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Rules and Directives Branch

May 18, 2001

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**Nuclear Information and Resource Service Comments  
on the Scope of the Nuclear Regulatory Commission's Environmental Impact Statement  
on Production and Use of Mixed Oxide Fuel, May 2001**

NIRS is active in the Global NIX MOX Campaign, we opposes the use of plutonium fuel in any reactor. We thoughtfully urge the Nuclear Regulatory Commission (NRC), on behalf of our members and friends, to choose the No-Action alternative and deny any license for MOX plutonium fuel production, transport, or use.

No-Action on a MOX license is the only credible path for NRC given the agency's mandate to protect our health, our safety, and our environment since plutonium fuel use jeopardizes these. In this case, No-Action simply denotes denial of a license for the construction and use of the MOX fuel factory, a well as any license amendments that would permit MOX fuel use. This does not imply that nothing would be done with the plutonium. To the contrary, the DOE passed a Record of Decision on the disposition of surplus plutonium, stating that a "dual track" was chosen in case one track fails. It could be argued that the NRC no-action is a 100% plutonium immobilization route. When NRC selects No-Action, the question of plutonium disposition would revert back to DOE and other branches of government, since NRC has no jurisdiction over plutonium disposition.

NIRS opposes export of the MOX program to Canada or any other country as an alternative to MOX in the US. The NIX MOX Campaign opposes plutonium fuel use in ANY reactor.

**Need for Clarification of Proposed Action**

NRC should table all work on the planned environmental impact statement (EIS) and action on the MOX fuel license application (construction authorization request—CAR) until there is a clearer statement defined about the proposed action by NRC. The Department of Energy (DOE) made the decision to build the proposed MOX plutonium fuel factory and also chose the proposed location accompanied by a public process, which made a number of assertions and promises to the public. Among these were defined limits to the program. The MOX program would be to address a subset of the weapons grade plutonium declared surplus at that time (50 metric tons). The mission was defined in terms of nuclear nonproliferation goals. It is clear to us (and we made every effort to tell the DOE) that the MOX mission will fail to meet these goals,

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and that MOX is such a high risk for both nuclear safety and nuclear proliferation that it should not be pursued. Nonetheless, it is important to recognize these promises made by the DOE.

It is not 100% clear that NRC's proposed action in licensing the proposed MOX plutonium fuel factory is the same as that presented to the public by the Department of Energy; it is not clear that NRC is limiting the MOX fuel license in the same way. Indeed, when it became clear that NRC would have the job of licensing – or not – DOE's MOX factory, NRC responded by revising Part 70 in a generic fashion and issued a Standard Review Plan (NuReg 1718) that applies generically to any MOX fuel factory that might be proposed anywhere.

It makes sense that proposed factory should meet generic regulations since the pit-falls of site-specific regulation are becoming abundantly clear in other arenas, such as the permanent repository program. Nonetheless, if NRC does nothing to affirm the promises made by DOE, then NRC must clearly define what the NRC action is. Given recent statements by the White House, an unrestrained action by NRC could result a seamless transition from weapons plutonium disposition to civilian plutonium being used to make more MOX with a return to reprocessing and plutonium separation at Savannah River Site (SRS). It is not acceptable that this result should come from NRC's action with no clear statement and consideration in the EIS and the scoping process. While NIRS brought these issues up at public scoping meetings, that is not sufficient. NRC must be clear about what the federal action is. Scoping is designed to define the boundary of study of an action, not the action itself. If NRC decides that its action is different than DOE's, this must be stated and EIS scoping meetings should be repeated.

Similarly, NRC and DOE should have resolved the issue of decommissioning of the MOX fuel factory prior to scoping. NRC licenses require decommissioning provisions. It is not a good precedent to set for NRC to grant an operating license with no provisions for decommissioning. This issue also raises alarm with respect to the question of defining the federal action.

If NRC has no license requirement for decommissioning of the fuel factory, the specter of ongoing plutonium fuel production and a return to the reprocessing of irradiated nuclear fuel looms large. NRC would have to include in their EIS of such an action the impacts from these activities, especially since the chosen location of the new factory--the F Area at SRS--lends itself to this scenario so well with the F "canyon" for plutonium recovery and high-level waste tanks. Of course if this is the plan, then the environmental impact statement (EIS) should also include looking at a "Mobile Chernobyl" scenario for nationwide transport of commercial nuclear power's high-level wastes to South Carolina...and the impacts of millions more gallons of corrosive liquid high-level waste being generated in this already challenged ecosystem.

