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Chernobyl - the official story

At an August conference in Vienna the Soviet Union presented its report on the April reactor accident, resulting in a public relations victory for the Soviets and conviction among Westerners of the safety of their own nuclear industries. Walter C. Patterson, an independent analyst and commentator on nuclear affairs based in Britain, attended the conference.

The Chernobyl accident in April apparently has convinced the world nuclear industry that nuclear power is safe - or at any rate safe enough. This somewhat disconcerting conclusion emerged from an August 25-29 conference in Vienna, sponsored by the International Atomic Energy Agency (IAEA). There the Soviet Union presented its official report on the world's worst nuclear accident. The conference's conclusion was not embodied in a formal communique, nor did it adopt any resolutions. Nevertheless, industry and government delegates from East and West clearly concurred that nothing they had learned should hamper the further expansion of nuclear power. Since the delegations were drawn from the nuclear community in each participating country, the conclusion is perhaps not unexpected. The process by which it emerged, however, is worthy of comment, not least as a guide to how the nuclear community will cope with Chernobyl henceforth.

With some 600 nuclear experts from 62 countries and 21 organizations, national and international, present, the gathering was nominally a "technical working conference"; but intensive diplomacy by the IAEA won agreement for both the opening and closing days of the conference to be open to the media, represented by more than 200 journalists. No one who attended the first day's session will soon forget it.

Western suspicions that the Soviet authorities would resort to obfuscation and cover-up were swept aside by a deluge of information - explicit, vivid, and chilling. The official Soviet report ran to 388 pages. In a five-hour tour de force the head of the Soviet delegation, Academician Valery Legasov, deputy chairman of the Kurchatov Institute of Atomic Energy, introduced the report. Even in translation his speech was gripping; his description of the final hours, minutes and seconds before the Chernobyl explosion left both delegates and journalists visibly disturbed.

Legasov also brought with him a 25-minute videotape entitled simply "26 April," which was shown to the conference on the opening morning and then twice again by overwhelming demand. The film offered a grim contrast to the Soviet television documentary being shown in the delegates' lounge. The doggedly cheerful documentary devoted most of its time to the efforts of the workers at the site and at Hospital 6 in Moscow. Legasov's videotape, however, recounted all too starkly the events of April 25-26 that had made all the subsequent heroics and cleanup efforts necessary. It described the Chernobyl plant and the RBMK-1000 reactor design; it then followed the course of the last experiment on Chernobyl Unit 4, to its catastrophic denouement.

The unit had been scheduled for shutdown for annual maintenance. In 1984, in similar circumstances, the staff had carried out an experiment to see how long after the steam supply was shut off the free-wheeling number 8 turbogenerator could supply electricity to run essential equipment; the experiment, though executed without difficulty, had been unsuccessful, since the electrical supply had dwindled too rapidly. Improved electrical equipment had since been added, and the experiment was to be tried again. But this time - perhaps because the previous attempt had been without incident - the experimental program was "not properly prepared and had not received

the requisite approval" (U.S.S.R. State Committee on the Utilization of Atomic Energy, *The Accident at the Chernobyl Nuclear Power Plant and Its Consequences* (Aug. 1986), p. 15).

At 1:00 a.m. on April 25, the staff began reducing reactor power from the maximum 3,200 megawatts to 1,600 megawatts. At 1:05 p.m. turbogenerator number 7 was shut down. At 2:00 p.m., to keep it from interfering with the experiment, the emergency core cooling system was disconnected. At this point, the electricity grid control center in Kiev notified Chernobyl to keep supplying power until late in the evening. The experiment was suspended and the plant continued in operation, with the emergency core cooling system disconnected.

Finally, at 11:10 p.m., power reduction recommenced. The experiment was to be carried out at a power level of 700-1,000 megawatts. However, with the automatic control system switched off, the operator could not stabilize the reactor quickly enough and power dropped to only 30 megawatts thermal. The ensuing buildup of neutron-absorbing xenon in the core then made it impossible to raise power above 200 megawatts. In an effort to offset the xenon poisoning, the operator withdrew more and more control rods. Operating instructions directed that the reactor should never be operated with fewer than the equivalent of 30 of its 211 control rods in the core. By 1:22 a.m. of April 26, only some six to eight rods' worth of absorber were still in place, and, in the dismaying words of one Soviet delegate, the reactor "was free to do as it pleased." At 1:23, with the reactor in this precariously unstable condition, the experiment began. It lasted only 40 seconds.

Legasov's videotape had tracked the changing power level of the reactor as a green line extending gradually along a simple graph. In the upper right-hand corner of the diagram was an equally simple schematic of the core of the reactor, with control rods sliding imperceptibly in and out. As Legasov's narrative reached its dreadful climax, the green line on the graph turned almost vertically upward; a blazing red glow swelled to fill the reactor core. It was not Hollywood animation, but it made its point.

In due course, the conference participants agreed that the reactor had suffered a "prompt critical excursion." The science editor of Britain's *Financial Times* put it more bluntly: it was a "slow nuclear explosion," taking perhaps a second rather than a nanosecond, but a runaway nuclear chain reaction nevertheless. The precise sequence of events in the crucial second or so remained unclear. Experts postulated that the fierce power surge - perhaps as much as 100 times the nominal design power - had shattered the fuel into incandescent fragments; the fragments had transferred their heat almost instantaneously to the water coolant, flashing it to steam with a pressure shock violent enough to blast a gaping crater through the concrete above the reactor. This "steam explosion" exposed the red-hot core; air rushed in, mixing with the hydrogen formed when zirconium fuel cladding reacted with steam. Within two or three seconds a hydrogen explosion showered the refueling hall and the surroundings with blazing core material, starting about 30 fires.

