Chapter Twenty-Two

Jumping the Fence

It was an opportunity to step outside the Site boundaries...

–Jay Kunze–

With the MTR out of business after 1970, the physicists who hadn't left Idaho were available for other work. Fortunately, this surplus of NRTS talent dovetailed with national events that offered new opportunities. In 1971 not long after an electrical "brownout" in the eastern states, President Richard Nixon warned Congress that the country should not take its energy supply for granted. He suggested that a new government department unify the country's energy development programs. But the price of energy was sufficiently low that Congress did little at the time.[1]

However, the NRTS and the AEC's other national laboratory facilities began to expand their research to non-nuclear energy sources. East Idaho business leaders were exploring every avenue they could to diversify and build new programs at the NRTS, so this was a welcome development. The employment numbers at the Site were about 5,600, having fallen from a peak employment of 6,145 in mid-1965. The Eastern Idaho Nuclear Industrial Council published a brochure entitled *Potentially Available Facilities*, which identified 223,000 square feet of space available in twenty vacant NRTS buildings. Diversification was highly desirable.[2]

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Well drilling at Raft River.

The IDO contractor, Aerojet Nuclear, was wide open to new possibilities. It created an office to pursue research work in alternative energy sources such as solar, geothermal, wind, and tidal energy. Physicist Jay Kunze headed the office and began looking around.[3]

Kunze learned of the geothermal waters that flowed from artesian wells in the Raft River Valley in Idaho, about 150 miles southwest of Idaho Falls and near the Utah border. A number of years previously, some farmers had drilled irrigation wells and to their surprise brought up boiling water. The remote valley had a population of a few hundred souls and received its electricity from the Bonneville Power Administration (BPA) through the Raft River Rural Electrical Cooperative. The co-op manager, Edwin Schlender, inspired by the national discussion about potential energy shortages, wondered if the hot water below the valley might produce electricity at a price competitive with that of the BPA. He hired a geologist to investigate the resource and applied for a water right from the Idaho Department of Water Resources (IDWR). Several neighboring landowners prepared to protest the application because the water table in the valley had been declining over the years and they feared new wells would worsen the situation.[4]

Kunze and his boss, Dr. Robert Brugger, drove down the highway one day in 1972 toward Malta, Idaho, to visit the cooperative. The Raft River is a north-flowing tributary to the Snake

The Raft River Pilot Plant at night.

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River, rising in the Raft River Mountains that stride the Idaho/Utah border. Beneath the valley surface, geological features such as faults intersecting each other at depths of several thousand feet provide heat and pathways to subterranean water reservoirs. Conditions such as these are common elsewhere in Idaho and other western states. Kunze recalled the trip.

Bob and I went to visit Ed Schlender. I felt a little uneasy going down there with the message, "Hello, we're from the government; we're here to help you." But the manager took to us, and we took to him. We developed a friendly relationship and started to put together a project. We worked with the Idaho Department of Water Resources, the public power agencies, and the BPA. The Raft River people gave us a lot of support, moral and otherwise. It was an opportunity to step outside the Site boundaries and attempt to develop a resource that would benefit Idaho.[5]

A research proposal took shape. Kunze worked with the Raft River neighbors and collaborated with the IDWR. He hired Clay Nichols, a geologic engineer with a specialty in geothermal geology, who had done his doctoral dissertation at the University of Oklahoma on geothermal systems and was then teaching at Boise State University. They went to Washington, D.C., in August 1973, seeking federal grant support. The objective was to drill wells deep into the fractured rock, bring up water at a temperature of 300°F, install turbine/generator equipment using a working fluid other than water, and generate electricity. The engineering challenge was to make the system work economically. The water was 50°F cooler than what then was understood to be economic. As a nonnuclear project and one that would take place off-Site, the project was a significant departure from the NRTS tradition.[6]

