's concept would involve arrangements under which DOE would process plutonium into mixed oxide (MOX) fuel. The MOX fuel would be delivered to the Supply System's reactors, on DOE's Hanford Reservation, and, after fuelling the reactors, spent MOX fuel would be returned to DOE for storage and disposal.

DOE would support the conversion of WNP-2 and the completion of WNP-1 as MOX fuel burners. The Supply System would reimburse BPA for capital improvements to the plants and would operate the plants. The generated power would be sold to BPA. DOE would pay plant operation and maintenance costs, and the revenues resulting from the sale of power would serve as a credit against the federal government's costs.

The reactors would remain the property of the Supply System and, importantly, would be operated by the Supply System as NRC-licensed facilities.

V. Summary of Advantages of the Dual Purpose Concept

Based upon our evaluation of the advantages of the Dual Purpose Concept to date, we see several important potential advantages of the proposed approach:

- **Enhanced Safety** -- The Supply System's concept centralizes operations on a single federal reservation -- which hosts both WNP-1 and WNP-2, as well as the capability to host a MOX fuel fabrication facility -- thereby simplifying transportation, fuel-handling, and safeguards issues and maximizing operational efficiencies. In addition, the concept employs a proven technology (MOX fuel use) and an experienced operator of commercial nuclear power plants.
- **Cost effectiveness** -- The Supply System's concept employs existing infrastructure and offsets costs to the federal government by generating electricity for sale by BPA.
- **Near-term plutonium disposition** -- Because it employs existing reactors, a proven technology, and an experienced plant operator, the Supply System's concept permits plutonium burning at the earliest possible date among the options being considered.
- **Environmental soundness** -- The Supply System's concept involves a proven method of plutonium conversion to a stable and familiar fuel form. In addition, this concept results in a conventional and highly diversion-resistant waste which the U.S. already has the capability to manage.

More broadly, the Supply System's concept is consistent with President Clinton's recently announced non-proliferation policy and is consistent with long-standing U.S. policy against use of civilian nuclear power reactors to produce nuclear weapons, as set forth in the Hart-Simpson Amendment to the Atomic Energy Act [42 U.S.C. § 2077(e)]. The concept is not a proposal for plutonium recycling; it is not a model for development of a commercial MOX fuel market; and it does not in any way promote nuclear weapons production. Rather, it envisions cooperation between the Supply System and the federal government for permanent disposition of weapons-grade plutonium at the lowest cost to federal taxpayers by in-reactor use and direct burial in a deep geologic repository. This is consistent with current U.S. policy on non-proliferation.

VI. Benefits of the Dual Purpose Concept Beyond Plutonium Disposition

Beyond the comparative advantages of the Supply System's approach to plutonium disposition, substantial additional benefits would result from use of the Supply System's plants to burn MOX fuel while at the same time generating electricity:

- **Economical power generation** -- the Supply System's concept provides for the generation of reliable, competitively-priced electricity, while adding needed generating capacity in the Pacific Northwest. The Northwest is today a hydroelectric-dominated region. However, pressures are developing on the water supply by irrigators, shipping, and fish interests. The added generation from WNP-1 would reduce the mounting pressures on this limited and variable resource. As Will Rogers said, "Whiskey is for drincken, water's for fighten."
- **Jobs creation** -- the Supply System's concept would result in 4,000 new highly-skilled jobs for completion of WNP-1 and modification of WNP-2 and 1,000 new highly-skilled jobs for long-term operation of WNP-1.



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- **Environmental preservation** -- the Supply System's concept would reduce current and future reliance on hydro power, thereby alleviating pressure on the region's fish population, and add generating capacity without either the need for new facilities or increased greenhouses gases.

While the Supply System's concept is fundamentally one for beginning U.S. plutonium disposition, these supplementary benefits reinforce the overall soundness of the Supply System's approach.

VII. Conclusion

In closing, I suggest that the significant efforts being undertaken by the many participants in this conference, and indeed the conference itself, are testimony to the fact that the United States, and hopefully other nations possessing nuclear weapons, recognize that we must address the task of managing and disposing of weapons-grade plutonium from dismantled nuclear warheads. The Supply System's concept, which, of course, is not the only option being discussed, offers a means of addressing U.S. plutonium disposition needs in a safe, cost-effective, and immediate manner -- one which builds on current plutonium disposition efforts.

There are, of course, other options that have been discussed, involving the use of both existing commercial reactors as well as advanced reactors. But we consider the Supply System's "Dual Purpose Concept" to have several important features which commend it, including a licensed and experienced nuclear operator, an operational emergency program, very limited pre-core transportation for the fuel assemblies, maximum uses of existing government facilities, potential for complete fuel conversion and destruction on a government reservation, and lowest cost to the taxpayer.

If the reactor-use option continues to receive support from knowledgeable quarters and emerges from the policy debate as a preferable plutonium disposition option, the Supply System looks forward to playing a key role in the future plutonium disposition policy of the United States. Thank you.

Statement of
the Washington Public Power Supply System
before the
Committee on Energy and Natural Resources
United States Senate
May 26, 1994

THE SUPPLY SYSTEM'S DUAL PURPOSE CONCEPT

The Washington Public Power Supply System (Supply System)^{1/} is currently exploring the potential of fueling two of its nuclear power plants with mixed oxide fuel (MOX fuel), comprising a mixture of uranium and surplus weapons-grade plutonium from U.S. stockpiles, in coordination with the U.S. Department of Energy (DOE). The fissioning of MOX fuel in the Supply System's reactors, located on the Hanford reservation, would simultaneously assist the federal government in disposing of weapons-grade plutonium and generate electricity for commercial consumption, thereby offsetting a portion of the cost to the federal government of disposing of plutonium from dismantled nuclear warheads.

