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Get tough on nuclear safety

A refreshingly frank and forward-looking report on the safety of French nuclear power plants in the wake of Fukushima should spur other countries to take a hard look at regulation of their own reactors.

The Three Mile Island and Chernobyl nuclear accidents each prompted profound rethinks of safety requirements. But as the incidents slipped into history, the nuclear industry, regulators and governments tended to revert to reassuring refrains that atomic energy was once again safe and in expert hands.

So it is probably too early to be confident about the impact of the Fukushima accident in Japan last March. But it is clear that, as the defences at the Fukushima Daiichi power plant crumbled, so too did the fundamental dogma of modern nuclear safety: that a series of back-up and redundant safety systems, combined with physical defences strong enough to resist expert estimates of external threats, was enough to make impossible a catastrophic meltdown and release of radioactivity into the environment.

As the first anniversary of the disaster approaches, and supporters and opponents of nuclear power prepare to use it to underscore their positions, will Fukushima mark a turning point for the nuclear enterprise, or will industry return to business as usual?

André-Claude Lacoste, head of France's Nuclear Safety Authority (ASN) in Paris, suggested at a press conference last week that things have already changed. "There will be a before and an after Fukushima," he promised.

Is he right? Some in industry will always oppose the costs of tougher regulation, and shortsighted or ideological politicians and companies will continue to insist that a repeat of Fukushima is impossible in their own backyards. But many in the nuclear industry were genuinely and deeply shocked to see at Fukushima a sequence of events that they believed impossible. The world's main nuclear operators have an interest in establishing the causes of the disaster and learning the lessons — they know too well that if another major accident were to occur, then in many people's eyes the already-struggling industry would be finished.

The World Association of Nuclear Operators, for example, has stressed the need for its members to respond properly to Fukushima, and has beefed up its own inspection and oversight of plants (see *Nature* **472,** 274 and http://doi.org/hj5; 2011).

So to France, the world's leading user of nuclear power and arguably the nation with the most to lose from a global rejection of it. Last week, the ASN released a report announcing a sweeping safety upgrade to all the country's reactors (see page 121). The planned multi-billion-euro improvements are part of a programme of tests to assess how well French reactors would stand up to extreme events, and how prepared plants are to deal with a major accident. The ASN's report is written with stunning candour, stating plainly that a loss of coolant or electricity could, in the worst cases, see meltdowns at reactors in hours. It also lists many shortcomings found during 'stress tests', in which some safety aspects of plants were found not to conform to existing standards.

Critics will wonder why the ASN didn't spot these problems earlier, given that it is responsible for regulating the plants. Others will question how the authority can reconcile its statement that France's reactors are fundamentally safe with its insistence that they must be upgraded on safety grounds. But it would be a mistake to penalize France for listing its nuclear shortcomings, especially when other nations seem less enthusiastic about publicly discussing problems with their own reactors and regulations. The French report makes for a breath of fresh air in a post-Fukushima climate in which worldwide public reassurance has too often taken priority over transparent debate.

"It would be a mistake to penalize France for listing its nuclear shortcomings."

The ASN has also come up with an elegant technical solution to get around the (universal) dilemma of how to protect a plant from external threats, such as natural disasters. The report recommends that all reactors, irrespective of their perceived vulnerability, should add a 'hard core' layer of safety systems, with control rooms, generators and pumps housed in bunkers able to withstand physical threats far beyond those that the plants themselves are designed to resist.

There will, rightly, be scepticism about whether France will ultimately implement the new measures. The bunker concept may prove technically difficult, and Électricité de France — the operator of the reactors — would need to pay for systems that some in the company will probably feel are an expensive luxury.

Whatever happens in the long term, the French plans have an immediate benefit: they raise the post-Fukushima safety bar for other countries. Those governments, regulators and companies that have yet to propose anything close to such far-reaching measures must now explain why not. ■

A long stretch

The UK government hopes to squeeze even more out of science — without paying a penny extra.

David Willetts may not be familiar with the film *Jerry Maguire*, in which Tom Cruise yells: "Show me the money!" But the UK science minister has been on the receiving end of a number of similar quips this week.

By most measures, the United Kingdom has always achieved greater research output than might be expected from the amount of government funding its science base receives. Last week, in a speech to the London-based think-tank Policy Exchange, Willetts said that he wants to stretch this relationship even further.

For starters, he wants the number of British universities rated among the world's top 100 to grow from the current figure of

between 10 and 19, depending on the rankings used. To help make that happen, he announced that his coalition government was "inviting proposals" for "a new type of university" that would focus on science and postgraduates. But there was a catch. "There will," Willetts stated, "be no additional government funding." This triggered a storm of protest from experts and several (poor) impressions of Cruise.

During his speech, Willetts was keen to reference plans for a huge university campus in New York being pushed forward by Cornell University (see *Nature* http://doi.org/hj9; 2011). And private higher education is clearly on the rise, albeit probably more in teaching than the research arena. But, as critics quickly pointed out, the Cornell project is receiving at least US$100 million in public funding.