Support rolled in from the usual network, aided by an apparent energy crisis. In the fall of 1973, the petroleum exporting countries of the Middle East embargoed the shipment of crude oil to the United States. The energy shortages that followed were the worst the country had experienced since World War II and lent an air of urgency to the quest for alternative energy supplies. Congress was quite willing to finance research that might produce greater national energy independence. Governor Cecil Andrus eagerly promoted the project. Idaho senator Frank Church was at the peak of his political power. He was chair of the Interior Committee's Subcommittee on Water and Power and, along with Idaho Senator James McClure, in a good position to help the project.[7]

Church, whose mother lived in a Boise neighborhood heated by geothermal water, had said, "Oh, we can't let this money go to Los Alamos!" Idaho muscled out other contenders, including other national AEC facilities, for some of the millions available for geothermal funding. The project began in 1974 with a plan to build, operate, and test a five-megawatt pilot plant. The geothermal water would exchange its heat to isobutane, which would drive the turbine. If successful, the project might have broader application elsewhere in the West.[8]

The program quickly attracted workers from various disciplines. Scientists converged in the Raft River Valley like a surgical team over a critical patient. Chemists analyzed the water. Radiologists determined its radioactive qualities. Geophysicists tried to understand the fractured rock below the surface. Seismic experts set up earthquake recorders. Hydrologists monitored the effect of hot water withdrawals on the cool groundwater system. Biologists identified the plant and animal species in the area, making a baseline for future comparisons. The old, old question of the right valve for a new job required engineers to invent a method to shut off the flow of boiling water originating at a thousand feet below the earth's surface. Metallurgists put samples of carbon steel and other metals into a loop of hot water to figure out corrosion rates. Computer programmers simulated the entire pilot plant system to aid with predictions. Even the technology of the fluidized bed moved to Raft River, as chemical engineers tried to keep the hot water from depositing chemical crud in heat exchanger tubes.[9]

The team set up side experiments. Could better drill bits do the job? They tried new ideas. What kind of pipe insulation would best prevent heat loss? They buried some pipe and compared the results with spray-on insulation. If geothermal water were used for irrigation, would salts build up in the soil over time? Someone staked out plots for trees, wheat, oats, potatoes, and beets. How about warm water being used for fish culture? Up went raceways and a fish pond for shrimp, perch, catfish, and tilapia. What went on inside a geothermal well? Special elec-

tronic instruments were snaked down the wells on cables. In short, the standard NRTS multi-disciplinary attack on a problem had a thorough workout.

The environmental monitoring studies at Raft River called for scientists and engineers in new specialties. Much of the talent was youthful, and several of the geothermal recruits were young women who were riding the crest of enthusiasm brought about by the environmental movement—and the crest of confidence brought about by the women's movement. Kunze hired Susan Stiger, a civil engineer with an academic focus on the environment and hydrogeology, to create the environmental program at Raft River. At the time, no models existed for comprehensive characterization of environmental features and their interactions. Once more, NRTS energy research was "all new" for a new generation.[10]

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Old trailers served as field offices and crew quarters at Raft River. Monitoring the performance of wells and fluids sometimes required 24-hour-a-day operation. No one seemed to mind. Kunze recalled another woman he hired:

We needed a geologist to examine cuttings while the well was being drilled. Someone referred me to a lady geologist named Susan Prestwich who lived in Idaho Falls. She had "sat wells" for her family business in Utah. I thought, "Drilling crews are known to be roughnecks. I can't send a woman out there all night to work that well!" But I talked to her, and she said, "Don't worry, I can handle those guys."[11]

And she did. Prestwich was the first female drilling engineer (and geologist) ever hired at the Site. As it had been for hundreds of NRTS male scientists and engineers before her, the chance of discovering something new was motive enough to endure an all-nighter. She continued with Aerojet and EG&G, the new Site contractor in 1976. Her career eventually took her to the Department of Energy in Washington. Stiger continued her career with Bechtel Corporation, returning to the Site in 1999 to manage the entire environmental management program when Bechtel became the contractor.

Kunze and Roger Stoker, the chief geologist for the geothermal project, extended the reach of the project to Boise. Geothermal wells drilled in the 1890s had heated homes in the city's Warm Springs neighborhood for decades, but the question was whether geothermal water might be found elsewhere on the Boise Front faultline. A team including Clay Nichols and Roy Mink from Boise State University selected a site for a test well on Boise

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Above. Inside a geothermally heated greenhouse near Raft River test facility. Left. Raft River Pilot Plant.