This concept, known as the "Dual Purpose Concept" or DPC, would entail arrangements under which DOE would process plutonium into MOX fuel. The MOX fuel would be delivered to the Supply System's reactors, and the spent MOX fuel would be returned to DOE for disposal. The Department would support the conversion of the Supply System's currently operating WNP-Unit 2 plant and the completion of its 65% constructed WNP-Unit 1 plant, both of which have the capability to burn MOX fuel. The Supply System would operate the plants, and the generated power would be sold to the Bonneville Power Administration. DOE would pay plant operation and maintenance costs, and the revenues resulting from the sale of power would serve as a credit against the federal government's costs. The Supply System reactors would remain the property of the Supply System and the nuclear plants would continue to be licensed by the Nuclear Regulatory Commission.

The National Academy of Sciences' Committee on International Security and Arms Control released a report on January 24, 1994, entitled "Management and Disposition of Excess Weapons Plutonium," which called the existence of surplus plutonium "a clear and present danger to national and international security" based on the recognition that the mere existence of this material creates proliferation risks. The National Academy of Sciences' Report concluded that "options for the long-term disposition of weapons plutonium should seek to meet a 'spent fuel standard' -- that is, to make this plutonium roughly as inaccessible for weapons use as . . . spent fuel from commercial reactors." Dr. Wolfgang Panofsky, Chairman of the National Academy Report, has testified to Congress that it is extremely urgent, once the

^{1/} The Washington Public Power Supply System is a municipal corporation and joint operating agency of the State of Washington that is empowered to finance, acquire, construct and operate facilities for the generation and transmission of electric power. The Supply System currently operates an 1,120 megawatt nuclear power plant, WNP-Unit 2, located on the Hanford Reservation, as well as a 27.5 megawatt hydroelectric facility, the Packwood Lake Project. The Supply System also owns two partially completed nuclear power plants, including WNP-Unit 1, which is a 65% complete nuclear power plant located adjacent to the operating WNP-Unit 2 plant on the Hanford Reservation. All electricity produced by the Supply System projects is delivered to electrical distribution facilities owned and operated by the Bonneville Power Administration (BPA), which in turn distributes the electricity to utility systems throughout the Pacific Northwest.



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plutonium has been safely removed from the warheads and securely stored, to choose a disposition option which meets the "spent fuel standard." The Department of Energy has stated that they will adopt this standard when evaluating plutonium disposition options.

Government-sponsored studies, including the National Academy of Sciences' Report, indicate that conversion of surplus plutonium to MOX fuel and use of the MOX fuel in existing commercial nuclear reactors may be the best near-term strategy for disposing of excess weapons plutonium and that the Supply System's plants are prime candidates for the task. In brief, the Supply System's Dual Purpose Concept:

- builds on current U.S. plutonium disposition initiatives;
- promotes nonproliferation through safe, cost-effective, timely and environmentally sound plutonium disposition;
- reduces the risk of proliferation by satisfying the spent fuel standard; and
- offers substantial benefits beyond plutonium disposition.

PROMOTING NONPROLIFERATION THROUGH SAFE, COST-EFFECTIVE, TIMELY, AND ENVIRONMENTALLY SOUND PLUTONIUM DISPOSITION

When compared to other plutonium disposition options now under consideration, the Supply System's Dual Purpose Concept offers several key advantages:

- **Maximized Safety** -- The Supply System's concept centralizes operations on a single federal reservation, thereby facilitating resolution of transportation, fuel-handling, and safeguards issues and maximizing operational efficiencies. In addition, this concept employs a proven technology (MOX fuel use) and an experienced operator of commercial nuclear power plants licensed by the Nuclear Regulatory Commission.
- **Cost effectiveness** -- The Supply System's concept employs existing federal infrastructure and offsets costs to the government by generating electricity for sale by BPA. Existing government facilities on the federal reservation may be instrumental in the conversion of warheads to reactor fuel, thus promoting security, as well as cost effectiveness.
- **Near-term plutonium disposition** -- Because it employs existing reactors, a proven technology, and an experienced plant operator, the Supply System's concept permits plutonium burning at the earliest possible date (subject to the availability of MOX fuel).

- **Environmental soundness** -- The Supply System's concept involves a proven method of plutonium conversion to a stable and familiar fuel form. In addition, this concept results in a conventional and highly proliferation-resistant waste, the management of which is part of existing U.S. programs.

The Dual Purpose Concept is not a proposal for plutonium recycling; it is not a model for, nor does it encourage, development of a commercial MOX fuel market; and it does not in any way promote nuclear weapons production. Rather, it envisions cooperation between the Supply System and the federal government for use of surplus plutonium in a limited number of commercial reactors located on federal reservations to reduce stockpiles of surplus weapons plutonium at the lowest cost to federal taxpayers.

