levels of radiation. Indian officials have strongly denied the existence of dangerous conditions at Tarapur. Recently, the horror stories were put in some question by a rare outsider's report of a visit in June. The visitor was E.A. Grimm, an engineer from the General Electric Company which sold the reactors to India. Grimm, who served as project manager during construction and early operation of Tarapur, noted the need for replacement parts, but said "the plant is running satisfactorily."

A widely noted adverse report of problems at Tarapur appeared in the *Times of India* on 8 May. The story said that outside workers including illiterate villagers had been brought in to do maintenance work in contaminated areas of the plant to spare Tarapur staff further exposure. In what was described as an eyewitness account of work during a shutdown of the plant, the reporter told how a queue of workers lined up outside the contaminated area. Then each, holding a wrench in one hand and a dosimeter in the other, "rushes in, turns a nut through one or two rotations or hammers a knob once and rushes out." The story said that workers in such relays are exposed to 2 weeks worth of permissible radiation in less than a minute and an annual dose in 10 to 20 minutes.

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The story describes in considerable detail how plant staff has been regularly exposed to radiation exceeding the limits set by the Indian Department of Atomic Energy. Indian officials do not dispute the figures, but maintain that Indian citizens have not been exposed to dangerously high levels of radiation.

In the summary of the report made available in this country by GE, Grimm says that the two units at Tarapur are running at about 75 percent of capacity to conserve fuel. He says that operations are "made more difficult" by a lack of spare parts including radiation detectors. He says that "lack of replacement recirculation pump seals seem to be most critical." (In late July, one reactor at Tarapur was reported shut down because of a leak in a circulation pump attributed to worn parts.)

Grimm's summary comment was, "In my judgment, the plant is running well and being run well despite their supply problems. They are dedicated, conscientious professionals who have been working there for 16 years and still only hire graduate engineers for their reactor operators." Grimm asked the reactor operators about radiation doses in the reactor containment area. He said they reported values that are moderate for a plant of that age and are workable.

The Tarapur project was launched by an Indian-U.S. agreement in 1963 and the plant began operation in 1969.

Scuttlebutt in the U.S. nuclear industry is that Tarapur had early troubles with leaks of radioactivity from fuel elements in the reactor core. GE's first production model boiling water reactors (BWR's), the type at Tarapur, were regarded as susceptible to such problems since the design had a unified system employing the same medium as coolant and to drive the turbines, which meant that stray radioactivity circulated throughout the system. Since 1980, the Indians are said to have reduced contamination levels mainly by running the reactors below capacity. A costly, time-consuming full-scale decontamination of the plant has not been done.

Tarapur's GE BWR's each has a rated capacity of 210 megawatts. By current Western standards they are regarded as too small to be economic. GE reactors of the same vintage have been shut down in Germany and Italy as have two in the United States. Tarapur, however, is regarded as important to the Indian power system. It's capital costs were relatively low and the size of the reactors suits Indian needs.

After the Tarapur BWR's were built, India, in the interests of nuclear self-determination, adopted a reactor type moderated by heavy water that could use natural uranium mined in India as fuel. The initiative has proved disappointing since the country has had difficulty in producing adequate heavy water supplies and the new reactors tend to perform below rated capacity. The Indians have learned to live with Tarapur and reportedly would like to extend its operating life beyond the projected 30-year span scheduled to end in the late 1990's. If India gets its way and the spare parts, therefore, Tarapur could continue for years to come as a factor if not the focus in Indo-U.S. nuclear relations.

—JOHN WALSH

Sun Sets at RCA, Rises at Solarex

RCA Corporation has decided to get out of the solar energy business, and is selling its technology and equipment lock, stock, and barrel to Solarex for an undisclosed sum. The deal, which is in the final stages of negotiation, involves RCA's patented technology for making amorphous silicon solar cells.

Although RCA is generally reckoned to be in the forefront of developing this technology, it decided not to risk large amounts of capital—estimated to be up to $100 million—to set up production facilities. Several Japanese companies, however, have not been so cautious; they are already using RCA's process to produce small cells for consumer products.

RCA decided about a year ago that it could not afford to go it alone in large-scale commercial production and began quietly looking for an industrial partner to commercialize the technology through a joint venture. Negotiations with two companies dragged on for several months, and RCA eventually imposed a deadline of 31 March. If agreement could not be reached by then, RCA said it would sell its technology and get out of photovoltaics entirely. The deadline passed, and the business was up for grabs.

Solarex, which is based in Rockville, Maryland, is already a major producer of the current generation of solar cells made from crystalline silicon. Its purchase of the RCA technology will give it a head start in the race to produce the next generation, which will be much cheaper to manufacture. (Amorphous silicon is widely regarded as the leading contender to replace crystalline silicon.) Equally important, Solarex is likely to hire several key photovoltaics experts from RCA, including David Carlson, who has headed the program at RCA for several years. Although Solarex's plans have not been announced in detail, the company intends to set up a manufacturing facility in New Jersey, close to the RCA labs in Princeton.

One unresolved question is what will be done about use of the RCA technology in Japan. At present, Japanese companies are simply using

the technology without licensing agreements. One source told *Science* that when the agreement with Solarex is finalized, RCA's patent rights will be enforced, by litigation if necessary.