City-owned land. The well produced 165°F water at a depth of about a thousand feet. A second well on Bureau of Land Management property nearby likewise found hot water, although slightly deeper. The wells were turned over to the city and the state, which developed systems to heat commercial and state office buildings in and near downtown Boise.[12]

The Raft River Pilot Plant started up in October 1981 and then ran briefly in 1982. Power from the plant went out on the regional electrical grid. It proved that the binary cycle using isobutane could work. For a number of reasons, including the depth of the wells, the system could not compete with the economics of hydropower production in the Pacific Northwest (where the costs of building public power dams are not charged to customers), but in some parts of the world, the system could compete with coal-burning plants that required special pollution controls.[13]

The project ended abruptly in the first half of 1982. After the election of Republican Ronald Reagan in 1980, the project (among many others) became a symbol of the Democratic party's supposed inclination to finance programs more properly in the domain of private enterprise. In addition, the energy supply crisis clearly had ended. Funding for geothermal research was drastically reduced. Frank Church was defeated in the 1980 election, and Raft River lost its most influential supporter.[14]

The IDO informed IDWR that no further funding was available for the project. Neither it nor Raft River Rural Electric pursued a water right, and the informal agreement between IDO and IDWR ended. The Pacific Northwest had entered a period of energy surplus, and neither Idaho Power Company nor BPA desired to buy power from Raft River. The IDO eventually asked the General Services Administration to sell the project, which was done officially on February 8, 1984. Hydra-Co Enterprises acquired the Raft River property and moved the pilot plant to Nevada.[15]

Other alternative energy programs sprouted at the NRTS in the 1970s. Site scientists found themselves involved in industrial energy conservation, the production of alcohol fuel, and solar energy research. They tested batteries for electric vehicles, developed glass and aluminum recovery systems for solid waste programs, and examined the energy potential in biomass production. The Site became the nation's lead laboratory for a hydropower program in which the government loaned funds to utilities and municipalities for small innovative hydropower systems. As a result of this program, Idaho Falls installed a low-head bulb-turbine system in the Snake River to increase its municipal electrical supply. Many of these programs involved commercial clients other than the federal government.[16]

The impact of the new programs helped increase employment levels at the Site, although the major nuclear activities at Argonne, the Naval Reactors Facility, the Test Reactor Area, the Chem Plant, and the LOFT facilities continued as the major NRTS missions. Maintaining a stable but growing employment base at the NRTS was important to the economic vitality of southeast Idaho. All of the national laboratories were diversifying

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Non-nuclear research at the NRTS included vortex studies. Large commercial airlines flew through plumes of smoke while cameras recorded the disturbance.

