

TECHNOLOGY

Atmospheres in reserve save energy

At night, an electric utility pumps air deep into underground caverns. The next morning, in time for a sharp rise in electricity demand, the pressurized air surfaces to drive the power plant's turbine generators. This scheme, called compressed air energy storage, is one method that utilities are considering for meeting daily energy demand fluctuations more efficiently.

One such plant has been operating successfully in West Germany since 1978. The Soyland Power Cooperative in Decatur, Ill., is about to select a site and sign a cavern excavation contract for the first compressed air energy storage facility in the United States.

The caverns required for the plant are to be excavated in limestone and connected to a water reservoir, which keeps the stored air at a constant pressure. During off-peak periods, a compressor powered by inexpensive grid electricity cools and forces air into the limestone caverns, displacing water. During peak times, air is drawn from the caverns, heated in combustion chambers and channeled to the turbines to generate power. This system saves up to two-thirds of the oil or gas that a conventional gas turbine peaking system requires. Another advantage is that the stored energy is available within minutes to meet emergencies and sudden power demand increases.

Every energy storage scheme is a net energy loser, but the storage pays for itself by displacing expensive petroleum fuels with cheaper base-load fuels like coal. The Soyland facility, a 220-megawatt plant with a 200,000-cubic-meter cavern storage capacity, should be operating in 1986, says Thomas N. Seng, Soyland environmental department director.

From ashes to aluminum

Coal-fired power plants in the United States produce more than 60 million tons of fly ash waste each year. Now, researchers at the Oak Ridge National Laboratory in Tennessee have developed an extraction process that may economically recover half of the 300 pounds of aluminum oxide contained in a ton of fly ash. Their report, "Evaluation of Potential Processes for Recovery of Metals from Coal Ash," was published recently by the Electric Power Research Institute.

The researchers investigated several possible recovery methods and decided that only one would be economic. In this process, fly ash is mixed with hydrochloric acid in plastic-lined steel tanks to produce a liquid from which aluminum chloride crystals can be separated. Although only 50 percent of the aluminum in fly ash is recovered, the process produces enough aluminum to pay for the disposal cost of the residue. Process costs are kept low through the use of inexpensive, acid-resistant plastics, fewer processing steps than in the past and acid recovery. Ronald M. Canon, resource recovery staff supervisor at Oak Ridge, says his group has submitted a proposal to the Electric Power Research Institute for a 2- to 3-year project to look at the process more thoroughly on a larger scale. Canon notes that iron can also be recovered from the fly ash.

Computers for combat aircraft

Automated features based on computer technology are needed to decrease pilot work load because of the increasing sophistication of combat aircraft and their use under more difficult conditions, says a newly released National Research Council study, "Automation in Combat Aircraft." The study identifies several problems facing air force pilots that may benefit from increased automation, including identifying objects beyond visual range as friend, foe or neutral and coping with the number of displays presenting information in the cockpit.

APRIL 17, 1982

ENVIRONMENT

Turtle farm exemption requested

In 1978, the green sea turtle (*Chelonia mydas*) was listed as an endangered species by the Fish and Wildlife Service and National Marine Fisheries Service. Included in the listing regulations was a prohibition of all commercial trade in green sea turtle products in the United States — required by the Endangered Species Act. But Cayman Turtle Farm, a green turtle mariculture operation located on Grand Cayman Island in the West Indies, objected. It claimed that selling its products in the U.S. would have no impact on wild sea turtle stocks and, in fact, it was actually helping to conserve the species by captive breeding the animals. The farm requested an exemption to the federal regulations that same year. The issue was finally settled with a suit in 1979, *Cayman Turtle Farm v. Andrus*, in which the court upheld an agency decision to deny the exemption on the grounds that allowing import of Cayman products would feed market demand for all sea turtles and make enforcement efforts against smuggling wild turtle products into the United States much more difficult.

Now, three years later, turtle farming advocates are trying again. Two organizations, the Pacific Legal Foundation and the Association for Rational Environmental Alternatives, have filed a petition with the FWS and NMFS — announced in the April 1 FEDERAL REGISTER — requesting an exemption from endangered species regulations for Cayman Turtle Farm. But "there is no new evidence contradicting the conclusions reached four years ago," says Michael Bean, an attorney with the Environmental Defense Fund, which intervened in the 1979 suit on behalf of the government. "International trade in any green sea turtles, including farmed ones, stimulates market demand and has an adverse impact on sea turtle conservation," he says.

Don't waste fish 'wastes'

Most fish processors today discard heads, tails and bones of the fish that pass through their processing plants. But these fish "wastes" could be saved and put to good use, says John Wekell, a chemist with the National Oceanic and Atmospheric Administration in Seattle, Wash. For example, he says, the protein-rich wastes can easily be treated and fed to livestock, sheep and poultry in place of currently used fish meal, which is rising in price. In addition, the unwanted fish parts could be fed to other fish raised in aquaculture tanks. In NOAA's Seattle lab, scientists used treated waste from hake (a relative of cod) to feed trout. The trout that ate the experimental diet did as well as those fed a more standard fare, says Wekell.

Watt agrees to restrict pesticide use

Interior Secretary James Watt has agreed to abide by strict restrictions against the use of chemical pesticides on national wildlife refuges. The restrictions, which prohibit pesticide use except in extraordinary circumstances and when no feasible alternative exists, had already been established by Watt's predecessor, Cecil Andrus. But in August 1981 the Interior Department ignored the policy and authorized aerial spraying of the pesticides Abate and Dibrom on salt marshes in two refuges on Long Island. The circumstances were far from extraordinary, says William Brown, senior scientist with the Environmental Defense Fund: "They wanted to control mosquitoes pestering inhabitants of adjacent homes." EDF immediately sued Interior and the agency withdrew the spraying permit within days. But some pesticide spraying had already occurred. "We continued the suit to make sure they would not do it again next year," Brown told SCIENCE NEWS. At the end of March, the Secretary agreed to honor Andrus's pesticide restrictions in the future.

265