If Solarex does eventually begin large-scale manufacture of amorphous silicon cells, it will find itself competing head-to-head with Energy Conversion Devices, a Michigan company headed by entrepreneur Stanford Ovshinsky. Energy Conversion Devices has a joint venture with Standard Oil of Ohio to produce cells based on a process Ovshinsky developed. Oil money is also helping to bankroll Solarex: the company is one-third owned by Standard Oil of Indiana.—**COLIN NORMAN**

Peace at Hand for Nuclear Physics

The tug-of-war over who would win a grant from the Department of Energy (DOE) to build a $100-million accelerator for nuclear physics research ended on 19 July when the Argonne National Laboratory withdrew from the struggle. This should clear the way for a rapid endorsement of the only other contender, a consortium of 23 universities known as the Southeastern Universities Research Associates (SURA). Because SURA was asked to reconsider its proposed construction site, it recently entertained the option of moving to Charlottesville, Virginia, but decided to stay in Newport News, where it can take advantage of some buildings and property donated by the state.

The controversy began in April, when a select DOE panel of physicists chose SURA's design as technically superior to four other submissions, including one drawn up by Argonne (*Science*, 27 May, p. 929). Not willing to accept this as a final decision, Argonne's director, Walter Massey, appealed to the Secretary of Energy, Donald Hodel. Massey wanted the decision reversed. To aid his cause, Massey recruited a number of Midwestern university officials and the Illinois congressional delegation, headed by its senior member, Senator Charles Percy (R). Argonne's backers argued that the decision had been influenced by other than purely scientific criteria, such as SURA's enticing offer to create 35 new professorships in nuclear physics. Furthermore, the Argonne group said, DOE was under a mandate from another advisory panel to avoid launching new facilities when existing laboratories could do the same work. Finally, in what seemed a desperate gesture, Percy said that if SURA's design were truly better than Argonne's, then Argonne could take it over and build it in Illinois—but more cheaply.

For several weeks, Hodel played the shuttling diplomat, visiting alternately Percy's offices and those of SURA's chief backer, Senator John Warner (R–Va.). Both insisted that Hodel attend mass meetings of scientists and politicos from back home, and that Hodel appear afterward to tell reporters about the constructive dialogues he was having with both sides. Hodel cooperated, saying he was "highly impressed" with the presentations. But in the end, someone passed the word to Percy and Massey that the show could not go on forever. If they did not withdraw, there might be no accelerator at all. In a letter released on 19 July, Percy wrote: "We have been told by Administration officials that they are under no congressional mandate to fund this proposal and that a protracted regional battle over the location of the accelerator could, in fact, result in its not being funded at all." One newspaper reported that the official who got this message across was George Keyworth II, the President's science adviser. Keyworth's office would neither confirm nor deny it.

In a coordinated bowing-out, Percy and Massey released letters on 19 July thanking various supporters for the work they had done. They explained that the best they had been able to do was to produce a stalemate. As Massey put it, this "could hurt all of American science, because it would probably result in a postponement or cancellation of the accelerator." This would be "unfortunate" for "the United States is striving to maintain its leadership in key areas of science and technology in the face of intense foreign competition."

Massey noted that Argonne stands ready to help solve technical problems which surely will arise as SURA tries to build its accelerator. He mentioned that the whole episode had served a good purpose, showing "that there is a deep concern on the part of the Illinois and other Midwestern state delegations . . . regarding the disproportionate flow of federal research dollars into states outside the Midwest region."

Percy concluded by observing that Argonne is seriously underfunded in the general equipment account, receiving one-fifteenth as much in 1983 as its sister labs. Hodel, Percy wrote, promised to correct this imbalance next year.—**ELIOT MARSHALL**

Oak Ridge Retracts Reprimand of Biologist

Joe LaGrone, director of Department of Energy (DOE) operations in Oak Ridge, Tennessee, on 21 July retracted an official reprimand given to a scientist who used to work at the national laboratory there. The punishment was meted out in 1982 to biologist Stephen Gough for his spare-time investigation of mercury pollution in a creek bed near an idle hydrogen bomb plant (*Science*, 8 July, p. 130). Gough was accused of insubordination for collecting bits of moss and sycamore root one Saturday and sending them to another federal laboratory for analysis. Shortly after his reprimand, Gough left the lab to work for a private defense contractor.

The DOE, which owns the lab and the bomb plant, later came under pressure to declassify a 1977 study documenting mercury leaks and accounting errors associated with the bomb factory. The report was released in May, indicating that 2.4 million pounds of mercury had been "lost," and as much as 475,000 pounds may have gone into the creek.

LaGrone became the manager of DOE operations in April, about the same time Gough was preparing to leave. He inherited the mercury pollution, the personnel problems, and the public controversy that went with them. Many local observers, including Gough, give him high marks for his effort to mend relations with Tennessee and the town of Oak Ridge. Gough is obviously pleased to have his record cleared, but says he is not likely to accept LaGrone's offer of a new job at the Oak Ridge lab.

—**ELIOT MARSHALL**