Appendix A: Abbreviations and Glossary

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ABBREVIATIONS

ALMR	advanced 1iquid metal reactor
DOE	Department of Energy
EBR-I, EBR-II	experimental breeder reactors I and II
GAO	General Accounting Office
GE	General Electric Company
HEU	highly enriched uranium
IAEA	International Atomic Energy Agency
IFR	integral fast reactor
LMR	liquid metal reactor
LWR	light-water reactor
MOX	mixed oxide
NAS	National Academy of Sciences
NRC	Nuclear Regulatory Commission
PEIS	programmatic environmental impact statement
RFP	request for proposal
STATS	NAS Panel on Separations Technology and Transmutation Systems

GLOSSARY

Actinides

A group of the heaviest elements, beginning with actinium (atomic number 89), and including uranium and plutonium.

ALMR system

As used in this report, "ALMR system" refers to, and is interchangeable with, the integral fast reactor with its associated reprocessing, hot cell, and waste treatment facilities.

Bench scale

An experimental process (or experimental equipment), generally used in a laboratory. Bench-scale activities represent the earliest stages of developing a new process and the smallest scale of equipment that is useful in examining a process.

Breeder

A nuclear reactor designed or operated in such a manner that the net amount of plutonium remaining in the reactor core and associated components after irradiation is greater than that contained in the original fuel elements.

Burner
A nuclear reactor designed or operated in such a manner that the net amount of plutonium remaining in the reactor core and associated components after irradiation is less than that contained in the original fuel elements.

Cladding
A metal (usually stainless steel or zirconium) layer that surrounds nuclear fuel elements. This protective covering serves to contain the fuel elements and acts as a first-level container for fuel rods when stored as waste.

Electrorefiner
As used in this report, electorefiner refers to the apparatus comprised of a cathode, anode, liquid cadmium, and other components operated in a hot cell to reprocess ALMR/IFR spent fuel. It is possible that the components could be modified to allow for the reprocessing of spent LWR fuel as well.

Fission products
Atoms created when a heavier element, such as uranium, decays into lighter elements such as iodine or strontium. Some of the uranium and plutonium in nuclear reactor fuel undergoes fissioning after combining with neutrons in the reactor core, with the corresponding release of energy and more neutrons. Most fission products created in a reactor are radioactive.

Fuel cycle
A generic term used to describe the series of steps that nuclear reactor fuel systems may take, from mining and milling of uranium, through enrichment, fuel element fabrication, and irradiation. Fuel cycles are generally considered either "open" or "closed." An example of an open cycle would be conventional light-water reactors in the United States that use uranium fuel, irradiate it in a reactor, and then dispose of spent fuel as waste. A closed cycle might be a plutonium-based fuel cycle that separates and reuses the plutonium contained in the initial spent fuel for additional cycles of irradiation.

Glove box
An enclosed unit equipped with gloves through which a technician can manipulate and process radioactive materials. Glove boxes provide protection from the least penetrating form of radiation, alpha radiation, as well as prevent unintended or accidental inhalation of dust and/or particulate material. They do not offer protection against highly radioactive materials, such as spent fuel, that emit more penetrating gamma and beta radiation.

Hot cell
An enclosed structure designed to allow safe operations with the most intensely radioactive nuclear materials. Hot cells are characterized by heavy concrete or metal shielding and specially designed radiation-shielding windows. Operations of highly radioactive materials inside the hot cell are done by remote robotic manipulation. Once radioactive materials are used in a hot cell no human can enter the enclosure.

Integral fast reactor
As used in this report, integral fast reactor refers to the entire advanced liquid metal reactor system, with its associated reprocessing and waste treatment facilities. IFR is synonymous with "ALMR system."

MOX fuel
Mixed-oxide fuel, a nuclear reactor fuel consisting of a mixture of uranium and plutonium oxides.

Plutonium
A human-made element produced when uranium is irradiated in a reactor.

Prototype scale
The step in the development of a new process that follows bench scale, used to conduct tests and obtain information that may be extrapolated to full-scale deployment.

PUREX reprocessing
A water-based chemical process used to separate plutonium, uranium, and other elements and fis-

sion products, from spent reactor fuel. It was originally developed to separate plutonium for nuclear weapons.

Pyroprocessing
A nonaqueous process used to separate plutonium, and other elements, from spent nuclear fuel. Pyroprocessing is an alternative to, and distinctly different from, the PUREX process. It is a high-temperature, electrochemical procedure.

Reprocessing
A general term to describe the treatment used to separate plutonium and uranium from the fission and other byproducts contained in spent fuel. PUREX and pyroprocessing represent two different reprocessing technologies.

Spent fuel
Fuel elements that are removed from a reactor after their nuclear composition has been changed by irradiation to the extent that the fuel can no longer sustain reactor operation through fission reactions.

Transmutation
The transformation of one atom into another by any one of a variety of means-fissioning, neutron bombardment in an accelerator, and so forth.

Transuranics
Elements, including plutonium, with an atomic number higher than that of uranium (92). Virtually all transuranic elements are human-made and radioactive.

Uranium
A naturally occurring radioactive element. Natural uranium is comprised of approximately 99.3 percent uranium-238. and about 0.7 percent uranium-235, a fissionable isotope. Different "grades" of uranium exist, based on the relative content of uranium-235.

Vitrification
A waste management process that immobilizes radioactive material by encapsulating it under high temperature into a glasslike solid, sometimes with other waste forms.