Experts contacted by *Nature* said that the idea that private finance and business sponsorship alone can create a new institution — as Willetts suggested — seems fanciful. "I don't think this is likely to fly without very, very substantial amounts of new money," says Paul Nightingale, a science and technology policy expert at the University of Sussex in Brighton, UK. And Roger Geiger, who studies research universities at Pennsylvania State University in University Park, says: "Industry has its own research labs and if they're going to invest their own money, that's where they're going to put it."

Neither Willetts nor his Department for Business, Innovation and Skills was willing to elaborate on the plans this week, saying only that much depends on the proposals that the department receives. The government insists that there has been "a lot of interest", but without government incentive, will that interest go any further?

In his speech, given just a stone's throw from the Houses of Parliament, Willetts also highlighted the good that his government has done. As the United Kingdom stumbles through one of the worst economic climates in living memory, the fact that the country's research budget has been largely protected from the severe cuts inflicted on other public sectors (including university teaching) is something to be thankful for.

And it is a shame that Willetts' high-profile but extremely brief mention of the universities idea distracted from other points in the speech, such as an admission that the government is involved in "picking winners" — investing in technologies underpinned by science and research that could bring economic benefit — something that politicians have been reluctant to acknowledge previously.

"Private higher education is clearly on the rise, albeit probably more in teaching than the research arena."

"The noises are positive. Every time he speaks about science and innovation the thinking seems to get a little more sophisticated," says Kieron Flanagan, a lecturer in science and technology policy at the University of Manchester, UK. This is a welcome shift from previous Conservative policies, which tended towards generic initiatives. However, the rhetoric has yet to be matched with much action, Flanagan says, although increased efforts to link businesses and research in key areas are a good start.

Many will be happy to be proved wrong if a number of world-leading finance-free universities do arise in the United Kingdom, as Willetts hopes. Meanwhile, discussion of the idea certainly has one thing in its favour: it's not costing anything. ■

Whales for sale

A quota-trading scheme could end conflict between whalers and conservationists.

In the chilly waters of the Southern Ocean, an annual drama is under way once more. The Japanese whaling fleet has set to sea again. So has a flotilla of vessels crewed by conservationists and activists, determined to keep the hunters from their prey.

Three Australian anti-whaling campaigners boarded the *Shonan Maru No. 2* whaling ship on Sunday. After negotiations, the Japanese government has agreed to release them to an Australian customs ship. The incident came just days after the conservation ship *Brigitte Bardot* was smashed by a giant wave and seriously damaged while pursuing the ship *Nisshin Maru*, some 2,400 kilometres from the Australian coast. Sea Shepherd Conservation Society, a group based in Friday Harbour, Washington, that operates the stricken vessel, is counting the cost of its principles. This isn't the first time: in January 2010, the group's powerboat *Ady Gil* sank after a collision with the *Shonan Maru No. 2*. The skirmishes and confrontations continue, with campaigners maintaining their high-risk pursuit and their attempts to foul the propellers of the whaling ships with ropes, and the whalers responding with water cannon. Surely there is a better way?

Perhaps. On page 139 of this issue, three environmental scientists outline a plan to introduce tradable quotas for whale catches. Under the scheme, conservationists could buy (and retire) the quotas from whalers, giving industry a way to profit from the animals without killing them. In return, anti-whaling campaigners could be more certain that their actions were reducing the slaughter. Theoretically, such a scheme would allow both sides to benefit with no loss of face. As the researchers say, it could "open the door to reducing mortality without needing to battle over whether whaling is honourable or shameful". And both the number of whales killed and the associated costs would go down.

The article's authors — Christopher Costello and Steven Gaines of the University of California, Santa Barbara, and Leah Gerber of Arizona State University in Tempe — use the per-animal profit of whaling ships to decide that about US$13,000 would be a fair price to buy the life of a minke whale, and $85,000 should secure a fin whale. "Whale prices should therefore be within reach of conservation groups and even some individuals," they suggest.

The idea first surfaced in 1982, to little effect. But perhaps, three decades on, its time has come. Market approaches to environmental problems are now common, with carbon offsets bought by individuals to neutralize their greenhouse-gas emissions. Such systems have even been shown to be effective, reducing sulphur dioxide pollution from US power plants.

To put a price on the head of a whale would be a different matter, of course. Committed anti-whaling campaigners would have to put aside moral objections and accept such a scheme's tacit legitimation of whaling as an enterprise to be rewarded, as well as the de facto official approval for the heavily disputed notion that whales (and other animals) are a resource to be exploited. Pro-whaling nations would need to be persuaded that the scheme would have more strategic benefit than their continuing political efforts to lift, or find ways to work around, the current commercial whaling moratorium. Then there is the need for scrutiny and verification of the quota market, not to mention getting such a plan through the political quagmire that bogs down annual meetings of the International Whaling Commission, the body that would be best placed to put a market mechanism into action. (And what of the world's scientists, denied information from some of the 1,000 or so whales slaughtered each year for 'scientific purposes'? *Nature* suspects that they would manage.)

Still, with political will and goodwill, the idea could work. At the very least, it deserves proper consideration from all involved. As events in the Southern Ocean show, pro- and anti-whaling groups will both go to extraordinary lengths to pursue their agendas. To those in peril on the sea, the middle ground should seem just as secure as the moral high ground. ■

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