SUMMARY STATEMENT

Like others, I am puzzled by the emphasis on heavy cuts in Advanced Reactor R&D. "Investment in the future," is precisely what IFR development is. It is investment in the future energy viability of the United States; a huge new energy source is being developed for relatively little investment.

The apparent effect is to close off the only option we have for clean and safe nuclear power that is sustainable in large quantity for any reasonably long time.

For anyone concerned about a future made uncertain by greenhouse gases and by depleting energy resources, the closing of this door must be troubling.

Put simply, the IFR uses fuel so efficiently that its fuel supply will never be an issue, no matter how much energy the technology is asked to produce. It is safer and cleaner, recycles much of its own waste, and leaves a much less long-lived waste product. It has been developed specifically to have these qualities and a number of other qualities too that are likely to be needed when large amounts of power are needed.

The development cost is small both by historical standards and by comparison to other comparable technologies. The technology costs about $40M a year, and the associated facility and site costs an additional $85M a year to operate. $125M a year then is the cost of demonstrating everything: the new fuel type, its reactor safety behavior, spent fuel processing, fuel fabrication, waste packaging, and everything else, right down to security guards. This $125M/year compares to the billion dollars or more, in today's dollars, that was being spent annually on only partially successful development of the mixed oxide fuel cycle only a few years ago here in the U.S. and currently in Europe and Japan.

The prestigious National Academy of Sciences, in the past year, completed a study on the future of nuclear power entitled "Nuclear Power: Technical & Institutional

Options for the Future," June 1992. In the report, mandated by Congress, the IFR was selected as the nation's highest priority long-term reactor option.

The IFR represents true technology innovation. Japanese utilities have already started taking notice of its potential, and two cooperative agreements, signed in 1992, give the IFR a total Japanese contribution of $46 million for the initial phase of the technology demonstration. The prospects for much broader international cooperation appear excellent.

Confidence in the expected commercial viability of the IFR has also received a big boost just this year. U.S. utilities, which historically have not supported advanced reactor R&D, have begun to come forward with offers of financial support. Southern California Edison just recently signalled its intent to provide $2M this fiscal year, through EPRI, to Argonne National Laboratory to support IFR development. Among their stated reasons is the possibility of IFR technology helping the nuclear waste issue. Other major California utilities are expected to follow suit soon.

We are about 3 years away from complete demonstration of the IFR. The fuel cycle demonstration would start this fall, and be fully underway next spring.

We're really on the verge of making a new and better future possible for nuclear power. It has been an investment in money and time. Pre-eminently, though, it is an investment in talent that is unmatched anywhere in the world. I hope this investment is allowed to return the tremendous contribution to energy security that it is capable of.

THE INTEGRAL FAST REACTOR:
TECHNOLOGY FOR THE FUTURE

A direct connection exists between our standard of living and our use of electrical energy. The requirement to generate electrical power has kept pace with the gross domestic product, and it is the only form of energy to do so. Efficient use of other, less available forms of energy, often depend on the use of electrical power.

More, not less, electrical power will be needed to meet the requirements of a cleaner, more efficient future. For example, the use of electric vehicles will require significant power generating capability for battery recharging. One problem is how to supply the energy without causing environmental, economic, or fuel supply (for future generations) problems.

The Integral Fast Reactor (IFR) program directly solves these important issues, as well as many others.

The IFR is a direct outgrowth of nuclear research from the earliest days - when there was a vision seen for nuclear power - clean, safe, economic, and virtually unlimited power production. Building on the experience gained in over 40 years of nuclear power, the IFR does all of these, and more. Here's the how and why.

"Unlimited" Fuel

First, a short discussion about the fuel supply for IFR. The fuel for IFR is really of little industrial use - except for making electrical power. IFR can take its fuel from a variety of sources, plutonium from bombs, spent fuel from today's nuclear plants, the "left-over" or depleted uranium from the uranium enrichment process when making fuel for today's nuclear plants, and uranium as processed from mines.

IFR uses all the available fuel instead of the less than 1/2% utilized by the nuclear power plants of today. That means that with IFR there is enough fuel source to

provide all the electric power for the world for literally hundreds of years. IFR should be considered as a "renewable" energy source.

Waste Advantages

Because fuel is recycled in the IFR, the actual radioactive waste from an IFR can be packaged into a much less volume than the amount of the waste from today's nuclear plants. The waste would take less space than a common file cabinet for an IFR plant of 1000 Megawatts electric for an entire year of operation (1000 Megawatts would provide the electrical power for about 500,000 people).

