

Nuclear Power Revival for GE Leaves Waste Unsolved (Update1)

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By Jeremy van Loon



Oct. 20 (Bloomberg) -- When 65 scientists met at Princeton University in 1955 to decide where to permanently store radioactive waste from nuclear power plants, their **conclusion** was simple: Bury it deep underground, far from earthquakes.

Since then, reactors worldwide have produced 270,000 tons of spent fuel, storing most of it in canisters above ground. U.S. regulators, reviewing 18 applications to build new atomic plants, said last month they may approve such temporary storage for as long as 40 years, double the current allowable time.

Governments across the globe are endorsing similar plans to temporarily warehouse their carcinogenic waste, helping clear the way for a revival in nuclear-plant construction that has given about \$115 billion in contracts to **General Electric Co.**, **Toshiba Corp.**'s Westinghouse unit and Paris-based **Areva SA**.

"New plants will continue to be built with no concern for where to put the spent fuel," said **Georgui Kastchiev**, senior scientist for nuclear safety at the University of Vienna's Institute of Risk Research. "A solution to the problem is constantly being moved to some point further in the future."

The new reactors will pile up radioactive waste, which already grows by 12,000 tons a year, the International Energy Agency in Paris estimated. That has prompted scientists to call again for the world to start **building** permanent dump sites, a request made periodically ever since **the first commercial atomic** plant began generating power in Sellafield, England, in 1956.

"Storing waste underground is the only solution," said **Hans Forsstroem**, a **nuclear physicist** who directs the **International Atomic Energy Agency's** fuel-cycle unit in Vienna. "You need to take care of your radioactive waste, and do so in such a way as to not put a burden on future generations."

Cask-Makers

Makers of casks that hold atomic waste from the world's **436 operating reactors** say they weren't designed to be hermetic cemeteries for the million years the substance may be harmful.

GNS of Essen, Germany, supplied more than 1,000 canisters to Germany, Lithuania, Switzerland and the U.S. that will hold radioactive waste for 40 years, said spokesman **Michael Kubi**. Each canister cost at least 1.5 million euros (\$2.2 million).

Enresa, Spain's atomic-waste manager, uses metal and concrete containers made by **Holtec International** of New Jersey and Madrid-based Ensa built to last about 100 years, an Enresa spokesman said. GNS and Enresa said the canisters may last longer than their ratings.

Temporary casks are used because engineers are still puzzled over how to avoid shifts in the earth that may crack open an underground dump thought to be secure, scientists say.

"You can't predict for a million years," **Frank von Hippel**, a researcher on nuclear power at Princeton University in New Jersey, said in an interview.

Building Revival

Nuclear power, which already produces 14 percent of the world's electricity, is undergoing a revival after a drop-off in development. Fifty plants are being built worldwide, almost double the number under construction in 2004, the World Nuclear Association in London said.

Demonized for decades by environmental groups as the most dangerous energy form, splitting atoms to produce electricity has gained favor among governments partly because it releases far fewer greenhouse gases than burning coal or natural gas.

China is erecting 16 reactors with 90 more proposed, data from the nuclear association shows. In the U.S., the Nuclear Regulatory Commission said it has 18 applications. The two nations emit 40 percent of the world's carbon dioxide, the main gas that nations are trying to limit in global climate talks.

Chinese Dump

To reduce greenhouse-gas output from conventional power plants, Japan may need more nuclear power, a trade ministry official said on Sept. 24. Five days later, India's Prime Minister **Manmohan Singh** said at a conference his nation may seek a 100-fold increase in atomic capacity in 40 years.

China, which lists its reactors under construction at 24, plans no permanent atomic-waste dump before 2040, according to the U.S. Department of Energy.

The atomic industry says new projects shouldn't be held up until permanent waste storage is first built.

The "small" amount of waste generated by reactors should not stand in the way of building more, **Vaughn Gilbert**, a spokesman for Monroeville, Pennsylvania-based Westinghouse, said in an interview.

Spent fuel is an "opportunity" because it contains un-used energy, said **Lisa Price**, vice president for the fuel business of Fairfield, Connecticut-based GE.

Reprocessing waste into new fuel is done in a few nations such as France. It's one solution for the "final storage" of radioactive material, said a spokeswoman at Areva, the biggest reactor builder, who asked not to be named.

Deadly Within Hours

"You can store it above ground forever if you want to," said **Ian Hore-Lacy**, a World Nuclear Association spokesman. "But the industry would like to see a disposal solution. Otherwise you have people saying waste is an unsolved issue."