### **Over-Lapping Jurisdictions and Qualifications of NRC to Regulate Plutonium**

Another reason that this process should be deferred is that this program will have some of the most complex over-lapping jurisdictions in the nuclear arena. Not only will DOE and NRC have to iron out complex issues of areas of responsibility for materials security and safety, but the SRS contractors, DCS and each of its component corporations and then the state and local authorities involved in accident response both at the respective sites and in transport.

This is particularly worrisome since NRC has no experience in regulating weapons grade plutonium or processes for working with it. NRC has made little effort since the news of their involvement in this program to increase that experience, or to insure that crucial programs such as lead test assembly assessment were on track. This neglect is compounded by repeated quotes

in the press from NRC staff pre-judging plutonium fuel as no greater risk than uranium fuel, prior to any credible NRC analysis of that question.

### **Site Specific, Not Generic**

Regardless of how NRC chooses to resolve the concerns expressed above, evaluation of plutonium fuel production and use as well as reactor-related impacts must be site specific, not generic. NRC is proposing to do a generic analysis of reactor impacts, even though the contract states clearly which reactors will be used. This is particularly distressing, given that the Duke ice condenser reactors are not appropriate as "reference reactors" for other types, nor is a more generic "reference reactor" a legitimate base for analysis of these unique systems.

### **Ice Condenser Reactors**

Even while NIRS is calling on the rejection of plutonium fuel in any reactor – and went so far as to invite the NRC to join the global NIX MOX Campaign when they came to the Southeast in the summer of 2000-- since there is going to be an evaluation of this program, we call upon the NRC to immediately and categorically reject any further consideration of the use of MOX plutonium fuel in ice condenser reactors. These reactors pose an unacceptable risk to the public with the use of uranium fuel; even more risky MOX should not even be contemplated!

Catawba and McGuire have the weakest physical containment structure in the entire US fleet of reactors, as evidenced in a recent NRC report on containment failure. We reject the notion that mechanisms of containment failure at these reactors can be adequately modeled in such a way that catastrophic failure probability estimates are meaningful. Indeed, tornadoes, earthquakes and perturbations in the electrical grid are not predicable. Therefore, experimental fuel, which could contribute to such failure, should not be put in reactors with little more containment than Chernobyl had, particularly when it is also significantly more deadly and costly if it is released. The NRC should act now to remove these reactors from further consideration.

### **Data & Analysis Methods**

Since weapons grade plutonium has never been fabricated into commercial reactor fuel and has never been used in a commercial reactor before, there is no data upon which the NRC can base its regulatory functions for this activity. Further, the relevant data for most of this program is weapons grade plutonium that has been recovered from the alloyed metal used to make a nuclear weapon pit. A pilot program would be prudent; otherwise this entire project is just that.

In the EIS there must be clear disclosure of the data every analysis or projection is based on, what the data actually is, and where the NRC got that data, and any uncertainty associated with it. When the information is not from weapons grade plutonium experience, or not from a dismantled weapon component, or not in the same application, NRC must make plain the assumptions being made to derive a projection related to the proposed salvaged weapons grade plutonium in the current proposed application, and the uncertainty associated with the calculations. It is also important to report all calculational methodology and all models used, as well as NRC's assumptions.

We also call upon the NRC not to allow the risk modification of any projected dose figures in this program, such as is being used in the draft 10 CFR part 63. It is not acceptable to report radiation exposure altered by someone's evaluation of the probability that the exposure will occur. Accident analysis in particular must be presented as a straight account of projected actual impacts associated with a particular scenario, if it were to occur, uncolored by probability factors, though these may be presented in the discussion of overall risk.

## **Environmental/ Operations Records**

We concur with the Blue Ridge Environmental Defense League in pointing out that the environmental and operational record of the Savannah River site is irrelevant to the CAR decision. It is the environmental records and operating histories of Duke, COGEMA, Stone and Webster that must be made publicly available, and cited in the NRC's analysis. COGEMA's records are of particular concern given their bad-actor status in Europe and Canada for catastrophic environmental impacts and worker abuse. Not only is there a language barrier for the US public, the data on their operations not publicly available to the French. NRC must require that their record be made available.

## **Savannah River Site (SRS) Concerns**

Active clean-up of past environmental abuses of DOE's SRS and the Savannah River basin has only just begun. Evaluation of a MOX factory and processes required must include impacts on this site and region and also impacts on the SRS clean-up and restoration process itself.