The IFR is the technology that enables practical actinide recycling, which reduces the effective lifetime of high-level nuclear waste from millions of years to a few hundred years. The IFR is designed to recycle and burn its own actinides, providing technical solutions to deal with the long-term high-level waste disposal. The IFR is also a very effective burner of actinides generated in the LWRs. As a spin-off from the IFR technology, a cost-effective and efficient pyrochemical process is being developed to extract actinides directly from the LWR spent fuel and feed into the IFR fuel cycle.

Safety

The IFR includes a unique combination of fuel and coolant coupled with appropriate design so that the reactor is self-regulating and prevents malfunctions from becoming serious. It features passive safety, meaning that the reactor will simply shut itself down without intervention by human operators or other electric or mechanical devices. It uses such things as thermal expansion and natural convective flow to achieve safety.

The passive safety features were demonstrated in successful 1986 tests at the Experimental Breeder Reactor-II in Idaho. They showed that IFR type nuclear plants

can be designed so that they are not susceptible to the type of accidents such as TMI and Chernobyl.

Diversion and Proliferation

The IFR fuel cycle has strong proliferation-resistant characteristics. The IFR process does not produce a pure Pu product stream, and the product is highly radioactive and would still need conventional aqueous reprocessing for anything but IFR usage, just the same as untouched spent-fuel would.

IFR and the Future

The IFR Program is making rapid technical progress, and we are at a critical juncture. A prototype demonstration of the entire IFR fuel cycle is scheduled to begin soon (fuel manufacture in October and spent fuel processing in February 1994). The IFR demonstration will be a major feat that will assure the U.S. its international leadership role in nuclear development. The demonstration schedule is on target to meet the Energy Policy Act mandated assessment of the actinide burning technology by the end of FY 1996.

The IFR development represents the future. To cut it off, and support only present technology, is an anti-technology stance not in keeping with stated administration goals. To back away from the IFR technology now is to back away from addressing the most important environmental and safety issues facing nuclear power. It, in fact, closes out an option that will be necessary for our energy future.

ECONOMIC BENEFITS/COSTS OF THE IFR TECHNOLOGY DEVELOPMENT

The IFR is a next-generation advanced nuclear technology that can provide environmentally-clean energy, for a time measurable in centuries. It truly represents an "investment in the future." It is even possible to roughly quantify the benefit/cost ratios, based on the future seen in the National Energy Strategy. The following table summarizes the estimated benefits and costs. Each item is discussed more fully below.

	$ Billions in 1993$	$ Billions Present Worth
Direct Benefits		
- Avoided Additional Repositories	28.8	9.5
- Reduced Repository Operating Costs Due to Reduced HLW Volume	42.5	10.6
- Avoided Higher-cost Uranium Resources	380.0	60.8
Total Direct Benefits	451.3	80.9
Indirect Benefits		
- Mill Tailings Remedial Actions	TBD	TBD
- Weapons Stockpile Plutonium	TBD	TBD
- Application to DOE Spent Fuel Inventories and Defense Waste	TBD	TBD
- Export Market Potential	TBD	TBD
Development/Demonstration Costs		
- Technology R&D	0.6	0.6
- Federal Funding of Commercial Demo Projects	2.0	1.6
Total Costs	2.6	2.2
Benefit/Cost Ratio	>170	>36

The above summary is based on an analysis performed for the nuclear energy demand scenario in the National Energy Strategy (100 GWe on-line through 2010 and 5 GWe/yr growth thereafter). The analysis was performed in constant 1993 dollars and the present worth of future benefits or costs was calculated using a real (subtracting

inflation) interest rate of 3% per year. Although the long-term benefits continue far into the future, the analysis was carried out only through 2070.

Direct Benefits

IFR actinide recycling does not replace the need for a repository. However, the elimination of the long-lived actinides, and reductions in waste volume and decay heat all combine to enhance the repository capacity utilization, and hence deferring the need for additional repositories. The benefit of deferring four additional repositories comes to $28.8 billion in 1993 dollars and a discounted present worth of $9.5 billion.

The high-level waste volume from the IFR pyroprocessing can be reduced by a factor of four compared to direct disposal of the LWR spent fuel. In addition to the deferral of additional repositories, there are savings in annual operating costs of the repository, which depend on the number of high-level waste canisters handled. The savings in the annual repository operating costs comes to $42.5 billion or $10.6 billion in present worth.

