



Concerns over nuclear energy are legitimate

Reassurances from 'experts' on the safety of nuclear power will not wash, says **Colin Macilwain**. The Fukushima crisis raises genuine questions.

The unique and almost existential nature of the risk posed by nuclear power has had ample airing over the past three weeks, since the disaster at the Fukushima plant in Japan. Enthusiasm for a global nuclear revival has stalled — and not before time.

The scientific community could yet play a valuable part in the management of this crisis. It could help put events in perspective, and begin the process of drawing out useful regulatory and other lessons. In the United States, this has already begun, with specific suggestions for change coming from former US government science advisers Frank von Hippel and Matthew Bunn. Last week on this page, Charles Ferguson, president of the Federation of American Scientists, did likewise (see C. D. Ferguson *Nature* **471**, 411; 2011).

Less edifying have been the nuclear experts who have popped up in the media to 'inform' the public about the crisis. Individually, their motives may be honourable, but the collective impression has been unconvincing: defensive, selective, condescending towards public fears and, in my view, ultimately counterproductive. Their combined message seems to have been: don't worry, things are under control, and Fukushima is not Chernobyl.

Well, Fukushima is certainly not Chernobyl, but some salient points about what Fukushima actually is, I would argue, deserve wider attention. All are relevant to the future deployment of nuclear power.

One is that Fukushima houses six reactors on one site, despite the fact that even the most basic analysis of failure modes and effects would come out resoundingly against such an arrangement. Not only are all the reactors exposed simultaneously to the same dangers — whether flood, earthquake, war or terrorist attack — but radiation release at one reactor or fuel tank could cripple recovery efforts at the others. Everyone in nuclear engineering knows this. Yet such co-siting is the central organizing principle of current nuclear-build plans in Britain, the United States and elsewhere, because the only communities that will accept new nuclear plants are those that already have them.

The second is an inherent problem with light-water reactors, including boiling-water reactors, as at Fukushima, and pressurized-water reactors (PWRs). These designs are compact and relatively inexpensive, but their potential for meltdown was once obvious enough that Britain spent 30 years trying to develop gas-cooled alternatives. But, now that PWRs are the only viable design for new nuclear build, that extensive search for a safer design seems to have been forgotten by many of those who promote a nuclear future.

A third point is the storage of spent fuel rods in pools of water at power plants. The amount

of fuel held in this way continues to grow relentlessly, particularly in the United States, where the Obama administration's shelving of the Yucca Mountain waste-storage project in Nevada leaves the fuel with nowhere else to go. As in the United Kingdom, such 'interim' storage is the only likely destination for spent fuel from new reactors, ahead of promised deep disposal in an uncostered, unscheduled and uncertain underground repository.

These legitimate technical criticisms of Fukushima, and of planned nuclear build, have been largely drowned out by the flood of technical reassurance offered by nuclear scientists and engineers in the wake of the disaster. For example, reassuring soundbites offered to journalists by the London-based Science Media Centre (which is funded by a variety of scientific bodies and industries, including Nature Publishing Group) in the days immediately after the earthquake contained barely a cautionary note on how serious the situation at Fukushima was set to become.

Instead, the scientific establishment and those whose careers are invested in nuclear power have sought to convince the public that 'science' supports nuclear power. Too many specialists have assured us of the general safety of nuclear power without adequately addressing specific concerns.

Some of this loyalty is deep rooted, I fear, in the development of the atomic bomb, which greatly embellished the standing of the scientific establishment with governments. Not long afterwards, many senior physicists embraced 'atoms for peace'. Having interrogated nature, and established the means to harness some of its terrible powers, they wanted to prove themselves 'useful'. Such a culture influences those who follow — and can take generations to wear off.

Costing and planning of new nuclear power stations will now be carried out in the light of three data points: Three Mile Island in 1979, Chernobyl in 1986 and Fukushima in 2011. In each case, excuses are readily made by supporters of nuclear power. For Three Mile Island, they were that radiation releases were minimal, and that a supposedly unsophisticated American public confused the accident with the plot of *The China Syndrome*. Communist incompetence, we are told, contributed to Chernobyl being as bad as it was. The race is now on to find a narrative that explains away the ugly reality of the Fukushima disaster. The alleged uniqueness of the earthquake and tsunami event is already emerging as the front runner.

Yet the real risk of nuclear power is that active human intervention has to be maintained, come rain, shine, war or political upheaval. That, and the threat of a downside too terrible to contemplate. ■

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