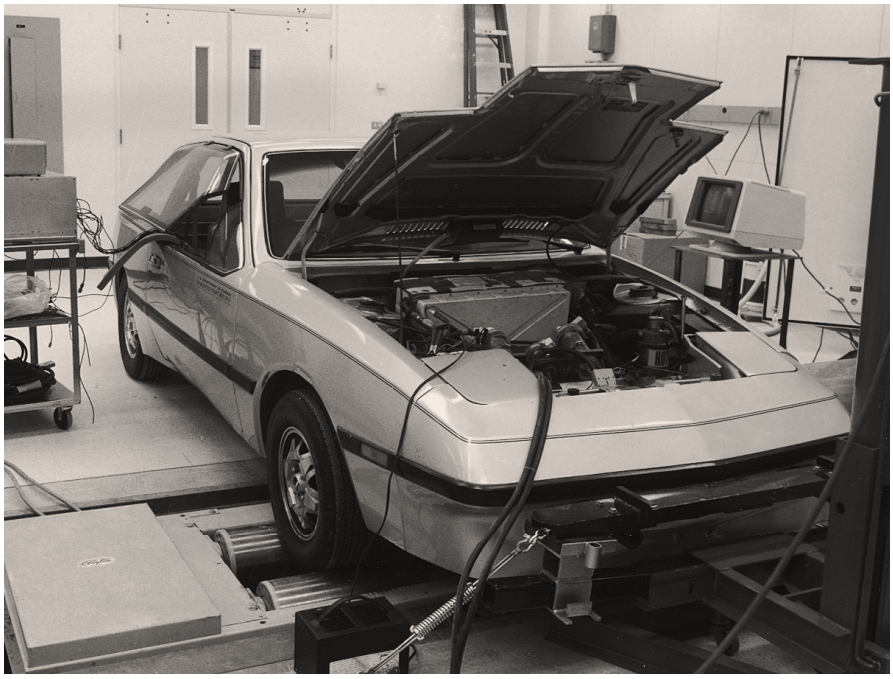
Courtesy of Orval Hansen

Orval Hansen

their missions, so an entrepreneurial approach to competition had to be added to traditional political approaches.

In this connection, a feeling had arisen over the years amongst Site scientists and administrators, members of EINIC, and others that the NRTS had gone far beyond the proof-testing of nuclear reactor concepts. Its nuclear safety engineering research had become a national force; its research in neutron physics, of global importance. The NRTS was a leader in radiation and environmental protection and advanced computer modeling. It was a world-class innovator in instrumentation and, despite Milton Shaw's shift of breeder work to Hanford, in the field of breeder reactors. Now, because of the environmental monitoring and waste management research at the old Burial Ground, the Site was becoming a leader in the technologies of waste management and retrieval.

Below. Advanced battery technology developed at INEL was used in a cooperative research project with the United States Advanced Battery Consortium.



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In short, by the early 1970s the Site had grown out of its role as a "testing station." It was truly a "laboratory." Furthermore, it was long past due for NRTS scientists to push back when people from Headquarters or other AEC "laboratories" slighted their importance from time to time. For example, in annual reports, the AEC didn't identify the NRTS as a laboratory and had no particular category to define the "thing" that was the NRTS. Obviously the NRTS needed a new name. The internal organization of the AEC had always made it hard to compete for funds and attention during a Cold War when military research and weapons production—and the labs that served those needs directly—had such strong champions.[17]

Around 1974, NRTS supporters asked Idaho congressman Orval Hansen to take the lead in getting the AEC commissioners to designate the NRTS as a "national laboratory," a mission he undertook enthusiastically. Elected in 1968, Hansen had gained a seat on the JCAE in 1971. Dixy Lee Ray became the chair of the AEC in 1972, appointed by President Nixon. She made internal reforms of the AEC that made her unpopular with senior members of the JCAE, entrenched interests at the AEC, and the commercial nuclear industry—a trio whose close relationship had sometimes had been referred to as an "iron triangle." Hansen described the name-change mission.

I went directly to Dixy Lee Ray, chairman of the AEC. I proposed that in addition to being designated as a laboratory that the new name include "Idaho" and that it should be known as a "national" laboratory to give it sta-

tus similar to other national laboratories. I firmly believe that Dixy's positive response was due, in large part, to her desire to do a personal favor to me. I had given her total support on the JCAE at a time when some other members of the committee resisted changes she was making in the AEC including those affecting Milt Shaw. She was grateful for my support and we developed a warm and close relationship. She knew that the requested name change would help me politically.

