Need for restructuring of NET exam

In continuation of the correspondences discussing the pros and cons of NET exam[1,2], one important point to be considered is the scope of NET exam. The matter of topics and subjects covered under NET needs a through debate from educationists, policy makers and scientists. Specifically, an example that can be quoted is the area of pharmaceutical sciences, which is right now not at all covered directly or indirectly in NET exams. From the beginning the pharmaceutical industry is one of the fastest growing industries in India. Now, in addition to this, as the pharmaceutical industry is entering into the phase of R&D era after 2005 GATT and WTO agreements, there is a huge additional requirement of scientists in this field. In the field of drug discovery, drug development and other allied health sciences, pharmaceutical scientists have proven themselves competent. The postgraduates in pharmacy (M Pharm) specialize in one of the subjects, viz. pharmaceutics, pharmacology and toxicology, medicinal/pharmaceutical chemistry, pharmaceutical analysis, quality assurance and pharmacognosy, to say a few. If they wish to pursue funded Ph D or post doctoral research at one of the national institutes, they need to clear the NET exam and then the question arises regarding selection of the subject area, for part II paper of the NET, in which he/she is interested and/or specialized. At present the only choices available to the pharmacy student are chemistry or life sciences. The pharmacy students need not study these subjects in depth like any other pure science student. Many aspirants therefore fail even after multiple tries or in many cases, they do not want to face an examination that is not actually meant for them. This deprives many scholarly students from entering key research institutes like IITs, IISc, CIMAP, NCL, NIPER, etc. on the CSIR/UGC funded seats. Although there are other alternatives for pharmaceutical scientists for working on funded projects in these institutes, the simple question is: why not have specialized pharmaceutical science subject area in NET itself. On the other hand, in the examination of GATE – the reputed national level entrance exam conducted by IITs – there is a separate branch of pharmacy (Code – PY), and every year thousands of pharmacy graduates appear for this examination and have a chance to prove their calibre. Most of the institutes in India give admissions for M Pharm on the basis of GATE score. Therefore there is no reason why we should also not have pharmacy or pharmaceutical sciences subject area in NET exams' part II.

1. Nilavu, S., *Curr. Sci.*, 2005, **89**, 241.
2. Patil, R., *Curr. Sci.*, 2005, **89**, 1066.

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Economics of nuclear power generation

Usha Pal and Jagannathan[1] have designed a heavy water moderated – boiling light-water-cooled reactor with Pu–Th fuel. The reactor has many good characteristics as discussed in the article. Table 3 shows that the seed input in a fresh batch of 1/3 core is 2.212 Te of Pu. Derived from this is that the full core loading would be around 6.6 Te of Pu. Taking into account the out-of-core inventory to fabricate the next batch of fuel loading, the reactor would need about 9 to 10 Te of Pu for operation. Pu has a value nearly equal to that of U-235; hence this high-incore and out-of-core inventory would put a heavy economic penalty on power produced. This fact may be compared with in-core fissile inventory of a natural-U PHWR, of the same size (as is being built in India), which is less than one Te.

In an economy where power need is exponentially increasing as in India, it is doubtful that one would go for such a concept, when with the same quantity of Pu one could install three units of the same size with uranium, natural or depleted. No doubt these reactors would have lower conversion factors and may have inferior characteristics compared to the proposed design.

Economics of power generation cannot be ignored. The proposed concept is based on fuel recycling. Fabrication of Pu-enriched fuel is relatively less expensive, as it could be done in glove boxes. On the other hand, U-233 enriched fuel requires completely shielded facility due to intense gamma rays leading to expensive fuel fabrication penalty.

Lastly, a general comment. Efforts are being made by the Indian Government to integrate India's nuclear power programme with the rest of the world. Two VVERs are being built with Russian cooperation in South India. One hopes, sooner or later, we would have an accelerated nuclear power programme with PWRs, the system which has most operating experience (95% of the world's nuclear power is produced by PWRs). I visualize 30,000 to 40,000 MWe nuclear capacity in India in the next 25 years. Of course, this capacity would be based on imported fuel. The question of utilization of Pu from these reactors could be taken up at that time, if fuel reprocessing of imported fuel is accepted. However, the decision would be to utilize Pu from the reactors in those reactors itself, with depleted or natural uranium or in PHWRs, if fast neutron reactors are not available. The reason is simple. Nuclear characteristics of Th cannot be wished away.

1. Usha Pal and Jagannathan, V., *Curr. Sci.*, 2006, **90**, 48–57.

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