Spent fuel from a reactor contains 20 times the amount of radiation considered fatal for a human if exposed for one hour, according to **U.S. atomic-energy regulators**.

The material, which can be sought for bombs by terrorists, is generally guarded in casks on site at the power plants or in state-supervised storage facilities. The risks are corrosion and damage to drums, which may leak and contaminate soil or water, said **Jan Beranek**, who coordinates atomic energy-related projects at Greenpeace, the Amsterdam-based environmental group.

In Germany, atomic-energy policy has left the country with a nuclear clean-up instead of a functioning repository, prompting Environment Minister **Sigmar Gabriel** to ridicule proponents of nuclear power for claiming it's "clean" energy. "If it's clean, then the waste is merely compost," he said.

German Lesson

Germany has learned the hard way that trying to seal off waste forever can come back to haunt.

Half a kilometer (1,600 feet) beneath a wooded hill in central Germany, in a former salt mine once billed as leak-proof, a buckled steel beam shows how shifting geology can play havoc with burial plans. The buttress is part of a system to keep walls from collapsing after the earth began moving in the repository housing 126,000 barrels of low and medium-level irradiated material, such as clothing, from nuclear businesses.

At the site 19 miles south of Volkswagen AG's headquarters in Wolfsburg, [nuclear-safety researchers](#) and mine workers race to stem a total collapse of the shifting mine. The uncertainty they face is reflected when greeting each other on trips to the pit. "Glueckauf!" they say, in the traditional miners' salute meaning "if we're lucky," we'll meet again above ground.

13 Stories Inverted

The dump is much like an inverted 13-story office tower. Its 131 chambers are submerged in stygian darkness and connected by 10 kilometers of roads. Without pumps from the surface, the air would be unhealthy to breathe. Everything used in the mine was dismantled, including dump trucks, sent down an elevator that accommodates six people, and reassembled.

Storing waste in the mine had to be stopped because scientists didn't understand how water flows in and out of the space, putting the structure and nearby water resources at risk, [Wolfram Koenig](#), president of the German nuclear safety regulator, said in an interview on a train to the site.

The U.S. dropped plans in February to develop a permanent dump at Nevada's Yucca Mountain over safety and geological concerns. The investigation used \$9 billion of the funds that utilities paid to cover atomic-waste storage since 1983. The U.S. Department of Energy now faces legal action from power companies that want their storage costs reimbursed.

The Yucca Mountain [flop](#) helped lead the nuclear regulator on Sept. 15 to propose doubling the period for on-site storage from the current 20 years, benefiting utilities that own plants such as [Dominion Resources Inc.](#) and [Progress Energy Inc.](#)

\$2.6 Billion Annual Cost

"I feel comfortable with onsite storage for decades," [Gregory Jaczko](#), chairman of the commission, said in a July interview, two months before the policy shift.

The annual costs for permanent disposal may be about \$2.6 billion a year, based on the IEA's estimate of [\\$0.001 per kilowatt-hour](#) and global nuclear-energy output data from the World Nuclear Association.

"As a percentage of the energy costs, this is very little," said the IAEA's Forsstroem. "The question is, will the money be there when it's needed?"

Most nations neither set aside money for burial nor pass the costs on to today's electricity consumers. There are a few exceptions, such as Sweden, Finland and the U.S., which raise money for permanent dumps yet to be built.

Swedish Leadership

Sweden, which alerted the world to radioactive particles from the 1986 Chernobyl atomic plant explosion, which in turn led to a drop-off in new plant construction, has set out to become the first to construct a long-term repository for its life-threatening garbage. It's due in 12 years at the earliest. Finland said it has similar plans and also expects to complete a repository around the same time.

SKB AB, Sweden's nuclear waste manager, in April chose a site in Forsmark, north of Stockholm, after three decades of vetting, and the work is "just beginning," **Claes Thegerstroem**, Stockholm-based SKB's chief executive, said in an interview.

When the repository is completed, there will probably be room to store additional irradiated waste should Sweden extend its use of nuclear energy. Lawmakers in February cleared the way to replace the country's 10 atomic plants, which produce almost half the nation's electricity.

France is also a leader and is considering burying spent fuel in clay 500 meters underground in the country's northeast. A tentative plan calls for construction to start in about 2017 so the repository can be used from 2025, according to the Web site of the waste-management agency Andra.

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