There are many concerns about putting additional processes at this site, not the least of which is the additive and synergistic impacts that would result from a large disruptive event at the site such as an earthquake, extreme perturbation of weather (storms which are being reported with increased frequency, with the force of many tornados combined), or terrorist act.

Mention of injection wells in the DCS environment report suggest an intention to further jeopardize the ground water of the region, not support its clean-up and restoration. This must be fully characterized, and then rejected.

Analysis of plutonium processing impacts must start with new findings on plutonium mobility in our environment. Higher oxidation states which may be directly soluble, and adhesion to colloids, facilitating suspension in soil water, ground and surface water both contribute to explaining why plutonium in New York, Nevada and other locations has been observed to migrate 10's of thousands of times farther and faster than the federal agencies previously thought when deciding to take actions that might release plutonium to the biosphere. The current action must be informed by the truth that plutonium does not sit still once released.

Is the NRC planning on imposing a zero release standard on the proposed MOX plutonium fuel factory? If not, then reality-based research on plutonium in the environment, specific to SRS and the Savannah River basin should be used to analyze the impacts of this program. Does such data exist? If not, how is NRC going to get it?

## **Plutonium Processing/Handling**

The fact that re-using nuclear warhead pits as reactor fuel will produce more wastes, more difficult to handle wastes, more worker exposures, more overall risk to the public through the combined phases of processing, production, transport and use, and that it will cost the taxpayers more money, should have been sufficient for DOE to reject MOX and embrace an alternative that would treat the plutonium from warheads as a waste. The NRC still has the option of arriving at this conclusion, and we believe that the increased wastes that will be generated from purifying the plutonium are alone, a sufficient negative impact on the existing burdens of the taxpayer and our environment, for NRC to reject the MOX license application.

Several million more gallons of high-activity deadly liquid waste would be generated by "plutonium polishing" to make the plutonium pure enough for reactor use. Adding this liquid

waste to the existing, leaking storage tanks is not a “solution.” NRC must include the disposition of all process wastes in their analysis. It is not clear that this process will even be sufficient, since any remaining gallium in the finished reactor fuel could result in cladding leaks, which would adversely impact health throughout the region.

### **MOX Plutonium Fuel Production Concerns**

The NRC needs to include in the EIS a careful analysis of accident conditions including: fire – including pyrophoria of the plutonium, station blackout, seismic events that reflect historical events in the region and sabotage. The fact that there is no containment for the fuel pellet sintering process must be considered.

The Site boundary should coincide with the NRC’s line of authority. The non – DCS workers at SRS are members of the public. Recent decisions at SRS to “decontaminate” structures and “rent them out” for other purposes also puts non-radiation workers on the site, who are clearly not DCS workers, and therefore members of the public. Annual and ongoing hunting and other activities such as conservation and biological study likewise bring individuals to SRS who must be considered members of the public. Therefore the “site boundary” must be the DCs site boundary, which should also correspond to the line of NRC regulatory authority at SRS.

Therefore emergency planning must be required and analyzed. It clearly will have to be yet another area of overlapping jurisdictions between the multiple agencies and the contractors.

### **Reactor Concerns**

We believe that the current EIS must include the consideration of impacts on our health, safety and environment from the use of MOX fuel in reactors. We have urged NRC to cease any consideration of licensing ice condenser reactors for MOX fuel use, and believe an honest and thorough analysis of this plan would form the basis to reject them. A generic analysis would not be appropriate since these reactors are not generic, nor would they serve as reference for any others. This analysis would also serve as the basis for a no-action decision since a rejection of reactor use would render MOX production moot.

Since weapons grade plutonium has never been used to fuel a commercial reactor before, let alone plutonium that is salvaged from a nuclear warhead, the NRC must be very clear about the source of data used for reactor analysis, and its veracity. It is often cited that plutonium –239 builds up in uranium fuel as a result of fission over time. Fission of this material is invoked as relevant experience for the use of salvaged weapons grade plutonium fuel. This is not a direct comparison however because the MOX fuel is advertised as 4 – 6 % weapons plutonium where uranium evolves less than 1% plutonium 239. Further, the issues of contaminants in the plutonium discussed further below are substantial, and not represented in the analogy.