REDUCING PROLIFERATION RISKS WITH THE SPENT FUEL STANDARD

Not only does the Supply System's Dual Purpose Concept promote nonproliferation through safe, cost-effective, timely and environmentally sound plutonium disposition, the DPC would also actually reduce risk of proliferation of weapons-grade plutonium by converting it into a conventional, proliferation-resistant waste form. Utilizing MOX fuel in the Supply System's WNP-1 and WNP-2 reactors would convert weapons-grade plutonium into a form which satisfies the "spent fuel standard" endorsed by the Department. In fact, when the MOX fuel is "burned" in the Supply System's reactors, the fuel would be converted to a waste form that is essentially the same as that produced in currently operating U.S. nuclear reactors. Plutonium in spent fuel is considered a low proliferation risk because sophisticated technology is required to handle and reprocess the highly radioactive fuel before it could be converted for weapons use. Unlike vitrification processes that are also being considered as a possible plutonium disposition option, the Supply System's Dual Purpose Concept would transform weapons-grade plutonium into a form of plutonium much less suitable for weapons use.

BENEFITS BEYOND PLUTONIUM DISPOSITION

Beyond the comparative advantages of the Supply System's approach to plutonium disposition, substantial additional benefits would result from use of the Supply System's plants to burn MOX fuel in an effort to dispose of excess weapons plutonium:

- **Economical power generation** -- the Supply System's concept provides for the generation of reliable, competitively-priced electricity, while adding needed generating capacity in the Pacific Northwest.
- **Jobs creation** -- the Supply System's concept would result in 4,000 new highly-skilled jobs for completion of WNP-1 and modification of WNP-2 and 1,000 new highly-skilled jobs for long-term operation of WNP-1.
- **Environmental preservation** -- the Supply System's concept would reduce current and future reliance on hydro power, thereby alleviating pressure on the

region's fish population, and add generating capacity without either the need for new facilities or increased greenhouse gases.

While the Supply System's Dual Purpose Concept is fundamentally one for beginning U.S. plutonium disposition, these supplementary benefits reinforce the overall soundness of the Supply System's approach.

IMPORTANCE OF A TIMELY DECISION

Given the lengthy process the Department of Energy has stated it will follow in evaluating and choosing the method for ultimate disposition of the surplus plutonium, the Supply System is concerned that the significant advantages of the Dual Purpose Concept could be lost. The Department has testified that it plans to evaluate the disposition options in a Programmatic Environmental Impact Statement (PEIS) and subsequent Record of Decision. The Department has stated that a Notice of Intent should be published in early to late June 1994 and that public scoping meetings and data collection will continue until the fall of 1994. The Department proposes to have a draft PEIS and further public hearings by mid-1995, with the Record of Decision completed by early 1996. However, the Supply System recently has voted to discontinue preservation funding for its two partially completed reactors early in 1995. Thus, the possibility exists that the Department will need to continue preservation funding for one or both of the Supply System's partially completed reactors in order to keep all practical plutonium disposition options viable. Keeping the Dual Purpose Concept as a feasible alternative also would allow for near-term disposition after the Record of Decision is made in early 1996.

If preservation funding is not continued past early 1995, the reactors in effect could not be licensed by the Nuclear Regulatory Commission. Thus, the Department would lose the opportunity to choose a plutonium disposition option that is licensed and regulated by an independent body that possesses technical experience and public confidence in regulating commercial light water nuclear reactors, some of which have burned MOX fuel on an experimental basis in the past. In addition to the advantages listed above, the United States would lose a disposition option which offers the significant advantage of signaling to the world that we are committed to disposing of surplus plutonium as expeditiously as possible.

CONCLUSION

There is broad consensus among experts, decision-makers and the general public that nations possessing nuclear weapons must begin the task of managing and disposing of weapons-grade plutonium from dismantled nuclear warheads. The Supply System's Dual Purpose Concept offers a means of addressing U.S. plutonium disposition needs in a safe, cost-effective, and timely manner -- one which builds on demonstrated technology, current plutonium disposition efforts, supports the Clinton Administration's nonproliferation policy, reduces the risk of proliferation and offers other substantial advantages.

**NEAR-TERM PLUTONIUM DISPOSITION
AND NUCLEAR POWER GENERATION:
THE "DUAL PURPOSE CONCEPT"**

**Remarks of William G. Council
Managing Director
Washington Public Power Supply System**

to be presented at the

**1994 INTERNATIONAL SYMPOSIUM
OF THE URANIUM INSTITUTE**

**London
September 1994**

I. Introduction

Good afternoon, ladies and gentlemen. It is a pleasure to participate in this symposium and an honor to be here with the distinguished members of the Uranium Institute and other participants in this most timely and important discussion. This afternoon I wish to address the disposition of weapons-grade plutonium from the perspective of the Washington Public Power Supply System, an interested observer of this pressing and evolving international concern. I should note that written copies of my remarks are available for those of you that are interested.

By way of background, I am the Managing Director for the Washington Public Power Supply System. In this capacity, I have initiated and continue to oversee the evaluation that the Supply System is currently undertaking of the feasibility and benefits of using our nuclear power plants for the purpose of burning excess plutonium from the dismantlement of nuclear weapons in the United States of America. The Supply System is the only organization with power reactors licensed by the U.S. Nuclear Regulatory Commission to come forward and entertain the use of converted weapons plutonium in commercial reactors in the USA. Several of the unique factors I will discuss this afternoon should explain why we are exploring this concept.

II. The Washington Public Power Supply System

For those of you who may not be familiar with the Supply System, we are a municipal corporation and joint operating agency of the State of Washington that is empowered to finance, acquire, construct, and operate facilities for the generation and transmission of electric power in the Pacific Northwest region of the United States.

