because the caesium content of some of them exceeded another arbitrarily low limit, may like to know that the government of Argentina fixed an even lower limit to safeguard its people (and the customers for its meat exports) from Chernobyl fallout, secure in the knowledge that tropospheric air masses do not cross the Equator. This is why one of the most important tasks with which the international agency has been saddled is that of negotiating standards of radiological safety which are recognized internationally to be sensible. That will not be easy.

Regulation

Regulation is also a means by which anxiety about nuclear safety may be excited. Each enforcement of a regulation may be represented as a sign that catastrophe has been only narrowly averted. In Britain, for example, where the nuclear issue is well on the way to being as contentious as in the United States, with the recent practice of making public announcements of all radioactive discharges to the environment, each few becquerels that find their way into the atmosphere or some water-body are greeted as a sign of the ending of the world by those committed to the view that nuclear energy is by definition an abomination. But the temptation to abandon openness must be resisted. The best, indeed the only hope, is that people will learn from repetition that radioactivity does not differ from other environmental pollutants in being dependent for the damage they do on their amount. Chernobyl was a serious disaster (and could, with bad luck, have been a lot worse.) Most radiation scares are quite different, but may malevolently be used to stir up trouble.

That is only one reason why it must be hoped that the regulatory approach to nuclear safety will in due course be overtaken by a more positive solution of the problem. In at least one respect, the Soviet system appears to have contributed substantially to the successful handling of the emergency: the educational system makes Soviet citizens knowledgeable about a variety of technical matters, and better able to appreciate the stochastic character of radiation injuries than is likely to be common elsewhere. It is also true, of course, that the Soviet system requires an unnatural degree of compliance with centrally laid plans, such as the decision that young children should be evacuated separately from their parents from the 30-km zone around the reactor. The moral for other would-be civil nuclear powers is that there is much to be gained from a deeper general understanding not merely of the putative benefits of nuclear power, but also of the risks. Even more openness will be needed.

None of this will ensure that operators behave responsibly. One of the ingredients missing from last week's Soviet report, for obvious reasons, is a full account of the reasons why the plant operators thought it necessary to depart so far from normal practice at the damaged reactor. For that matter, what is known of the frequency of corner-cutting without mishap there and at other power stations? And what of the degree to which the Soviet system, now more than ever one in which liberal people tolerate only grudgingly state institutions that have lost general respect, may have contributed to the accident by engendering cynicism about even sensible rules and regulations?

The counterpart in the West is the willingness of contractors to skimp on the quality of equipment supplied or of managers to discard warnings from professional people in the pursuit of what would be called "norms" in the Soviet Union. The loss of the US space shuttle last January refers. The only remedy that will in the long run work is that professional engineers, whatever their status in a hierarchy, should have the right to speak their minds and to be listened to. If it is accepted that the general public should be well-informed, should not the professional people who carry the responsibility enjoy a degree of independence they are now denied? That, of course, will be a hard reform to implement, not merely in the Soviet Union. The Soviet account of Chernobyl is that of a thoughtless crew eager to finish off a tedious chore. Would they have behaved like that if they were in charge, not merely shift-workers? □

Chips in big boxes

The personal computer manufacturers are in calm waters, and may become sleepier.

CURIOUS things are going on at the bottom of the computer market, the battlefield on which dozens of companies have lost their shirts (or, more cannily, other people's) in the past three years. Surprisingly, prospects are looking up for the companies that have managed to survive, while even business (the prospects for the next quarter) is improving. What can have changed? And why are many manufacturers of electronic components, especially in the United States, still wailing loudly at what they assert must be unfair competition from elsewhere?

What has been happening is an illustration of a familiar and easily recognized economic phenomenon. There was a time, roughly a decade ago, when toy manufacturers were seeing what uses they could make of the semiconductor chips that much more august manufacturers were used to building into mainframe computers. Perversely, some toy-makers built the chips into toy computers, which the younger generation occasionally lent to its elders. Not much time was needed for entrepreneurial elders to sense a market for machines selling for hundreds, not thousands, of dollars, which is how the trade in personal computers sprang to life. But as with the British railway construction boom of the mid-nineteenth century, eager investors were much more numerous than those among them who could grab a substantial share of the market. On the railways, the outcome was predictable. Companies swallowed each other and became bigger in the process until there was nowhere else for them to go, whereupon the incentive for technical change melted away. The result is modern British Rail.

Computer users are more fortunate, so far at least. The shakeout has been traumatic for many companies. Outright bankruptcy has been more common than merger and amalgamation. But consolidation and ossification have not followed. Part of the benefit, for users if not for established manufacturers, is that there seems to be an endless supply of upstart companies willing to compete with the established fellows on price, but that are unable consistently to beat them on performance. Both kinds of companies have also benefited, the upstarts from the money they have sometimes made, the established fellows from the demonstration provided at little cost by the others that there is a huge and sustainable market to work. The competition has become so volatile that the big fellows fear they will be swallowed by the upstarts; some are even thinking they should compete on technology.

That is why the big fellows are at last waking up. IBM's personal computer (called PC) is now long in the tooth, but there is a better version on the way. It may be more significant that Digital Electronics has thought it worthwhile to sell a cheap (or cheapish) computer that is compatible with its own minicomputer called VAX. Even in Europe, once nearly disappeared companies (such as the British Acorn) are talking as if they have a future again (under the Olivetti umbrella).

So is the shakeout at an end? Unfortunately, at least for manufacturers, no. The plain truth is that the machines now on the market are still rudimentary devices, whose big boxes are still mostly filled with old-fashioned wiring. People talk of the time when it will be possible to carry the power of a mainframe computer in a shopping bag, but the lap-top computer has only just become practicable and affordable.

It will be interesting to see whether the new chip of which Intel is now boasting will be that much more capable than Motorola's new product at enabling the design of decisively superior machines, but past performance does not suggest that even the thrusting entrepreneurs in the business are that adventurous. Their products are still most of all conspicuous for the size of the boxes they inhabit. There is a long way to go before their promise is delivered. □