The present commercial reactors utilize less than 1/2% of the uranium resource. The IFR extends the uranium resource by a factor of hundred or more, and puts a cap on the uranium resource required to continue production of nuclear energy. With IFR deployment, the cumulative uranium requirements to meet the National Energy Strategy scenario are 1.7 million short tons of U_3O_8, which happens to be the total resources estimated in "Reasonably Assured" and "Estimated Additional -I and -II" categories up to $50/lb U_3O_8 cost. The additional uranium required for the LWR once-through scenario would have to come from the higher $100/lb cost category and from speculative resources. The avoided cost for this higher cost category resources comes to $380 billion, even with the cumulative uranium consumption through 2070 only. The present worth of the saving is $60.8 billion.

Indirect Benefits

In addition to the direct benefits quantified above, there are other benefits which are difficult to quantify, but are as real as the direct benefits. The benefits that are identifiable within nuclear technology are:

- The avoided costs of remedial actions for additional mill tailings.

- Weapons stockpile plutonium can be effectively and efficiently burned up without any cost penalty. In fact, a large saving in the power generation cost is expected. As the IFR fuel, an inventory of 100 MT is worth about $5 billion, at the same time solving the disposition issue.

- The IFR pyroprocessing technology has potential for application to various Pu scrap materials in the defense complex and DOE spent fuel inventories of various kinds. Billions of dollars of savings can be realized for ultimate disposition/disposal of these materials.

- IFR is a U.S. unique technology, with excellent export market potential. This is the nuclear version of a high-technology, that will assure the U.S. its international leadership role in nuclear development.

Furthermore, IFR is the only practical near-term technology having a large energy supply capability which could substitute for carbon-based fuels and address the

global warming issue. This, in fact, may be the most important benefit of all: providing a long lasting and environmentally-clean energy option for our future generations.

Costs of IFR Technology Development and Demonstration

The IFR technology development cost is very small, compared to any one of the potential benefits quantified above.

The IFR technology R&D activities require an annual budget of about $40 million and the associated facility operation for pilot-scale demonstration requires an annual budget of about $85 million. The present worth of the total development cost to demonstrate technical and economic feasibility by the end of 1998 is only $580 million.

If the technology development and demonstration is successful, then the next phase of commercial-scale demonstration projects (FY 1998-FY 2010) is estimated to require an additional $1.63 billion of federal funding (nonfederal contribution to the commercial-scale demonstration projects is excluded.)

The total IFR development and demonstration cost including the commercial-scale demonstration projects is $2.2 billion, which compares very favorably with the present worth of the direct benefits, $80.9 billion, plus other indirect benefits.

ELECTRICITY FUTURE DEMANDS THE NUCLEAR OPTION

Duke Power Company Chairman, William Lee, recently invited his audience to look ahead and travel fifty years into the future to 2042.

By then, Lee suggested, world population will probably be about nine billion people, all of them with legitimate expectations for a decent standard of living. What constitutes decent? And how much electricity will be required to ensure a decent standard of living?

For the sake of argument, Lee assumed that an acceptable standard of living for the world's people in 2042 would be roughly ***half*** the current U.S. level. In the U.S. today, per capita Gross Domestic Product is about $22,000. Worldwide, it's about $4,000. So bringing the world up to one-half the U.S. level will require a ***tripling*** in the worldwide standard of living over the next 50 years.

In the world today, it takes about six-tenths of a kilowatt-hour of electricity to produce one dollar in goods and services. Lee assumed that efficiency gains will allow us to chop electricity input per dollar of GDP in half in the next 50 years (this, by the way, assumes ***massive*** success for efficiency improvements and conservation. Without this assumption -- as difficult as it will be to achieve -- the picture below is even bleaker).

Then he did the arithmetic. "To achieve the worldwide standard of living of $11,000 annual GDP per person at three-tenths of a kilowatt-hour of electricity per dollar will require 3,300 kilowatt-hours per person per year. Multiply that by 9 billion people, and you find that it will require 29.7 trillion kilowatt-hours of electricity a year -- ***three times*** the 9 trillion we produce today."

Lee reminded his audience that, 50 years hence, all the power plants in service today will be worn out. "So to generate three times as much as today's electricity will mean current plants must be replaced by new ones, and their generation capacity must be duplicated with more plants, then duplicated again."

Lee's conclusion: "We can't cop out and assume that some magic invention will drop in our laps and bail us out." After reviewing the energy choices available, he suggested that "we cannot hope to significantly increase personal productivity, and hence the standard of living of the world's growing population, and protect the planet without a substantial contribution from nuclear energy."