The Supply System currently operates an 1,120 megawatt nuclear power plant, WNP-Unit 2, located on the Hanford Reservation in Washington State, as well as a 27.5 megawatt hydroelectric facility, the Packwood Lake Project. The Supply System also owns two partially completed nuclear power plants, including WNP-Unit 1, which is a 65% complete nuclear power plant located adjacent to the operating WNP-2 plant on the Hanford Reservation. (The Hanford Reservation, owned by the U.S. Department of Energy (USDOE), has served as a nuclear industrial center since 1943 when it was selected by the U.S. government as the location for construction of one of the world's first nuclear production reactors.)

All electricity produced by Supply System projects is delivered to electrical distribution facilities owned and operated by the Bonneville Power Administration (BPA), an arm of the USDOE, which in turn distributes the electricity to utility systems throughout the Pacific Northwest.

III. The Dual Purpose Concept

Earlier this year, the Supply System announced its intention to explore the possibility of fueling two of our nuclear power plants with mixed oxide (MOX) fuel, comprising a mixture of uranium and surplus weapons-grade plutonium from stockpiles in the USA. I would like to take a few minutes to explain the details of the Supply System concept -- the "Dual Purpose Concept", as we refer to it.

The concept entails using the two Supply System nuclear power plants located on the Hanford Reservation -- the WNP-2 facility, a General Electric boiling water reactor currently in operation, and the WNP-1 facility, a partially completed B&W pressurized water reactor -- to "burn" surplus weapons-grade

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plutonium in the form of MOX fuel, while simultaneously generating electricity for commercial consumption, thereby offsetting much of the cost to U.S. taxpayers of disposing of this excess weapons material.

Before getting into the details of the Supply System concept, I would like to explain briefly where the Supply System concept falls within the overall discussion of plutonium disposition.

As you are aware, a broad range of options for plutonium disposition is being considered in the USA. The Supply System's concept is a near-term disposal option which falls under the general heading of "reactor-use options."

In the USA, the National Academy of Sciences and other knowledgeable participants in the plutonium disposition discussion have determined that the use of weapons-grade plutonium as MOX fuel in existing commercial reactors is among the most viable and desirable options for disposition of this material. The reactor-use option would invoke a conventional technology -- MOX fuel use -- to convert weapons-grade plutonium into a highly diversion-resistant and environmentally manageable form (spent nuclear fuel), while at the same time extracting the economic value of the material by using it to produce electricity.

The other recommended option, vitrification, continues to suffer from lack of technical support and absence of practical experience. In addition, vitrification of weapons plutonium fails to meet the "spent fuel standard" embraced by the National Academy and the Clinton Administration, unless other high-level radioactive wastes are introduced into the process. The addition of radioactive waste into the vitrification process would further extend the timetable for deployment of this concept. In addition, vitrification fails to offset the costs of disposition by extracting the economic value of the plutonium in the form of electricity.

The Supply System's concept is fully consistent with the reactor fissioning option for plutonium disposition. In fact, the concept of using WNP-2 and WNP-1 as plutonium burners was specifically discussed by the National Academy of Sciences in its recent study of plutonium disposition options.

As presently envisioned, the Supply System's concept would involve arrangements under which the USDOE would provide for processing of plutonium



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into MOX fuel. The MOX fuel would be delivered to the Supply System's reactors, on USDOE's Hanford Reservation, and, after a once-through fuel cycle, spent MOX fuel would be returned to USDOE for storage and disposal. Studies to date have determined that spent MOX fuel meets the specifications controlling the ongoing U.S. government development of a permanent spent fuel repository at Yucca Mountain in the State of Nevada.

USDOE would support the conversion of WNP-2 and the completion of WNP-1 as MOX fuel burners. The Supply System would operate the plants. The generated power would be sold to BPA. USDOE would pay plant operation and maintenance costs, and the revenues resulting from the sale of power would serve as a credit against the U.S. government's costs.

The reactors would remain the property of the Supply System and, importantly, would be operated by the Supply System and would continue to be licensed and regulated by the U.S. Nuclear Regulatory Commission.

IV. Summary of Advantages of the Dual Purpose Concept

Based upon our evaluation of the Dual Purpose Concept to date, we see several important potential advantages of the proposed approach for plutonium disposition:

- **Enhanced Safety and Efficiency** -- The Supply System's concept centralizes operations on a single federal reservation -- which hosts both WNP-1 and WNP-2, as well as the capability to host a MOX fuel fabrication facility -- thereby simplifying transportation, fuel-handling, and safeguards issues and maximizing operational efficiencies.
- **Proven Technology** -- Unlike concepts such as vitrification, the Supply System's concept employs a proven technology (MOX fuel use) and an experienced operator of commercial nuclear power plants and produces a conventional waste form. Indeed, several countries presently use MOX fuel in their nuclear



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programs (UK, France, Switzerland, Japan, Germany, Belgium among them) and are doing so quite successfully and safely. The WNP-2 reactor designer, General Electric, has determined that WNP-2 is ready now to begin a demonstration program using MOX fuel and that, with successive fuel reloadings focused on MOX fuel, the plant can eventually operate on 100 percent MOX fuel.

- **Cost Effectiveness** -- The Supply System's concept employs existing infrastructure and offsets costs of disposition by generating electricity for sale and use.
- **Near-Term Plutonium Disposition** -- Because it employs existing reactors, a proven technology, and an experienced plant operator, the Supply System's concept permits plutonium burning at the earliest possible date among the options being considered.
- **Environmental Soundness** -- The Supply System's concept involves a proven method of plutonium conversion to a stable and familiar fuel form. In addition, this concept results in a conventional and highly diversion-resistant waste which the U.S. already has the capability to manage.
- **Potential Impetus For Any International Effort** -- If international cooperation regarding plutonium disposition is deemed necessary and appropriate, the Supply System's concept could enable the USA to take an important first step in any such cooperative effort.

