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EMERGING NUCLEAR ENERGY SYSTEMS AND NUCLEAR WEAPON PROLIFERATION

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ABSTRACT

A number of new concepts for producing nuclear energy are examined particularly from the point of view of their impact on the proliferation of nuclear weapons. By proliferation of nuclear weapons, firstly it is generally meant the increase in the number and the quality of such weapons within the five nuclear weapon states (namely France, the People's Republic of China, the UK, the USA and the USSR); and secondly it is meant the spread of nuclear weapons to other countries. While the former is known as vertical proliferation, the latter is called horizontal proliferation. New technologies increase vertical proliferation by increasing the knowledge of the basic physics of thermonuclear weapons which may lead to improved nuclear weapons and even to the development of new types of weapons. Moreover, some new technologies may even increase the production capacity of fission and fusion materials needed for use in nuclear explosives. While these are some of the major implications for vertical proliferation, the spread of the technologies eventually will contribute to horizontal proliferation as well. Once non-nuclear weapon states acquire the level of scientific

and industrial base for such technologies, new paths to horizontal proliferation will become inevitable. An attempt is thus made in the paper to classify the emerging new nuclear energy systems according to their possible contribution, both today and in the near future, to the proliferation of nuclear weapons. Particular attention is given to the following systems: (1) inertial confinement fusion devices which can be used to study the physics and the effects of thermonuclear explosion in laboratories; (2) hybrid fusion-fission reactors and accelerators breeding potentially large amounts of plutonium and tritium as well as substantial quantities of nuclear materials of military interest (for example, highly fissionable transplutoniums such as Cm^{245} and Am^{242m}); (3) compact systems capable of breeding significant amounts of fissile materials which, under the present non-proliferation regime, require safeguards (for example, plasma focus, muon catalysed cold fusion, mini-magnetic fusion devices); (4) enrichment of fissile materials using high-energy lasers; and (5) new systems which could provide a relatively low risk for proliferation of nuclear weapons.

Reference is also made to various studies such as those performed under the auspices of the Non-proliferation Alternative Systems Assessment Programme (NASAP).