What Mr. Lee did not say was that not only is nuclear power needed, but that we cannot get there with today's ***form*** of nuclear power. Today's reactors are very inefficient users of uranium. Tripling the number of today's reactors worldwide would use up all of the known uranium in a few decades. It has always been planned that today's reactors must eventually give way to ***breeder reactors***. With the same uranium resource, these reactors make possible huge numbers of nuclear plants for thousands of years. The Integral Fast Reactor is a revolutionary new form of breeder reactor -- just the kind needed to fulfill Mr. Lee's challenge.

ENVIRONMENTAL IMPACT

The environmental impact created by current fossil-fuel energy technology is a growing significant concern. Airborne pollutants are linked with 'acid rain' (sulfur dioxide) and the 'global warming' (carbon dioxide). Ash particulate contains concentrated toxic heavy metals and is scattered by the wind, or dumped to eventually find their way to water resources. Even if we could show that our water supplies are not being seriously damaged, and our climate is not becoming warmer, we are faced with the obvious effects of the airborne particulate discharges. Widely accepted risk analysis results show that 30,000 deaths per year can be attributed to the effects of burning coal.

One has only to visit a major city caught in an inversion to understand how a number of automobile engines (small fossil-fueled power plants) can create a significant health hazard. Coal-fired power plants in this country produce several hundred pounds of ash and other poisons per year for every person in the U.S. Of this about 10% is released to the atmosphere, and the remainder must be also dealt with. This is the 'fallout' that we must accept with an energy industry based upon the burning of fossil fuel.

The 'soft' energy technologies, such as wind and solar power, also have negative environmental impact. In order to create a technology force-fit to the energy available in nature the efficiency of the energy production is low. Wind and solar technologies suffer from this, requiring large land areas and massive installations to produce significant quantities of power.

The environmental impact does not stop there. The large installations require large amounts of materials for construction. For example, to construct a 1,000 megawatt solar plant, two million tons of concrete, 500 times more than for a nuclear plant, are needed. The figures for other materials are comparable. The materials must be mined and processed, operations that certainly involve significant environmental impact. Note also that despite several decades of substantial effort to develop wind technology to the point where large amounts of power can be generated most of these efforts

have failed. Solar has fared little better; it is not currently a technology which can efficiently produce large amounts of power.

A nuclear-based energy industry produces few airborne pollutants, with little or no impact on health. Nuclear energy preserves air quality. The potentially harmful waste products of fission-based technologies are effectively limited to solid waste products, and the disposal of this waste, while problematic, can be done using long-term storage without direct damage to the environment. Nuclear power generation operates on the principle of containing wastes, not dispersing them.

The IFR liquid metal cooled reactor technology is being developed specifically to address these issues. Since it burns no fossil fuels it produces no airborne effluents and therefore protects air quality; moreover, it is specifically designed to minimize the amount of solid waste, by recycling the spent fuel for consumption in the reactor itself. This is not only an efficient use of resources but also minimizes the amount of waste products produced compared to fossil or other current nuclear technologies. Furthermore, processes are being developed to enable IFR pyroprocessing technology to similarly recycle waste products produced by the current light water reactor nuclear industry. The IFR promises not only a clean energy resource but can potentially be used as a waste burner to support waste reduction from current nuclear technologies.

DISPOSAL OF NUCLEAR WEAPONS

The end of the cold war has brought the world great benefits but has also brought a new set of global problems. One of these is that the United States and the former Soviet Union have agreed to make significant reductions in the number of nuclear weapons. A total of 100 tons of plutonium is expected to be removed from the weapons stockpiles in the near future and much more may be removed as future treaty agreements are negotiated.

This plutonium exists whether we like it or not, and something must be done with it. There are only two things that we can do with plutonium; we can **store it** or we can **destroy it.** Storing is not a good option because no one wants to accept indefinite storage and the concomitant safeguard costs of the huge quantities of plutonium involved.

The technology being developed for the IFR not only disposes of the plutonium, it uses it to produce useful electricity safely and cleanly.

The IFR is ideally suited as a solution to the problem of weapons disposal. The IFR system consists of a liquid metal cooled nuclear reactor and a compact fuel recycling facility. The simple one-step recycling process returns unfissioned plutonium, whether from spent fuel or weapons, to the reactor along with the most hazardous waste products. The materials being recycled are so radioactive and impure that they cannot be used in future weapons. Ultimately, all of the plutonium is fissioned so that it does not end up in storage. Putting weapons plutonium in today's reactors would destroy only a small fraction of it, the rest would inevitably end up in storage as an even more complex and difficult waste form.