More broadly, the Supply System's concept is consistent with President Clinton's non-proliferation policy and with long-standing U.S. policy against use of commercial nuclear power reactors to produce nuclear weapons. The concept does not promote nuclear weapons production and would be aimed at decreasing rather than increasing the amount of separated plutonium and hence the risk of diversion. The concept envisions cooperation between the Supply System

and the U.S. government for permanent disposition of weapons-grade plutonium at the lowest cost to U.S. taxpayers by in-reactor use and direct burial in a deep geologic repository.

V. Benefits of the Dual Purpose Concept Beyond Plutonium Disposition

Beyond the comparative advantages of the Supply System's approach to plutonium disposition, substantial additional benefits would result from use of the Supply System's plants to burn MOX fuel while at the same time generating electricity:

- **Economical Power Generation** -- The Supply System's concept provides for the generation of reliable, competitively-priced electricity, while adding needed generating capacity in the USA's Pacific Northwest region.
- **Diversification of Regional Electricity Generating Sources** -- The Pacific Northwest is today a hydroelectric-dominated region. However, pressures are developing on the water supply by irrigators and shipping and fish interests. The added generation from WNP-1 would reduce the mounting pressures on this limited and variable resource.
- **Jobs Creation** -- The Supply System's concept would result in 4,000 new highly-skilled jobs for completion of WNP-1 and 1,000 new highly-skilled jobs for long-term operation of WNP-1.
- **Environmental Preservation** -- The Supply System's concept would reduce current and future reliance on hydro power and add generating capacity without either the need for new facilities or increased greenhouse gases.

While the Supply System's concept is fundamentally one for beginning plutonium disposition in the USA, these supplementary benefits reinforce the overall soundness of the Supply System's approach.

VI. U.S. Policy Debate & International Considerations

The Supply System's Dual Purpose Concept, as outlined above, continues to be consistent with emerging U.S. policy on plutonium disposition. As I mentioned a moment ago, the National Academy of Sciences has concluded that the use of MOX fuel in existing commercial nuclear reactors is one of the most promising alternatives for plutonium disposition. In May of this year, the Clinton Administration recognized the National Academy study and the use of MOX fuel in existing commercial reactors as one option for plutonium disposition and endorsed the "spent fuel standard." In a "Speech to the Public Forum on Plutonium Disposition," the Assistant to the President for Science and Technology embraced a four-part approach for securing nuclear materials, building confidence through openness, halting further accumulation, and carrying out ultimate disposition.

While the policy debate appears to be honing in on concrete options for plutonium disposition that are consistent with the Supply System's concept, there is a growing sense of urgency among stakeholders in the plutonium disposition arena. In a May 1994 address, the Clinton Administration emphasized that "we cannot afford unnecessary delay" and embraced the National Academy of Sciences view that we must move with all deliberate speed to eliminate stockpiles of surplus weapons-grade plutonium. Likewise, in proposed legislation on plutonium disposition program funding for fiscal year 1995, the U.S. Congress has expressed concern that further delay in selection and advancement of a plutonium disposition policy may foreclose desirable options. Amid this consensus on the urgency of adopting a plutonium disposition policy, the Supply System's concept alone offers a means of implementing almost immediately one of the most highly recommended strategies for drawing down plutonium stockpiles.

This sense of urgency is driven not only by concern that particular U.S. options for plutonium disposition may be foreclosed with the passage of time, but also by concern about the security of weapons material stockpiles in the former Soviet Union and elsewhere. Indeed, reports surfacing in recent months about

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discoveries of small amounts of weapons-grade plutonium in the hands of civilians underscore the urgency of moving forward with plutonium disposition on an international level. In this context, and in view of the fact that more time will pass before a disposition policy is finalized in the U.S. or elsewhere, options such as the Dual Purpose Concept which can be implemented in a short time should become even more attractive -- especially when compared to options such as vitrification which would involve considerable investment in new technology and infrastructure and thus long lead times. Viable near-term options, even if they cannot alone accommodate the entire disposition mission of the USA, could be an important first step in a multinational confidence building process.

As the plutonium disposition policy debate plays out in the USA and elsewhere, the Supply System will continue to explore the option of using its existing facilities as a potentially significant first step in the disposition phase of plutonium management. While the Supply System does not view itself as a promoter of any particular international plutonium disposition effort, it stands ready to support any U.S. effort involving reactor fissioning that may ultimately be undertaken in connection with such an international effort. As the Clinton Administration recognized in its May address on plutonium and international security, "what we do with our plutonium in the United States will inevitably have a major impact on what Russia does [and] will inevitably affect how other countries manage their plutonium, and how they view our seriousness about arms reductions and nonproliferation." The Supply System will continue to explore the Dual Purpose Concept as a legitimate, near-term vehicle through which the USA could express its firm commitment to pursuing global resolution of the plutonium disposition issue.

VII. Conclusion

In closing, I suggest that the significant efforts being undertaken at the national and international levels, and indeed this symposium itself, are testimony to the fact that nations possessing nuclear weapons are coming to recognize that we must address immediately the task of managing and disposing of weapons-grade plutonium from dismantled nuclear warheads. The Supply System's concept offers a means of addressing plutonium disposition needs in the USA in a safe, cost-effective, and immediate manner -- one which builds on current plutonium disposition efforts and paves the way for further international progress on weapons



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disposal. Importantly, we believe that the Supply System's Dual Purpose Concept has significant advantages that would facilitate near-term progress toward a solution to the global plutonium disposition issue.