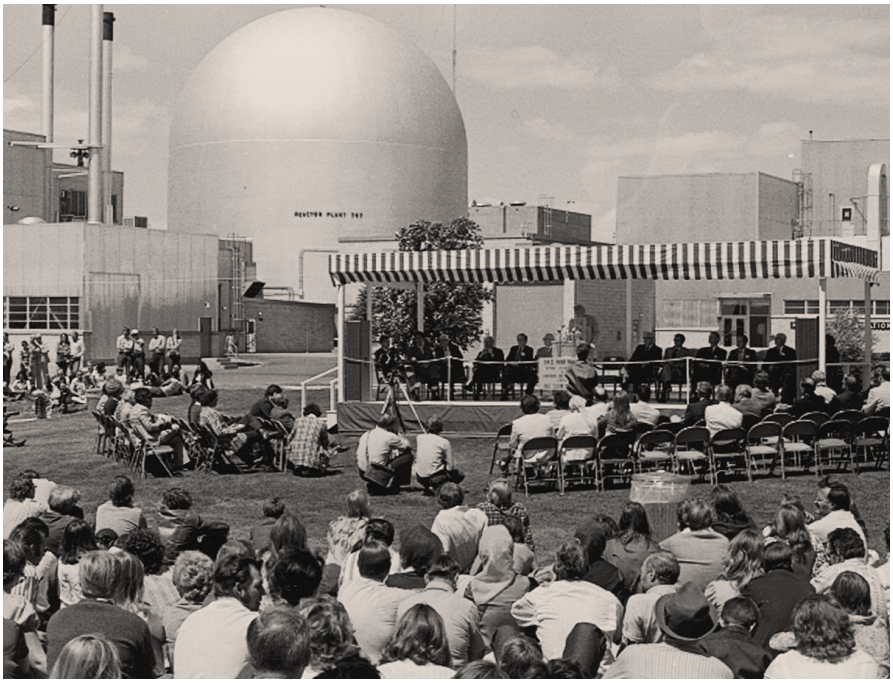
There was resistance to the requested name change. The national laboratories were a kind of club. There was little enthusiasm for the apparent elevation of a more narrowly specialized installation to national laboratory status. I believe that the resistance influenced the name finally selected. I suggested that it be the Idaho National Energy Laboratory which would be more descriptive of its mission. I don't want to leave the impression that politics played the dominant role in the name change. I believe that we had a strong case to make.[18]

Although Hansen didn't feel that "engineering," the adjective finally selected to describe the laboratory, adequately reflected the kind of research, testing, and development of advanced technologies being done in Idaho, he had achieved his main goal: status for the Site as a national laboratory and a name that identified it with its state.

In August 1974, preparations were underway in Idaho to celebrate the tenth anniversary of EBR-II. The plan was to use this occasion, to take place at Argonne West, to announce the new name. Hansen invited Vice President Gerald Ford to do the honor. Ford agreed to come to Idaho, but in early August it became clear that President Nixon had been involved in a criminal cover-up and that his resignation was imminent. Ford canceled his trip to Idaho, but AEC Commissioner William Anders, a former Apollo astronaut, dignified the speakers'dais and pronounced that the NRTS would be known thereafter as the Idaho National Engineering Laboratory (INEL).[19]

Later in the year other name changes occurred in Washington, D.C. By October 1974 the Arab oil embargo had lifted, the crisis in the presidency had passed, and Congress was ready to reform the AEC, separating its developmental and regulatory functions into two agencies. The Energy Reorganization Act of 1974 abolished the AEC and distributed its developmental functions to the Energy Research and Development Administration (ERDA). The bill transferred to ERDAseveral energy programs formerly in the Department of Interior (coal, mining) and the Environmental Protection Agency (automotive systems). The regulatory and licensing function went to a new agency called the Nuclear Regulatory Commission (NRC).

The new agencies went into effect in January 1975. Jimmy Carter became president in 1976. That winter, a shortage of natural gas in the New England states helped shape Carter's view that conservation must become a major element in a national energy plan. Carter promoted further reorganization aiming for a more comprehensive planning approach. Congress created the Department of Energy (DOE) in 1977. James Schlesinger, who earlier had



Argonne National Laboratory-West S5843

AEC Commissioner William Anders announces that the NRTS will be renamed the Idaho National Engineering Laboratory. EBR-II is in the background.

INEEL Cultural Resources

Charles E. Williams

been an AEC commissioner, became the first Secretary of Energy and a member of the president's cabinet.[20]

With these changes, the nation's nuclear enterprise had effectively been shifted from the custody of a powerful congressional committee to the executive branch. The route to political influence became far more diffuse than it had been. Presidential politics became at least as important as congressional politics, and this contributed further to the decline in nuclear research already underway. For example, one of Carter's goals was to eliminate the country's dependence on nuclear energy by the year 2000. Schlesinger organized DOE not by types of fuel (nuclear, fossil, geothermal), but by different processes along a continuum from research through development to commercialization. The organizational chart changed frequently during the 1980s, but the old sheltered autonomy, such as it was, of the AEC/JCAE system was gone for good.[21]

The forces that had changed the nuclear outlook at the national level had gathered their strength from the local political dynamics of the nation's fifty states. Idaho citizens had no commercial power plant upon which to focus their concern about environmental degradation, their fear of nuclear accidents, or their protests to the Cold War arms race. But they did have the INEL.