The fuel cycle process being put into place in the IFR program is also exactly the right process needed to convert the weapons plutonium into a useful reactor fuel. No complex new technologies would need to be developed. In fact, the IFR process could be used to put the plutonium into a safe state right away. The plutonium can then be safely stored for later use in power producing IFRs.

HIGH TECHNOLOGY JOBS AND PEOPLE

Over the past fifteen years Argonne has painstakingly assembled the multidisciplinary team of people and the special, unique facilities necessary to develop an entire reactor system for the future. The reactor itself, the new fuel on which the concept is based, its safety, its operability; a revolutionary new process for very simple fuel processing, fuel fabrication techniques and waste disposal forms and means; all are a part of the program. Much is new and discovery and invention are commonplace in the program.

The team is comprised of a small but select group of scientists, engineers, and technicians of every scientific and technical discipline required for the development and demonstration of this technology.

More than two thirds have advanced degrees, most from the finest schools here and abroad, and at least one third have PhD's. These advanced degrees include metallurgy, mechanical engineering, chemical engineering, reactor engineering, reactor physics, chemistry, physics, computer science and business administration.

All these are welded together in a single team, 1500 people spanning two sites 1500 miles apart. All the facilities are in place too, with their highly-trained operational teams. There is nothing else like this in the world. This development is the cutting edge, worldwide. It's here in the U.S. Basic concepts have been proven -all that remains is a demonstration of the integrated system.

The present budget proposal will scatter it to the winds.

THE ENERGY POLICY ACT OF 1992

Recently the Congress passed, after two years of extensive debate, the Energy Policy Act of 1992, a comprehensive energy plan for the U.S. The bill contains a number of specific provisions about the future of nuclear power. This bill was passed by a Democratic Congress. The President's attempt to eliminate advanced reactor R&D is squarely at odds with the advanced nuclear reactor technology provisions of the Energy Policy Act passed only three months ago by a Congress controlled by his own party.

Congressional support for advanced reactor R&D is unequivocally clear, through the features contained in the 1992 Act. The Secretary of Energy is required to submit to Congress in June 1993 a plan to complete the necessary R&D of advanced nuclear technologies. The plan must develop advanced reactor designs that are cost effective, have a standard design, and possess enhanced safety features. The goal, stated in the Act, is advanced reactor concepts that are passively safe and environmentally acceptable--exactly the ***right*** goal.

Then, by 1996, preliminary advanced reactor plant designs are to be submitted to the Nuclear Regulatory Commission for approval. Also required in 1996 is an evaluation of the actinide burning technology to determine if it can reduce the volume of long-lived radioactive products. The IFR is the only nuclear reactor technology that is capable of true actinide burning.

The Secretary is further required to make a recommendation to Congress in 1998 on whether to build one or more prototype demonstration reactors which would be on-line by 2010. At least 50% of the funding must be from non-federal sources.

The advanced nuclear reactor technology provisions of the Energy Policy Act are a prudent and responsible response to the challenge of providing adequate electrical energy to fuel economic growth. These provisions represent a consensus of

the Congress. IFR development is aimed precisely at the Energy Policy Act goals of advanced reactor technologies that are safe, economic, and environmentally benign.

The Energy Policy Act of 1992 provides a framework wherein, if followed, the U.S. can realize true long-term energy security. The Administration proposal of 1993 to eliminate advanced reactor R&D in effect terminates this.

USE OF NATURAL GAS FOR POWER GENERATION

The Clinton Administration plans large increases in natural gas usage in the United States and in funding for natural gas research and development. In spite of administration claims that natural gas is "environmentally-friendly", increasing reliance on natural gas will not come without environmental impact. Natural gas is a fossil fuel, and burning it in increasing amounts inevitably adds to the carbon dioxide buildup in the atmosphere.

The administration projects a 20% growth in U.S. natural gas demand by 2010, from a level of 19 trillion cubic feet in 1990. The claim is that this will "lessen our dependence on foreign oil and help to lower our trade deficit." Maybe, but most of the growth in natural gas usage is expected to be in gas-fired electricity generation, and only 4% of U.S. electricity today comes from oil burning. It is not clear that increased natural gas usage will save even a barrel of imported oil.

