MONASH University

DEPARTMENT OF MATERIALS ENGINEERING

Seminar

OPTIONS FOR OUR ENERGY FUTURE

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3rd March 2009, 4:00 p.m. – 5:00 p.m.
Science Lecture Theatre S2

As the World searches for a replacement for fossil fuels as its primary energy source, the question arises as to what criteria should be employed in choosing the replacement technologies. Certain "natural" criteria, such as cost and availability will play an important role but others, such as efficiency of conversion, use of existing infrastructure, portability, and emission potential, to name but a few, will impact the decisions in a manner that has never been experienced before. Coupled with the fact that our current, industrialized society has been designed and built around portable, high energy density/high power density energy sources for transportation (road, rail, sea, air) and around large generating facilities (power plants), and that the accompanying energy philosophy could be changed only at enormous cost, it is evident that the favored technologies are those that can be introduced and implemented only at minimal total cost, at least over the short to intermediate term. This means that our transportation sector will probably continue to use liquid fuels (e.g., carbon neutral biofuels) or natural gas, or possibly even hydrogen for the foreseeable future, but our fixed-base generating facilities must move dramatically away from the burning of fossil fuels. While the renewables, such as passive solar, solar PV, wind, tidal, etc, will address niche markets, their limited availability, generally high per kilowatt initial cost, and the need for energy storage facilities will prevent widespread adoption. Thus, careful consideration of the available options finds that only nuclear power (fission in the short term and fusion in the long term) are capable of meeting the demands of society if we are to maintain our standard of living, which is based upon the ready availability of cheap energy. Thus, nuclear power is readily scalable over plant sizes ranging from <10MW to >2000MW, the fuel ($^{235}U_{92}$ for fission and $^{3}H_{1}$ + $^{2}H_{1}$ for fusion) is plentiful and of low cost, the fuel reserves are enormous (particularly with "breeding" of fissionable transuranic elements, such as $^{239}Pu_{94}$) the waste is minimal (especially with the Generation IV "actinide burning" reactors now under development), and the advanced reactors are inherently safe (through appropriate reactor design). The proliferation issue continues to be a matter of concern, but the development of "closed" fuel cycles, where reprocessing and mixed U/Pu fuel fabrication takes place on-site has greatly relieved proliferation concerns. The seminar will examine all of these issues and will attempt to establish of logical process for selecting the most appropriate technologies.

Visitors are most welcome: Please note the parking arrangements. There is a designated Visitors Car Park (N1) clearly ground-marked by white paint and tickets, at a cost of $3/day, are available from a dispensing machine. ('Blue' permit designated areas are for Monash members only.). It is also possible to park at other designated Visitors Car Parks (E1, S1 and S2) on the Clayton Campus, but tickets are $1.4/hour.

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