

Nuclear fallout

The Fukushima disaster sounds yet another warning call of the need for safe and clean energy sources, but the need to mitigate climate change will keep nuclear in the picture for some time yet.

The events of the past year have served as a serious warning call about the urgency of transitioning to both clean and safe energy sources. The Deepwater Horizon oil spill in April 2010 — now recognized as the worst in US history — contaminated several hundred miles of the Louisiana shoreline, destroying invaluable marine habitat and causing untold damage to the fishing and tourism industries. In another global energy disaster, the tsunami that struck the northeast Japanese coastline in early March has now resulted in a nuclear disaster equal in scale to that of Chernobyl.

Both of these incidents reinforce the need to shift away from energy sources that pose a high risk to human health, and are more effective in conveying that message to the public than the more remote, if riskier, threat of climate change. The political response to the Fukushima disaster suggests that world leaders are aware at least of the public's concern for energy safety. Already, Germany has shut seven of its oldest nuclear plants, and Europe has committed to testing all 143 reactors in its 27 member states. China — a nation that accounts for 40% of planned new reactors globally — has brought a halt to all new nuclear projects (page 91). And in spite of ambitious plans to scale its nuclear capacity by one third by 2030, Japan has now reverted to importing liquefied natural gas, as well as oil and coal (page 90).

However, despite the aversion to nuclear power in the aftermath of the Fukushima disaster, the negative response is likely to soften over time. Only a year has passed since the Gulf of Mexico disaster and already licensing for deepwater rigs has resumed in the region, and continues unabated elsewhere in spite of dwindling returns. Much like the response to the risk of offshore drilling, plans for expanding nuclear capacity are probably on hiatus rather than halted.

This is partly owing to the fact that even though nuclear energy poses significant human health risks, including the risk of radiation exposure and nuclear proliferation, so too does climate change. If greenhouse-gas emissions continue unchecked, the probability of extreme impacts on human health is higher than from deploying new nuclear power plants.

The impacts of severe climate change would reach virtually every corner of the globe, and range from human disease to crop failure and extreme weather events (page 84). Reducing emissions thus continues to be more critical than preventing the expansion of nuclear power. Moreover, in a strange side-effect of the Japanese disaster, the nation's imports of carbon-intensive energy products has pushed up the price of carbon, an effect that will ultimately make alternative energy sources — including nuclear — more attractive in the long run (page 90).

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On timescales that matter to climate mitigation, we are unlikely to have the luxury of switching off fossil fuel and nuclear power simultaneously. Although wind and solar are promising sources of plentiful energy, nuclear is the only available source of non-carbon baseload power, and so the future energy mix will almost certainly include nuclear to some extent, regardless of the risks. After all, the global need for energy is increasing, with electricity demand in the US alone predicted to rise 30% by 2035. And according to some estimates, that means the share of nuclear power should increase to about 30% by 2050, a shift that would require an additional 2,000–3,000 power plants (*Nature* **467**, 391–392; 2011).

Even though the practicalities of deployment mean that such a scheme is unfeasible, the risks posed by expanding nuclear even on the scales planned before the Fukushima disaster — which would represent 4–6% of the global energy demand — are not insignificant. If these plans do indeed regain the political support they once had, they will require highly effective risk management and risk communication to allay the fears of a concerned public.

Proper risk management can partly be achieved by a commitment to a more robust reactor design than that of the type used in the Fukushima power plant. Although that means that Germany's decision to shut its old reactors should stay in place, it could open a door to safer deployment of new reactors in countries such as the UK, whose Secretary of State for Energy and Climate Change, Chris Huhne, has commissioned a report into the lessons to be learnt from the Fukushima disaster (*Nature* doi:10.1038/news.2011.209; 2011). Many of the plants being built now should be better able to withstand an impact such as the tsunami that hit Japan's northern coastline on 11 March. But just as critical to risk management is due consideration of the location of existing builds; regardless of their specification, locating nuclear reactors in earthquake-prone regions represents an incomprehensible level of irresponsibility.

For the public to accept the nuclear option anew governments worldwide must communicate clearly about the risks, and in that regard, the UK's commissioned report on lessons from the Fukushima disaster, due out in full in September, is to be commended. Communicating transparently on the risks of nuclear will mean more research into the likely health impacts of long-term versus short-term exposure and from different sources, to expand on what little we now know (page 91). And importantly, it will require a clearer picture of the possibilities at the thin tail of the risk-distribution curve.

Although current technology and knowledge dictates that nuclear will form part of any low-carbon global energy mix, we should not take that as a *fait accompli*. The past year has shown that neither corporations nor governments can afford the economic and human costs of failing to invest in clean energy. Without the possibility of discovering a clean fuel for cars, a method of capturing and storing carbon dioxide or a smart-grid technology that will boost energy efficiency and so lessen demand (page 76), we will be stuck relying on at least one, and probably two, highly risky energy options. □