The key point is that real electricity growth is essential for economic growth and the U.S. Department of Energy projects an increase in coal-fired electrical generation of 34-43% by 2010. The increase in natural gas consumption for electrical generation will not be offset by reduction in coal or oil use but rather will be added to the already increasing CO_2 production from burning coal. Natural gas puts about 60% as much CO_2 into the atmosphere for the same amount of heat generated from burning coal. The bottom line, environmentally, if natural gas consumption grows by 20% in 2010, is that 240 million <u>additional tons of CO_2</u> will be injected into the atmosphere annually. Nor can one dismiss other environmental impacts from the offshore drilling and pipeline construction activities that will be required for utilization of natural gas.

Ironically, just fifteen years ago, the federal government mandated a phaseout of the existing use of gas by utilities and a ***prohibition*** against new utility and industrial gas-fired plants. The prohibition remained in effect for nearly a decade. Gas

was declared at the time to be such a premium fuel and chemical feedstock that it should not be used for power generation.

Finally, even if estimates of reserves have grown in recent years, natural gas is clearly a finite resource. Proved reserves in the lower 48 states (where 98% of U.S. gas was produced in 1990) are estimated at about 160 Tcf, only eight years consumption at today's level of demand, and estimates of resources that are potentially economically recoverable with present technology range from 900 to 1200 Tcf (45-60 years). We are hardly awash with natural gas reserves. Also natural gas is an important chemical feedstock that should be reserved for uses where substitutes are unavailable.

The buildup of CO_2 in the atmosphere is an undisputed fact. There is 50% more CO_2 in the air now than there was in pre-industrial times. The impact on global temperatures is not clear, but the potential impact is so large that it hardly seems prudent to make increased use of fossil fuels U.S. ***policy***. Further, it makes no sense to abandon a nuclear power technology which has the potential to supply huge amounts of electricity for thousands of years while emitting ***zero*** atmospheric pollutants.

PROSPECTS FOR NUCLEAR FUSION AS A FUTURE SOURCE OF ELECTRICITY

Controlled thermonuclear fusion has been under development since the 195-0's. While fusion is the power of the stars, controlling the fusion process on earth represents significant scientific and technical challenges. The leading concept for controlled fusion is magnetic confinement in which a hot hydrogen plasma at temperatures around 100 million ˚C is confined by a powerful magnetic field. Although progress in physics has been substantial and present fusion devices are near conditions of theoretical break-even, another 30-35 years of development is projected before the operation of a fusion DEMO plant is expected.

Because of the high cost of developing a nuclear fusion reactor, the U.S., European Communities, Japan, and the Russian Federation have formed an alliance to build the International Thermonuclear Experimental Reactor, or ITER. The reactor is expected to produce 1500-3000 MW of fusion power, and will be used by the international community as the primary test facility for fusion physics and technology. The international community has supported long-term development of fusion power because of its perceived advantages of reduced activation of materials, safety, an almost infinite fuel supply, and reduced concerns about long-term waste disposal. However, there remain uncertainties concerning the long-term economic competitiveness, and the performance of the fusion plasma under power reactor conditions.

Developing another clean source of nuclear generated electricity, like fusion, is a worthwhile goal. However, the IFR provides an energy source that shares with fusion unlimited energy potential, but is both more certain and nearer-term. Because of the importance of an adequate energy supply to our future and uncertainties in the development paths, alternate energy options are imperative. There are not many. None is more promising than the IFR. Further, the technology developed for the IFR is also complementary to the nuclear technology needed for fusion reactors. The Fusion Program in the U.S. has already made use of advanced fission technology in its R&D programs, and of the test facilities shares with the IFR at least some that are now threatened with shutdown.

Editors Note: The last two pages of this report originally contained graphics which could not be faithfully reproduced. I did feel, however, that the captions were worth relating as they convey several important facts about the IFR. The captions are:

The IFR Process

- Reactor converts useless materials to IFR fuel (U-238)
- Fuel Feedstock Input - Depleted uranium weapons materials & LWR spent fuel.
- For fuel the IFR requires a 6 foot cube per 60 years /1000MWe
- Waste Output - Fission products (less radioactive than original ore after 200-300 years) about 200 cubic feet
- Fuel cycle separates fuel from waste and the fuel is returned to the reactor. [The graphic shows that the reactor and fuel processing facility are connected and comprise a closed cycle for the fuel. The material never leaves the facility].

The IFR Fuel Cycle

Potential Fuel Sources

- Mining - Minimum impact on environment.
- Weapons Material
- LWR Spent Fuel (Efficient use of resources through recycling).
- Depleted Uranium (about 500 year supply)

Waste Stream

- About 200 cubic feet per year
- Decays to less than radioactivity of the original ore in 200-300 years.
- No need to transport waste for entire life of plant (about 60 years)