The analysis of MOX fuel use must include diminished reactor control due to two key factors: the smaller number of delayed neutrons rendering control rods less effective, and weapons grade plutonium fission's characteristic coefficient of heat where the hotter the reactor gets, the easier it is to split plutonium. Uranium’s natural characteristics assist operators in controlling the fission process. What is the reduction in margin of reactor safety, both from these intrinsic plutonium properties, and also any steps taken to mitigate them?

Acceleration in reactor component aging due to weapons grade plutonium’s hard, fast neutrons must be studied. This must be factored into increased waste streams as components are replaced, new reinforcing materials are added, and also accident risk.

MOX fuel's higher levels of heat, fission products, residual plutonium and the full array of actinides, should be assessed in terms of routine releases to air and water, thermal impacts to Lakes Wylie and Norman, worker and public radiation exposure and all waste streams...and their waste streams!

In looking at waste, both so-called low-level and high-level must be considered in on-site management / disposal, transport, processing and disposal. At each step routine releases, worker exposures, public exposures, accident scenarios including criticality and pyrophoria where applicable, and resulting attendant waste and clean-up processes.

When it comes to high-level waste, the NRC must assess impacts on fuel pool storage, dry storage containers, transport casks and handling / emplacement at a permanent repository. What does this do with the DOE's shift to a "cool" design for Yucca? Further the much greater residual un-fissioned plutonium in this waste will present criticality challenges unlike conventional uranium wastes at each step along the way. Indications are 2 – 4 times more fissile plutonium in this waste, which must be factored in.

The NRC must also fact in that North Carolina will soon be excluded from using the Barnwell site for so-called low-level waste disposal. What will the use of MOX fuel do to the concentration and total amounts of plutonium in reactor operations waste? Where will it go? What about the impacts on waste treatment such as incineration or decontamination?

Since there is the a trend towards releasing radioactively contaminated materials and wastes into unrestricted commerce where there is no further regulation, materials originating from MOX use that would have has even more plutonium than those form current processes must be evaluated with the goal of preventing any release or exposure or accretion in our environment.

In addition to these analysis, because plutonium fuel has never been used commercially in the US before, and it will change the source term associated with every ancillary activity associated with reactor operation, every single contract that Duke has with service providers must be reviewed to see if a change to MOX fuel would impact that operation, its workers, host community and transport routes. For example: coverall laundering. What will the impacts be on residences and businesses in the vicinity of the nuclear laundry that Duke uses? What about the surface and ground water there? What about the sewer district? All of this must be looked at, as well as other vendors and contractors, such as component repair / decontamination operations. The entire "foot print" of reactor support services must be assessed.

The source term (amount and type of radioactivity including persistence) used in the analysis of a plutonium core release accident must be accurate, and the doses reported from projected accidents not modified by risk factors. The DOE has validated the finding by Dr. Ed Lyman of the Nuclear Control Institute that a major accident while MOX fuel was in use would cause significantly more cancer deaths than the same accident with uranium fuel in use. A possible doubling in fatal cancers associated with use of 100% MOX fuel, and the projected 25% (or more) increase in cancer deaths associated with the DCS plan for a 40% core is unacceptable and should be the basis for NRC to select the no-action alternative and reject MOX license. The NRC's EIS should further document the full range of health impacts from a catastrophic MOX fuel accident, and do so considering the actual population of the Charlotte Metro region, including children. Of particular concern is the persistent impacts to water and food that would result from the actinide-rich profile of MOX fuel.

Reality-based emergency response capability must be part of the above analysis, including the commentary from Charlotte area residents that simply daily lunch time traffic is enough to render access routes to the McGuire reactor area impassable.

In addition to catastrophic accident analysis, NRC needs to look at the potential for poor quality control in gallium and other contaminant removal from the recovered warhead plutonium and plutonium scrap material. The potential for fuel cladding leaks or cladding failure is great given the tendency of gallium to attack the zircaloy of fuel cladding. The Massachusetts Public Health Department study of actual health impacts to the SE part of that state from faulty fuel at the Pilgrim reactor should be used as the basis for a projection of the public health impacts that faulty fuel at McGuire or Catawba could have on the region.

If this level of detailed analysis will not be provided in the current EIS, A Supplemental EIS (SEIS) should be done at the time that Duke or any other utility seeks a license amendment to use plutonium fuel. This SEIS should be specific to that reactor.

### **Transport Concerns**

Many concerns with shipment of both plutonium and MOX fuel have been referenced above. It is not acceptable for NRC to defer to DOE on the regulation of transport of unirradiated MOX fuel. It is not acceptable to simply dismiss accidents or sabotage or other hostile acts as unlikely as DOE does and spare no effort to develop contingencies or weigh impacts. We support the comments and concerns of the State of Georgia as they apply to movement of both plutonium source material and the fuel product in the region.

