THIS WEEK

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Energetic concerns

Rewarding existing nuclear power plants for the value of their low-carbon power makes sense, but the nuclear industry has a lot of work to do if it is survive and thrive in the twenty-first century.

When the state of New York moved last December to require utility companies to provide 50% of their power through renewable sources by 2030, questions about nuclear power naturally arose. Six nuclear reactors at four facilities currently provide more than 30% of the state's electricity — and more than half of its low-carbon source. Four of those plants were at risk of closure owing to simple economics: they have not been able to compete with cheap natural gas.

After factoring in the climatic value of low-carbon power generated at these stations, however, state regulators created a new subsidy on 1 August. The state began with the 'social cost of carbon', which represents the damage caused by greenhouse-gas emissions. The US government's central estimate is currently US$38 per tonne of carbon dioxide, rising to $50 in 2030. Revenues were well below that, so these plants will now be eligible for a 'zero-emissions credit' designed to make up the shortfall. In the first 2 years alone, that subsidy could be roughly $965 million. Illinois-based Exelon Corporation, which owns two of the facilities and is in negotiations to purchase the third, said it would press forward with its plan to keep the plants running.

The first lesson is that the price of carbon matters. New York is one of nine eastern states participating in an emissions trading system. The current price — averaging around $4 per tonne of CO_2 — was not high enough to keep nuclear power competitive with natural gas.

The US nuclear industry, and some pro-nuclear environmentalists, have hailed the New York standard as a precedent, and rightly so. It's a potential model for other US states in which nuclear power is facing similar economic hurdles. More generally, it's yet another reminder that climate policies have a long way to go, despite the rhetoric enshrined in the Paris climate agreement last year.

The nuclear industry's woes don't end there, however. Roughly 440 nuclear power plants currently provide 11% of the world's electricity, but they are on average 30 years old. More than 60 reactors are under construction, but the industry must work just to maintain its share of the energy mix as older plants close in the coming decades.

Simultaneously, New York state is opposing efforts to extend the lives of two other reactors at the Indian Point Energy Center on safety grounds. The operator has been fending off questions about tritium contamination in groundwater and various equipment malfunctions while applying for a permit from the US Nuclear Regulatory Commission to extend the life of the reactors from 40 to 60 years.

As long as nuclear power plants can demonstrate that they can operate safely, their contribution to the global effort to reduce greenhouse gases should be encouraged. But the reality is that there may be places where governments — and communities — decide that the potential price of a nuclear accident is too high. Whether the industry can expand in any meaningful way may depend on a new — and as yet unproven — generation of accident-proof reactors. Despite its efforts to keep a few reactors alive for now, New York is clearly betting on renewables. ■

CERN's road bump

The disappearing LHC signal is disappointing for those pitching for the next big accelerator.

Science thrives on discovery, so it's natural for physicists to mourn this week. As the high-energy-physics community gathered in Chicago on Friday, hopes were high (if cautious) that the Large Hadron Collider (LHC) at CERN, Europe's particle-physics laboratory near Geneva, Switzerland, had chalked up another finding to build on the discovery of the Higgs boson. Not so — the bump in the data that had caused such excitement was washed away with a flood of data that revealed it to be a mere statistical fluctuation.

Ordinarily, physicists would be satisfied if the LHC continued its bread-and-butter existence of confirming with ever-greater precision the standard model — a remarkably successful theory that is known to be incomplete. But the excitement over the bump has left them hungry for more. As is evident from the 500 theory papers written about the bump, physics is ready for something new.

That the LHC has not turned up anything beyond the standard model does not mean it never will. The machine has collected just one-tenth of the data that scientists hoped to amass by the end of 2022, and just 1% of those it could collect if a planned revamp to increase the intensity of collisions goes ahead. But the dry spell worries some. The idea of supersymmetry predicts that heavier counterparts to regular particles will become evident at higher collision energies. Before the LHC was switched on, fans of the theory would have gambled on being able to see something by now. And if the dry spell extends to a drought, high-energy physics could descend into what some call the nightmare scenario — the collider finds nothing beyond the Higgs boson. Without 'new' physics, there is no thread to pull to unravel the countless mysteries that the standard model fails to account for, including dark matter and gravity.

There remain strong reasons to build a successor machine. But without another discovery, the public's delight in high-energy physics could fade: there comes a time when exploration alone no longer satisfies.

Convincing funding agencies to cough up several billion dollars to continue the same approach will therefore be tough, especially when neutrino and lab-based precision experiments cost a fraction of the price. It will be physicists' job to consider carefully the worth of pursuing that discovery strategy. And if high-energy colliders remain essential, they need to work on their sales pitch. ■