There are, of course, other options that have been discussed, involving the use of existing commercial reactors as well as advanced reactors. But we consider the Supply System's Dual Purpose Concept to have several important features which commend it, including a licensed and experienced nuclear operator, maximum use of existing, centralized facilities on a government-owned nuclear site, and lowest cost to taxpayers.

The reactor-use option continues to receive support from knowledgeable quarters. If it emerges from the U.S. policy debate as a preferable plutonium disposition option, the Supply System looks forward to playing a key role in the future plutonium disposition policy of the USA and perhaps contributing to the prompt resolution of this issue on the international level. Thank you.

**WHAT ARE THE REALITIES OF MAKING A NUCLEAR DEVICE FROM
SPENT COMMERCIAL REACTOR FUEL?**

- While a 1992 study group at Princeton University Center for Energy and Environmental Studies insists a crude bomb could be fabricated from diverted reactor spent fuel, consider the following:
 1. Assembly of such a device requires knowledge of heavy metal machining, forming of explosive charges, and integrating the fuse assembly, engineering tasks which are beyond the abilities of terrorists operating in some bastion at a sub-national level
 2. The use of reactor vice weapons grade plutonium makes the task much more difficult and the results unpredictable.
 3. To develop all the technical ability, financial support, international trade network, etc., surreptitiously on a sub-national level without the host country knowing of the program is unrealistic.
 4. Finally, Iraq spent \$1 billion a year for 10 years, involved 10,000 trained people and still was unsuccessful in manufacturing a nuclear weapon.
- Weapons grade plutonium converted to plutonium oxide then blended with depleted uranium oxide is ready to be used in MOX fuel elements and is unusable for weapons.
- In 1995 the signatories of the Nuclear Non-Proliferation Treaty (NPT) will decide if it should be extended or continue in force indefinitely. Our policy, with respect to weapons plutonium, should be based on facts and technically achievable results consistent with the goals of non-proliferation, if we are to show leadership and influence the final arrangement of the NPT.

PLUTONIUM DISPOSAL OPTIONS - SPENT FUEL VS. VITRIFICATION

- Europe - 30 reactors licensed to use mixed oxide fuel
 - 15 operating on mixed oxide fuel
 - 15 tons of reactor grade plutonium have been recycled, which is technically a more difficult task than making mixed oxide fuel from weapons grade plutonium
- Vitrification of weapons grade plutonium with high level waste will not be developed on an industrial scale for 25 years and \$2B - current estimate by the investigators/developers.
- European economic experience with reactor grade plutonium has been extended to weapons plutonium as a mixed oxide fuel. Thus, the disposal cost figures are based on actual prices and offers made by "for-profit" industrial corporations, and not theoretical cost assumptions. These were compared with the most optimistic results for the vitrification option. Results based on 100 tons of warhead plutonium, the MOX fuel savings is \$1 to \$2 billion dollars. The range of savings results from the market conditions for power, uranium and enrichment costs.
- Yes, fuel fabrication of MOX fuel is five (5) times that of standard uranium fuel element. However, the overall cost of materials and fabrication is only 12% higher for the MOX fuel assemblies; this difference is eliminated if designs using higher burnup rates are used.

**GE REPORT SUPPORTS WNP-2 OPERATION
ON MIX OXIDE FUEL**

- No modifications are required to WNP-2 reactor systems in order to use a full range of plutonium enrichments.
- A full MOX core can be implemented in stages as the WNP-2 commercial uranium fuel is discharged from the reactor.
- Two (2) fuel designs have been developed for the GE Mark V reactor. They are called the "Island" design, and "full MOX" design.

The "Island" design is a very conservative design. This minimizes potential licensing issues as only 20% of the fuel rods contain plutonium. Existing government facilities at Los Alamos National Lab (TA-55) now have the fabrication capacity to support such a design for up to three (3) BWR's and could commence to support a demonstration program in WNP-2 by 1997.

The "full MOX" design uses plutonium in all fuel rods and could be implemented in WNP-2 as soon as a new MOX fabrication facility is brought on line to provide the required volume. Such a facility could be available by the year 2000: This is when WNP-1 could be available for the plutonium disposition mission also.

- It would require three (3) GE BWR's to disposition 50 metric tons of plutonium within 23 years of full MOX loading, assuming a 75% capacity factor.
- Initial demonstration in WNP-2 could require up to 20 MT of MOX fuel. This is within the capability of the Los Alamos TA-55 facility. The European's are or have operated facilities with throughput of 50-150 metric tons per year.
- Both fuel designs have been evaluated against currently approved safety envelopes for our fuel and comply with necessary criteria. Thus, no licensing delays are seen for a conversion to MOX fuel for WNP-2.
- The spent MOX fuel has been evaluated and was found to be acceptable in the permanent repository using the same criteria as for commercial spent fuel.