Leadership at the Idaho governor's office, the IDO, and IDO's prime contractor all changed about the same time. Carter drafted Cecil Andrus, who had won his second term as governor in 1974, as Secretary of the Interior. Lt. Governor John Evans moved into the governor's chair in 1977 and then won his own election as governor in 1978. Charles E. Williams, previously the deputy manager at the Nevada Test Site, succeeded Glenn Bradley as IDO manager in 1976. Aerojet lost its bid to extend its operating contract in 1976, and the new prime contractor was EG&G Idaho.

Evans continued the Andrus campaign to remove nuclear waste from Idaho. At his first opportunity, a public hearing on waste management, he reminded ERDA of its obligations to Idaho. Evans wanted an action schedule and "I respectfully request that this commitment be put in writing." The Idaho Potato Growers and Shippers and many others commended Evans for his stand. The general sentiment was that the sooner the waste was removed from above the aquifer, the better.[22]

DOE canceled its plans to develop a repository in Kansas, setting back any plans it may have had to remove waste from Idaho during the 1970s. Evans responded by turning to the national waste management picture, investing considerable energy in the Nuclear Power Subcommittee of the National Governors Association. The best hope for Idaho to see the last of the waste was to assure that national policy created a better place for it. He felt that Idaho had little legal means of preventing DOE from sending new wastes to Idaho in the interim. But, he said, "I would use the powers of this office to protest in the strongest possible manner. I think that kind of public pressure would stop it."[23]

In November 1979 the INEL monitoring program found a trace of tritium in a water sample taken from the aquifer near the southern INEL boundary. The press covered this news, and explained that it had come from the Chem Plant injection well. The news provoked a public reaction similar to the earlier one about the TRU buried at the Site, and again Senator Frank Church called for an investigation.[24]

By this time, grass roots environmental and peace movements in Idaho had gathered momentum and were strong enough to help build the "public pressure" Evans had invited. The Idaho Conservation League had organized in 1973 and its membership grew quickly throughout the 1970s. Its agenda was broadly aimed at several issues, including wilderness preservation and energy conservation. In response to the news about the injection well, a group of environmentalists and pacifists in Boise organized the Snake River Alliance to work for the closure of the well and an end to the practice of waste injection. The group quickly recruited members, particularly in the Twin Falls area where citizens felt themselves potentially in the direct path of the hazard. Aside from its objection to the well, the Snake River Alliance evinced a mistrust of the DOE and a concern that nuclear fuels could be directed toward weapons production. Other groups such as the Groundwater Alliance based in Ketchum, Idaho, also organized and found common cause with the Snake River Alliance.

These groups held meetings, published newsletters, appeared at hearings, scraped together funds, and learned to make the most of NEPA-mandated public hearings and other opportunities to get their messages to the press, the public, and the politicians.

For the first time since 1949, the finely meshed network of interests protecting and nurturing the INEL was forced to contend with an antagonistic network fighting for different goals. The governor's office, while not a complete dropout from the old network, had to acknowledge the new network and the electorate it represented.

The public was alarmed at INEL's overt and deliberate introduction of a radioactive substance directly into the aquifer. How could this be safe? Evans read their letters and realized that the State had to provide a counterweight to the public's faltering confidence in the INEL. Once more, a governor of Idaho created a special task force of distinguished authorities to investigate the situation at INEL and make recommendations. Once more the IDO conducted tours and answered questions. The IDO reminded the group that it had been sending quarterly and annual monitoring reports to the governor and Idaho's health officers for years. The practice was no secret. Monitoring would continue. Site drinking water was safe. Chem Plant improvements already had reduced the amount of tritium entering the waste stream. The State was welcome to take its own samples.[25]