No Western advance commentary on the Soviet report had come close to conveying the true horror of the accident. Legasov's videotape included footage filmed from a helicopter jolting above the hole torn in the top of the reactor building, apparently only a day or two after the accident. Deep in the grey twisted ruins could be glimpsed the glow of the burning core. After the first afternoon session, journalists watched in fascination as the nuclear community faced up to the reality of their industry's first catastrophic accident - the accident they had believed could never happen.

Few of those journalists, however, could have anticipated the transformation that was to take place by the following Friday. On August 25 the conference mood was bleak and tense; by August 29 it had become cheerful, convivial, verging on the euphoric. The possible reasons for this metamorphosis can only be inferred. On Tuesday, Wednesday, and Thursday conference participants withdrew behind closed doors, away from the media's gaze. Four working groups met in parallel

sessions, to consider the short- and long-term technical aspects of the accident, the emergency measures taken, and the radiological consequences. After each morning and afternoon session, Morris Rosen, director of nuclear safety for the IAEA, chaired a press conference lasting an hour or more.

Inevitably, however, time constraints proved frustrating. Some journalists wanted the working-group chairmen to summarize the findings of the sessions, but four summaries took up at least half an hour, further limiting the time for questions. Answers from the panel all too often turned into extended lectures aimed at the lowest common denominator of understanding among the media. Though understandable, this was unfortunate: the media representation was of the highest caliber, including many of the most experienced reporters covering the nuclear scene internationally. At the end of the conference one British delegate was heard to remark that the questions from reporters were better than those asked by delegates in the closed working groups.

In both the working groups and the press conferences two themes dominated: the long-term health effects of the accident and its implications for nuclear safety worldwide. The treatment of these two themes during the conference, in the press conferences, and in informal briefings through the week, suggests how the grimness of the opening day could have evolved into the sweetness and light of the closing plenary session.

The immediate health effects were clearly horrific; the Soviet presentation left no doubt of that. They were nevertheless limited: 31 fatalities to date. The press conference panelists - comparing this with fatalities in car accidents, plane crashes, and other modern technological mishaps - insisted on the need to keep the health effects of the Chernobyl accident in perspective. As to the longer term, many people would suffer cancers as a result of exposure to radiation from Chernobyl, some of which would certainly be fatal. The precise numbers, however, could not be predicted with any confidence, nor would it be possible to say that Chernobyl caused any particular cancer. Dan Beninson, chairman of the International Commission on Radiological Protection, declared himself convinced that Soviet estimates were unnecessarily high; the number might be only 2,000, in a population of many millions over a 70-year lifetime.

In successive press conferences such comparisons were pressed ever more emphatically. By setting the long-term Chernobyl fatalities against a background of all the other deaths occurring during the same period in the same population, the health effects of the accident could be made to appear unimportant. Even the central Soviet estimates, implying 24,000 fatal cancers and hundreds of thousands of non-fatal cancers, could be thus discounted. (A British delegate was heard to remark that there is no such thing as an "extra" death; the quota is one death per person.) By implication, if Chernobyl didn't get you something else will, so why worry about a nuclear accident? Bemused observers from outside the nuclear community watched the emergence of this new approach to radiopathology. Indications are that this may henceforth become a central tenet of nuclear industry philosophy. Morris Rosen commented that it was not for him to say what society would consider acceptable. Compared to the health effects from other types of energy production, society might even consider such a casualty list an acceptable price to pay for "cheap, clean nuclear electricity."

Furthermore, Western conference participants found that the Soviet data reinforced their already firm conviction that the Chernobyl accident had little, if any, relevance to nuclear safety elsewhere. The Soviet report itemized the advantages and disadvantages of the RBMK design and described how Soviet engineers had endeavored to incorporate features offsetting the disadvantages. Lord Marshall, chairman of Britain's Central Electricity Generating Board, briefing journalists, claimed, however, that Legasov had admitted that the RBMK design had not merely disadvantages but defects. No official translation appeared to bear out this allegation, but it became the focus of Western reaction to the technical discussions. At the outset, Western delegates declared that the

RBMK design could not be licensed in Britain or the United States. They laid great stress on its "positive void coefficient" - that is, the positive feedback between reactivity and steam - claiming that no Western design would be so vulnerable to catastrophic malfunction.

Even so, by the close of the conference the Western delegations had drastically muted their criticisms of Soviet nuclear technology. The evidence of impressive Soviet competence in other areas - especially the emergency measures implemented in the hours after the accident - had taken the edge off earlier Western suggestions that the Soviets could not be trusted to build and operate nuclear plants. In response to press questions, Legasov demanded that Western delegates put their technical doubts directly to his delegation, rather than obliquely in briefings to journalists. Instead the Western delegations began to hedge, declaring that they did not know enough to be able to offer definitive opinions as to Western licensability of Soviet plants modified after the accident. Onlookers reflected that the Western delegations might have been reluctant to challenge Soviet nuclear safety directly, lest the Soviets reciprocate with a similar challenge about the safety of Western nuclear plants. Human error is not unique to the Soviet Union.

As a result, the final plenary saw a comradely closing of the nuclear ranks, amid an outpouring of mutual congratulations on the week's efforts. For the Soviets the conference was a public relations triumph. Their forthrightness and candor all but blotted out the memory of the initial Soviet failure to warn their neighbors about Chernobyl. The IAEA, too, won plaudits for its role as an honest broker and a conduit for improved East-West dialogue.

Questions nevertheless remain. The nuclear power industry has suffered its first unambiguous catastrophe and come to terms with it. The nuclear community clearly expects the rest of the world to do likewise - to put Chernobyl behind it and press on. The rest of the world, however, may not be quite so sanguine.

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