WNP-1 & 2 DUAL PURPOSE OPERATIONS SCENARIO

Revised 6/6/94

SUMMARY RESULTS

Total Annual Operating Costs

	1994 Constant <u>\$ in millions</u>
WNP-2 O&M	\$209
WNP-1 O&M	166
WNP-1 Debt Service – Includes debt service on \$50 M for WNP-2 Upgrades	158
Plutonium Disposal Fee	<u>25</u>
Total	<u>\$558</u>

Annual Payments by DOE & BPA (after both plants operational)

	1994 Constant <u>\$ in millions</u>
BPA – Purchase of Power at Market Rate	\$443
DOE	<u>114</u>
Total	<u>\$558</u>

Cost of Power to BPA

	<u>Mills/kwh</u>
1994 Real Levelized Cost of Power to BPA with DOE Subsidy	<u>29.06</u>
1994 Real Levelized Cost of Power to BPA w/o DOE Subsidy	<u>36.81</u>

WNP-1 & 2 DUAL PURPOSE OPERATIONS

Key Assumptions/Qualifications

General Assumptions/Considerations

All Costs estimated in 1/94 constant \$ – Excludes future escalation

Financing Assumptions

Interest Rate for Long Term Borrowing =	6.00%
Long Term Borrowing Term (years)	40
Bond Issuance Costs =	3.00%
Reserves for Long Term Debt (Months of Interest Costs) =	6
WNP-1 Existing Construction Fund =	\$110 Million dollars

Economic Assumptions

Present Value Discount Rate =	3.00%
All Costs estimated in 1/94 constant \$	
Real Escalation =	0.00%

Capital Cost Assumptions

Completion Costs 1/94 \$ in millions	
WNP-1	\$1,900 Million dollars
WNP-2 Upgrade Costs are Estimated @	\$50 Million dollars

Construction Schedule

	<u>WNP-1</u>	<u>Upgrade</u>
	<u>7/94-6/95</u>	<u>WNP-2</u>
Preconstruction		
Construction		
Start	7/95	FY95
Complete	6/2000	FY95

WNP-1 & 2 DUAL PURPOSE OPERATIONS

Key Assumptions/Qualifications (Continued)

O&M Costs Assumptions

WNP-2 FY 1994 Budget and Long Range Plan are the basis for estimated O&M costs for both WNP-1 & 2 reduced by 25% for WNP-1 to reflect two unit efficiencies with close proximity

	\$ in millions	
	<u>WNP-2</u>	<u>WNP-1</u>
Operation & Maintenance Costs	\$174.0	\$131.0
Capital Costs	35.0	35.0
Plutonium Disposal Fee	12.5	12.5
Total	\$221.5	\$178.5

Nuclear Fuel is provided at no charge to both WNP-1 & 2

Plant Life

Thru 2024 for WNP-2
40 years beginning 2000 for WNP-1

Assumed Market Value of Power From WNP-1&2 (mills/kwh)

Calendar Year Breakdown	mills/kwh	Total # of days	Generation Days	Generation		Value of Power \$ in millions		Average Cost of Power mills/kwh
				<u>WNP-2</u>	<u>WNP-1</u>	<u>WNP-2</u>	<u>WNP-1</u>	
January - April 16	35.0	106	106	2,498,126	2,718,284	\$87,434	\$95,140	22.06
April 17 - May 31	0.0	45	0	0	0	0	0	
June 1 - July 31	8.0	61	51	1,201,928	1,307,854	9,615	10,463	
August 1 - August 31	20.0	31	31	730,584	794,970	14,612	15,899	
September 1 - December 31	35.0	122	122	2,875,201	3,128,592	100,632	109,501	
		365	319	7,305,840	7,949,700	\$212,224	\$231,003	

Generating Profiles

	<u>WNP-2</u>	<u>WNP-1</u>
Ave Annual Capacity Factor	75.00%	75.00%
Ave CF Between Refuelings	88.31%	88.31%
Outage Duration (Days)	55	55
Outage Schedule	4/17-6/10	4/17-6/10
Net Output (MW)	1112	1210
Annual Generation(net mwh)	7,305,840	7,949,700

WNP-1 & 2 DUAL PURPOSE OPERATIONS

Key Assumptions/Qualifications (Continued)

Construction Financing Debt Issuance Schedule

EY	<u>WNP-1</u>				Issuance Costs	Capitalized Reserves	WNP-1	WNP-2	Gross IDC	Total Costs	Ending Balance
	Beginning Balance	Bond Issue	Investment Income	Total Income			Completion Costs	Upgrade Costs			
1995	110.0	0.0	2.2	2.2	0.0	0.0	5.0	50	0.0	55.0	57.2
1996	57.2	280.0	6.7	286.7	8.4	8.4	280.0		16.8	313.6	30.3
1997	30.3	650.0	13.6	663.6	19.5	19.5	570.0		55.8	664.8	29.2
1998	29.2	690.0	14.4	704.4	20.7	20.7	570.0		97.2	708.6	24.9
1999	24.9	525.0	11.0	536.0	15.8	15.8	380.0		128.7	540.2	20.7
2000	20.7	<u>225.1</u>	<u>4.9</u>	<u>230.0</u>	<u>6.8</u>	<u>6.8</u>	<u>95.0</u>		<u>142.2</u>	<u>250.7</u>	0.0
Total	110.0	<u>2,370.1</u> 0.0	<u>52.8</u>	<u>2,422.9</u>	<u>71.1</u>	<u>71.1</u>	<u>1,900.0</u>	<u>50.0</u>	<u>440.7</u>	<u>2,532.9</u>	0.0

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WNP-1 & 2 DUAL PURPOSE OPERATIONS