It is worth appending a portion of the NRC's February Advisory Committee on Reactor Safety meeting to these comments to insure that our concerns shared by Mr. Sieber are in fact considered in this EIS: (Mr. Sieber of ACRS talking to Mr. Tim Johnson of the NRC's MOX fuel project, official transcript 02/02/01)

MR. SIEBER: Right. An additional question. When you talk about the security of mixed oxide fuel, when you ship a new unburned fuel assembly from the fabrication plant to the reactor, does that follow the rules of shipping special nuclear material or is it something greater than that since --

MR. JOHNSON: It would fall under the transportation regulations.

MR. SIEBER: Well, it would seem to me that some relatively simple chemical processing could be used to concentrate the plutonium and separate it from the depleted uranium just as it was put together in the first place, say as opposed to slightly enriched uranium where making a more fissile material is virtually impossible without a diffusion plant or centrifuge or something like that. You see what I mean?

MR. JOHNSON: No, could you --

MR. SIEBER: Well, you could take this fuel assembly, put it in nitric acid, again, run it through an organic separation process and separate the uranium from the plutonium.

MR. JOHNSON: This is after the radiation?

MR. SIEBER: No, this is at the point where it leaves the fabrication plant, before it's inserted into the reactor. So you end up with high grade plutonium again after you do that which would be an opportunity for somebody --

MR. JOHNSON: Right, well, the security of that shipment will be an important consideration.

MR. SIEBER: Okay. You would take something like that into consideration?

MR. JOHNSON: Yes.

### **Radiological Analysis**

Since NRC is doing an environmental analysis, not a compliance review, it is vital that in addition to maximally exposed individuals, all individuals be considered. That the NRC evaluate radiation exposures impacts not only on the "standard man," but his children, his unborn children, his aging grandmother and his sister with already compromised health. Particularly

since the actinides, more prevalent in MOX include many alpha-emitting elements, current findings on the genetic implications of alpha exposure by Dr. Eric Wright must be used as the basis for these studies.

### **Environmental Justice Concerns**

A complete environmental justice analysis must include not only the communities adjacent to Savannah River Site, but also communities down wind and down river, including subsistence fish consumers, and transport routes for both the source material and the fuel transport, as well as the reactor communities, and all waste communities. Further consideration should be given to the fact that this entire program has been located in the Southeastern United States and whether it fits a pattern of "dumping on Dixie."

### **Other Socio-Economic**

Western North Carolina relies heavily upon seasonal tourism and seasonal residents in our economic base. The impacts on perception of this area – both from transport of plutonium and plutonium fuel over many years, and the use, making the nuclear power reactors in this area uniquely risky, must be considered. Property values in the immediate area of these reactors must also be assessed.

The NRC must include in this analysis a consideration of the impacts of potential bankruptcy of a number of Carolina towns and cities – known collectively as the Electri-Cities – as a direct result of the MOX license in the seemingly inevitable event of electric utility deregulation in the Southeast. The program which brought municipal investment to the construction of the second Catawba reactor will result in sure economic catastrophe for these investors in the event that Duke is shielded from deregulation pressures by the tax subsidy which the DOE MOX contract would provide. With deregulation the Electri-Cities will have to continue to repay municipal bonds that were sold to buy into reactor construction, while Duke will be able to under-sell these prices, all the while enjoying the MOX tax subsidy. Please include an assessment of these impacts on the region.

Plutonium fuel increases all nuclear liabilities. MOX use should be evaluated with respect to the Price-Anderson Act package of payments and liability limits. How does the decision by Duke to volunteer for higher liability, and be compensated by DOE for this impact the equal liability / payment assumptions upon which Price Anderson is forged? What are the equity issues for the other reactor owners in the US, particularly since there is evidence that MOX fuel use could such an accident more likely to occur? What are the concerns for the taxpayer? Since current industry liability caps under Price Anderson do not approach the true costs of a major accident with uranium fuel, the increased costs from a MOX accident would almost certainly be a taxpayer burden. Since the taxpayer is paying for this entire program, this must be of paramount concern to the NRC.

Thank you for your consideration of these vital concerns, and taking action to protect our health, our safety and our environment by rejecting the MOX proposal.

Sincerely,

Mary Olson  
Director, Southeast Office