PANDORA'S FALSE PROMISES
THE INTEGRAL FAST REACTOR: FACTS AND MYTHS
A Beyond Nuclear Fact Sheet

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AN INTRODUCTORY NOTE

Pandora's Promise is a new documentary that claims nuclear power should be embraced as a solution to climate change. While repeating many of the known propaganda lines of the nuclear industry and its boosters, the film also touts the Integral Fast Reactor (IFR) as the overlooked savior of nuclear power. This fact sheet is intended to set the record straight on the IFR. Beyond Nuclear recommends that any viewing of *Pandora's Promise* be done from an informed position and with a great deal of skepticism. We recommend an alternative film, ***The Atomic States of America,*** available at: www.specialtystudios.com/page.asp?content_id=33502 screened at Sundance in 2012.

THE BASICS

The Integral Fast Reactor:

- is a sodium-cooled reactor that is fueled with a metallic alloy of uranium and plutonium.
- is a fast reactor — i.e. neutrons are not slowed down — and "breeds" or creates more plutonium than is used as fuel.
- is integral because it operates in conjunction with an on-site "pyroprocessing" facility to separate plutonium and other long-lived isotopes from spent fuel. The transmutation process also converts the long-lived waste radioisotopes into shorter-lived waste products.
- was developed as a prototype at the Argonne National Laboratory between 1983 and 1994 but much of its technology was based on development programs used in the 1950s.
- was canceled under the Clinton administration due to its proliferation risks and high cost.
- is not in existence anywhere in the world today.

PROLIFERATION

- The IFR must be fueled with plutonium and will produce more plutonium. This plutonium can be used to make nuclear weapons.
- The use of plutonium as a commercial fuel breaks down the barrier between the civilian and military use of plutonium and sets up the potential for theft or diversion by outside parties.
- The main obstacle to nuclear proliferation is the lack of nuclear materials that could be used to make even crude nuclear bombs. Pyroprocessing lowers the proliferation bar considerably.
- The IFR can produce weapons-grade plutonium using a shorter irradiation time.
- No technical fix can remove the proliferation risks associated with pyroprocessing and the use of plutonium-based fuel. Even though the plutonium will be mixed with other elements, these are not radioactive enough to provide theft-resistance, and a country seeking nuclear weapons could readily separate the plutonium from the other elements by chemical means.

THE RISKS OF SODIUM AS A COOLANT

- Sodium reacts violently with water and burns if exposed to air.
- Sodium-cooled fast reactors can undergo meltdown accidents, just like Light Water Reactors, but also sodium leaks and fires and catastrophic core disassembly accidents.
- The Department of Energy noted in 2002 that *"There have been small sodium leaks (and small fires) at essentially every sodium-cooled reactor plant built; in some cases, several of them."*

SAFETY CHALLENGES

- None of the designs for the so-called Generation IV reactors, of which the IFR is one, indicate that they would be significantly safer than today's dangerous nuclear power plants.
- A core meltdown in an IFR could result in a rapid power increase that could vaporize the fuel and blow the core apart.
- Fast reactors have a history of failure. The fast reactor at Dounreay, Scotland was abandoned two decades ago with the heavily contaminated site now expected to cost more than $5 billion to decommission. Japan's Monju prototype fast reactor suffered a catastrophic fire in 1995. The now closed Fermi 1 fast reactor in Michigan, suffered a partial core meltdown in 1966. France's Superphénix, the world's only commercial-sized breeder reactor, was a financial and production disaster, operating only half of the time that it was connected to the grid and generating less than 7% of its capacity over its abbreviated lifetime due to multiple safety incidents and accidents.

WASTE REDUCTION

- The notion that the IFR is useful to "consume" radioactive waste is vastly overblown. In 1996, the National Academy of Sciences published an in-depth and comprehensive study, *Nuclear Wastes: Technologies for Separations and Transmutation,* that concluded that efforts using the IFR to "consume" radioactive waste and reduce the global inventory of transuranic isotopes would *"have high costs and marginal benefits that would take hundreds of years."*

COSTS

- As Princeton professor Frank von Hippel writes: *"The differences between the capital and operating costs of water- and sodium-cooled reactors have remained discouragingly large. Many experimental and demonstration breeder reactors have been built around the world but none has been a commercial success."*
- The capital costs per kilowatt of generating capacity of demonstration liquid sodium-cooled fast reactors have typically been more than twice those of water cooled reactors.
- About $100 billion (in 2007 dollars) has been spent worldwide on breeder reactor research and development and on demonstration breeder reactor projects. None have proven to be economically competitive.

THE PRACTICAL

- In order to meaningfully address climate change, a new reactor of any kind would need to come on line somewhere in the world every two weeks – highly impracticable. Prioritizing a reactor like the IFR, that has never even been built, would slow the process even more.
- Reactors of any design are too expensive and take too long to build to address climate change in time. The urgency of climate change necessitates the rapid deployment of safer, cheaper and faster renewable energy technologies that are ready today and the use of energy efficiency measures and conservation.
- For the 50 years since the first reactors came into operation the risks remain the same: weapons proliferation; vulnerability to catastrophic accident; ballooning costs; the unsolved radioactive waste problem; human rights violations; harm to human and animal health and ecosystems; and "routine" radioactivity and toxic chemical releases at every step of the uranium (or plutonium, or thorium) fuel chain.

A more detailed and comprehensive version of this document, complete with footnoted references, will shortly be available on the Beyond Nuclear website at www.BeyondNuclear.org.