Annual Operating Cashflows - \$ in Millions

Year	Fiscal Year	Costs				Revenue			Average Payments Required From DOE	TOTAL REVENUES	Revenues From Power Sales
		WNP-2 total O&M Costs Incl Fee	WNP-1 total O&M Costs Incl Fee	WNP-1 New Debt Service	TOTAL COSTS Incl fee & Debt	WNP-1	WNP-2	WNP-1&2 Total			
1	1995	0	0	0	0	0	0	0		0	
2	1996	0	0	0	0	0	0	0		0	
3	1997	222	0	0	222	0	212	212	9	222	212
4	1998	222	0	0	222	0	212	212	9	222	212
5	1999	222	0	0	222	0	212	212	9	222	212
6	2000	222	0	0	222	0	212	212	9	222	212
7	2001	222	179	158	558	231	212	443	114	558	443
8	2002	222	179	158	558	231	212	443	114	558	443
9	2003	222	179	158	558	231	212	443	114	558	443
10	2004	222	179	158	558	231	212	443	114	558	443
11	2005	222	179	158	558	231	212	443	114	558	443
12	2006	222	179	158	558	231	212	443	114	558	443
13	2007	222	179	158	558	231	212	443	114	558	443
14	2008	222	179	158	558	231	212	443	114	558	443
15	2009	222	179	158	558	231	212	443	114	558	443
16	2010	222	179	158	558	231	212	443	114	558	443
17	2011	222	179	158	558	231	212	443	114	558	443
18	2012	222	179	158	558	231	212	443	114	558	443
19	2013	222	179	158	558	231	212	443	114	558	443
20	2014	222	179	158	558	231	212	443	114	558	443
21	2015	222	179	158	558	231	212	443	114	558	443
22	2016	222	179	158	558	231	212	443	114	558	443
23	2017	222	179	158	558	231	212	443	114	558	443
24	2018	222	179	158	558	231	212	443	114	558	443
25	2019	222	179	158	558	231	212	443	114	558	443
26	2020	222	179	158	558	231	212	443	114	558	443
27	2021	222	179	158	558	231	212	443	114	558	443
28	2022	222	179	158	558	231	212	443	114	558	443
29	2023	222	179	158	558	231	212	443	114	558	443
30	2024	222	179	158	558	231	212	443	114	558	443
31	2025	0	179	158	336	231	212	231	105	336	231
32	2026	0	179	158	336	231	212	231	105	336	231
33	2027	0	179	158	336	231	212	231	105	336	231
34	2028	0	179	158	336	231	212	231	105	336	231
35	2029	0	179	158	336	231	212	231	105	336	231
36	2030	0	179	158	336	231	212	231	105	336	231
37	2031	0	179	158	336	231	212	231	105	336	231
38	2032	0	179	158	336	231	212	231	105	336	231
39	2033	0	179	158	336	231	212	231	105	336	231
40	2034	0	179	158	336	231	212	231	105	336	231
41	2035	0	179	158	336	231	212	231	105	336	231
42	2036	0	179	158	336	231	212	231	105	336	231
43	2037	0	179	158	336	231	212	231	105	336	231
44	2038	0	179	158	336	231	212	231	105	336	231
45	2039	0	179	158	336	231	212	231	105	336	231
46	2040	0	179	158	336	231	212	231	105	336	231
Total											15,184

* Debt service based upon the bond issuance schedule shown on previous page.

** O&M includes spent fuel disposal fees, decommissioning costs and generating taxes.

Net Generation Mwh	Discount Factor	Discounted Revenues From Power Sales	Discounted Net Generation Mwh	Total Discounted Revenues
	1.0300			
	1.0609			
7,305,840	1.0927	194	6,685,879	203
7,305,840	1.1255	189	6,491,144	197
7,305,840	1.1593	183	6,302,082	191
7,305,840	1.1941	178	6,118,526	186
15,255,540	1.2299	360	12,404,150	453
15,255,540	1.2668	350	12,042,864	440
15,255,540	1.3048	340	11,692,101	427
15,255,540	1.3439	330	11,351,554	415
15,255,540	1.3842	320	11,020,927	403
15,255,540	1.4258	311	10,699,929	391
15,255,540	1.4685	302	10,388,280	380
15,255,540	1.5126	293	10,085,709	369
15,255,540	1.5580	285	9,791,951	358
15,255,540	1.6047	276	9,506,748	347
15,255,540	1.6528	268	9,229,853	337
15,255,540	1.7024	260	8,961,022	327
15,255,540	1.7535	253	8,700,021	318
15,255,540	1.8061	245	8,446,623	309
15,255,540	1.8603	238	8,200,604	300
15,255,540	1.9161	231	7,961,752	291
15,255,540	1.9736	225	7,729,856	282
15,255,540	2.0328	218	7,504,715	274
15,255,540	2.0938	212	7,286,131	266
15,255,540	2.1566	206	7,073,913	259
15,255,540	2.2213	200	6,867,877	251
15,255,540	2.2879	194	6,667,842	244
15,255,540	2.3566	188	6,473,633	237
15,255,540	2.4273	183	6,285,080	230
7,949,700	2.5001	92	3,179,778	134
7,949,700	2.5751	90	3,087,163	130
7,949,700	2.6523	87	2,997,246	127
7,949,700	2.7319	85	2,909,947	123
7,949,700	2.8139	82	2,825,191	119
7,949,700	2.8983	80	2,742,904	116
7,949,700	2.9852	77	2,663,014	113
7,949,700	3.0748	75	2,585,450	109
7,949,700	3.1670	73	2,510,146	106
7,949,700	3.2620	71	2,437,035	103
7,949,700	3.3599	69	2,366,053	100
7,949,700	3.4607	67	2,297,139	97
7,949,700	3.5645	65	2,230,232	94
7,949,700	3.6715	63	2,165,274	92
7,949,700	3.7816	61	2,102,208	89
7,949,700	3.8950	59	2,040,978	86
		8,227	283,110,526	10,422
			29.06	36.81