The task force traveled around the state and heard public comments. In the end, it concluded that "no immediate health hazard exists, and it seems unlikely that a long-term hazard is posed by current disposal practices." It complimented the INEL for its "forthright and helpful" assistance and noted no evidence of a cover-up. The INEL had been cleared once more of taking undue risks with public safety. Nevertheless, the committee recommended that the practice of discharging radioactive liquid wastes through the injection well to the aquifer be discontinued in favor of some other alternative that would somehow prove to be "more acceptable." Public perceptions were important, it said.[26]

The task force advised the governor to do everything possible to prevent this low-level waste from entering the aquifer. Idaho should improve its independent monitoring capability, it said, repeating a suggestion made to Andrus by a previous committee.[27]

The next three years saw the campaign to plug the injection well unfold at several venues. The IDO hired the Fluor Corporation to analyze how the Chem Plant operations might be engineered to end the injection of tritium-contaminated water. The governor gave the Fluor study time to mature and in the meantime protested DOE waste shipments into Idaho. He redoubled his efforts to accelerate the moment when a national storage facility would relieve the state. By this time, DOE had settled on a location in New Mexico for a Waste Isolation Pilot Plant (WIPP), a project replacing the salt mine in Kansas as a potential repository for TRU waste. A date for moving any waste from Idaho had moved into the mid-1980s.

The Snake River Alliance and its associates kept the waste issue alive in their newsletters and meetings. In September 1980 they held a protest rally near EBR-I, calling for an end to the injec-

tion well, an end to shipments from Rocky Flats, and an end to breeder reactors in general. Environmental degradation and the production of weapons were two faces of the same issue. Sam Day, the editor of the *Progressive* and the featured speaker, observed that the breeder reactor, because of its ability to make plutonium, "probably represents the greatest danger beyond nuclear war itself to the future and welfare of humankind." Another speaker asserted that the INEL was "the home and playground" for the U.S. breeder reactor program. The business community in Idaho Falls felt that such comments were "absurd."[28]

As the governor's office waited for the IDO to act on an alternative to the injection well, the relationship between the two offices deteriorated. Idaho wanted more than just to look over an INEL lab technician's shoulder while collecting a water sample. It wanted to examine engineering drawings and specifications, to be notified prior to certain construction projects, to be sent an inventory of every air pollution emission source at the Site, and more. But the IDO manager had conveyed to Evans his view that activity within the boundaries of the Site was "none of the state's business." The editor of the *Post-Register* called for an end to the "spitting match" between the two offices so they could solve the problem together.[29]

Although the Fluor Report had been completed in 1980, the IDO managed to delay for nearly three years a decision on the injection well. The governor's staff characterized the IDO as "stubborn." In May 1983 Charles Williams left the IDO, and DOE appointed Troy Wade to take his place. At last, things began to move faster and with more amity.[30]

On February 9, 1984, Governor John Evans stood near the Chem Plant in his overcoat against the chill weather and diverted a stream of waste water into an evaporation pond. The four-acre pond was sixteen feet deep, its bottom allowing the percolation of water into the soil. Radionuclides would interact with the soil and become trapped just below the pond. The tritium would evaporate into the air with the water. IDO said the project had cost $800,000.[31]

Possibly for the first time, an Idaho governor had been the ceremonial figurehead to dedicate a new project at the Site. The environmental network regarded the closing of the well as a victory for the citizens of Idaho, apparently not concerned with the fact that the tritium would henceforth dilute and undergo radioactive decay in the air instead of underground.

Behind the scenes, the governor had also won another kind of victory. He had signed a Working Agreement with the IDO. It allowed the governor's employees to accompany INEL monitoring technicians on the job. Idaho could split water samples with IDO and perform its own independent analysis. The IDO and the governor reaffirmed their promises not to surprise each other in public. Any press releases about environmental releases or problems would come after both parties had reviewed and signed off on them. The governor's office was now in a position to monitor the Site. The State of Idaho finally had arrived inside the INEL fence.[32]

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DOE-IDOmanager Troy Wade (left) and Governor John Evans open the new evaporation pond at the Chem Plant on February 9, 1984.