Soviet Union

Fire threatened fast reactor cooling system, says unofficial report

"We have no accidents which would give rise to anxiety among people and set them against the development of nuclear power engineering," Andronik Petrosyants, chairman of the State Committee for the Utilisation of Atomic Energy, told the press recently.

This, however, is not the opinion of the townspeople of Sverdlovsk, in the Urals. A clandestine report which has just reached the West gives a vivid description of the alarm caused by a fire at the Beloyarsk nuclear power station some 60 km away.

The author, who identifies himself only as 'N.N.' appears to have inside knowledge of the workings of the power station. He alleges that during New Year's Eve celebrations in 1978/79, a fire started in the "machine hall". Several firefighters lost their lives in combatting the blaze. It was not brought under control until "everything that could possibly burn was completely burned up."

"N.N." admits that there was no immediate risk of the reactor exploding; however, the reactor cooling system was, he says, threatened. The Beloyarsk station has a fast-reactor, and the primary circuit of the heat-exchanger contains highly radioactive molten sodium at 500°. A rupture in the primary circuit would cause an explosion scattering radioactive material in a cloud like that produced by the 1957 Kyshtym disaster.

"N.N." says that the threat of a similar cloud from Beloyarsk was sufficiently real for the authorities to provide special trains and buses, standing by to evacuate, if necessary, the settlement of Zarechnyi close to the plant.

Following the fire, says "N.N.", a KGB team from Moscow, led by a General, came down to investigate. Their findings remain, he says, unknown, but the local population feel that a significant part was played by the fact that "the shift was drunk, like almost everyone else in the Soviet Union that night." No official allusion has been made so far to any fire at Beloyarsk.

Like the 1973 fire at the Shevchenko fast breeder, which was due to a rupture in the sodium circuit, the Beloyarsk fire was not technically a "nuclear" disaster. According to Academician Anatolii Aleksandrov, President of the Soviet Academy of Sciences and himself an experienced nuclear engineer, fully half the funding of nuclear power stations is spent on safety.

This however, N.N.'s report suggests, is insufficient; the human factor also must be taken into account.

Vera Rich

High energy physics

End of the physics phoney war

Competition for the prize of the intermediate vector boson is leading to doubts about the future of CERN, the European centre for subnuclear physics. But the real competition may be trans-Atlantic. Robert Walgate reports

IN a few weeks' time, the European Committee for Future Accelerators will be holding an extraordinary meeting to discuss what amounts to a perceived competition between West Germany and CERN. ECFA, which has no constitutional power but which represents the views of an influential body of European physicists, is thus cautiously falling in line with Italy, which first shed doubt on Germany's intentions.

The Chairman of ECFA, French physicist Professor Marcel Vivargent, was recently quoted in an Italian newspaper as saying that Italian efforts to clarify CERN's future programme "merits the best attention" and is supported by many European physicists. (In late December, the Italian delegation to CERN walked out of a meeting of CERN Council in a protest at "lack of sufficient discussion" of CERN's future, and allusion to potential German competition.)

Vivargent told *Nature* that he understood the Italian position, as a relatively small nation relying on CERN: "they want CERN to remain the top lab in Europe". He also said that he understood the German desire to find a future for its lab, DESY. The problem, which had been neglected by CERN Council, was to mesh the two objectives together.

Strictly ECFA will be discussing 'complementarity' between two accelerator proposals; HERA for the German laboratory DESY near Hamburg, and LEP for CERN. HERA is designed ultimately to collide 30 GeV electrons with 820 GeV protons and shed light on interquark forces, and perhaps the structure of the quark. (It is equivalent to a 52 TeV electron linac firing at a stationary target, giving a 'spatial' resolution of some 100,000th part of the proton radius.)

But the first part of HERA, according to its coordinator Bjorn Wiik, will collide 35

GeV electrons with equal energy positrons. It will operate in this mode for four years before the proton ring is complete. "Our proton ring will be by far the biggest superconducting effort in Europe" explains Wiik "so we have allowed a long lead time to build it". According to present targets, the electron phase of HERA will be ready in 1985, and the protons in 1989.

LEP, on the other hand, is dedicated to the collision of electrons and positrons at beam energies between 22 and 130 GeV. Protons do not come into the proposal, although the proximity of the CERN complex of proton machines, up to the 400 GeV SPS, make the use of protons a possibility.

The gem in this energy range is the Z^0 , which at 90 GeV would be the heaviest particle yet and a key element in the unified theory of the weak and electromagnetic interactions. In the theory, due to Abdus Salam and Steven Weinberg, the Z^0 plays the role of the photon in the weak interaction (which causes nuclear decay and limits the output of the stars).

The Z^0 (or neutral intermediate vector boson) is mesmerising physicists like Moby Dick mesmerised Captain Ahab. LEP would create it (if it exists) with 45 GeV colliding beams. So would HERA, if it could be stretched up to that energy; and since approval for LEP is unlikely to come before mid-1981, and construction (at a constant CERN budget) is predicted to take seven years, there is a possibility — it is argued — that HERA would have snatched the Z^0 four years before LEP.

The question is actually more complicated, because CERN is likely to find the particle in 1981 — but not with LEP. CERN is building a proton-antiproton collider which will produce 270 GeV on 270 GeV collisions towards the end of 1981, with a view to creating a few Z^0 s. But it will not produce many — opinions

Machines which might compete for the Z^0

Device	Projected cost	Circumference	Earliest likely physics	Beam energy	Luminosity**
LEP	\$640m	30.6 km	1989+++	22-130 GeV**	$10^{32} \text{cm}^{-2} \text{s}^{-1}$
HERA	\$167m++	6.5 km	1985 (electrons)	35 GeV	10^{32}
SPC	\$60m	1.8 km*	1984	50 GeV	10^{30}
antiprotons (budgeted)		6.8 km+	1981	270 GeV	$10^{30}++$

* in two loops

+ in the SPS ring

** main option 86 GeV

+++ electrons only; with protons double this

** event rate per unit collision cross-section at peak energy

*** fraction of events producing Z^0 some 30 to 50 times lower

+++ could be earlier if large fraction of present research programme cut