the agency from harsh punitive action. Somewhat ironically, Representative John B. Conlan (R–Ariz.), the chief accuser of NSF and often an antagonist of Symington's, also lost his seat in the House after a bitterly fought primary battle for his party's nomination in the Arizona Senate race. So NSF officials doubtless have mixed feelings about the fortunes of politics in the primaries.)

Who will succeed Symington as chairman is not clear, in part because another Science and Technology subcommittee chairmanship is open. Representative Ken Hechler (D–W.Va.), who has headed the subcommittee on energy research, development and demonstration (fossil fuels) also gave up his seat when he ran in the West Virginia gubernatorial primary. He lost to John (Jay) Rockefeller IV, who went on to win the governorship in the general election. Hechler, who was centrally involved in the fight for compensation of miners afflicted with black-lung disease and has been a strong advocate of the prohibition of strip mining, after the reverse in the primary, decided to mount a campaign as a write-in candidate. He came very close—the verdict was delayed for several days—but has been finally counted out.

Part of the uncertainty about subcommittee chairmanships arises from the Science and Technology Committee rules which provide that seniority on the full committee rather than on a subcommittee prevails. This means that a member with sufficient seniority can claim the open chairmanship of a subcommittee other than one on which he serves. But hesitation is also encouraged by questions about the future pattern of congressional authority over energy, particularly about the fate of the Joint Committee on Atomic Energy.

Representative Mike McCormack (D–Wash.) is a member of the JCAE and also chairman of the House Science and Technology Committee's other subcommittee on energy research, development and demonstration dealing with less conventional energy sources. In the event of a demise of the JCAE and reshuffle of authority over energy in Congress, McCormack is an example of those who would want to keep their committee options open until the dust settled.

If all of this seems involuted, it is. But for a legislator, getting the right committee assignment at the right time serves to make life on Capitol Hill more interesting and serves one's political interest at the same time.—JOHN WALSH

TVA Today: Former Reformers in an Era of Expensive Electricity

Since 1973, when fuel prices began their precipitous rise, the country has been caught up in strong currents of debate over the best way to manage its suddenly scarce energy resources. One of the most dramatic chapters in this controversy is taking place in the Tennessee River Valley, where the once-bold Tennessee Valley Authority (TVA), a federal agency created at the height of New Deal reforming zeal, is being accused of being reactionary by today's energy reformers.

"The energy world has turned upside down, and yet it seems to me that TVA is continuing with the same bag of tricks that they started life with," said David Freeman, a nationally known energy expert, to a Nashville audience last February. The statement neatly summarized the views of TVA's critics, who charge that the agency is overbuilding new generating capacity and making a foolhardy commitment to a nuclear future, instead of undertaking serious reforms aimed at using existing generating capacity more efficiently through conservation programs and rate changes.

The TVA, however, is no mean foe; it is a mammoth institution with $6 billion in assets; it is the largest utility in the country; it is a potent political force in the Tennessee Valley. It is committed to using cheap power to promote economic growth, or, as the agency says, "In TVA, electric power is regarded as a tool for economic development." And TVA is justifiably famous for having followed this precept. Beginning in the 1930's at the depths of the Depression, it used cheap electricity to help transform the backward valley into a modern industrial economy. For example, since TVA entered the region, the median income there has risen from 45 to 75 percent that of the national average.

Today, TVA continues to live by this philosophy. It is expanding at the electric utilities' time-honored, historic rate, doubling every 10 years; it wants to preserve its rate structure, which, as in the past, charges higher prices to homeowners than to bulk users, such as industry and government. It argues that its conservation programs, which consist of study and demonstration efforts instead of mass promotion campaigns, are adequate. However, in the view of TVA's would-be reformers, in the valley, in Washington, and in New York, there is a serious question as to whether these policies are adequate in the post-1973 energy era. For, while TVA's rates are still a third lower than the national averages (a resident there in 1975 paid 1.76 cents a kilowatt-hour) they have risen sharply. By valley standards, electricity has become an expensive commodity. In this sense, TVA's problems since the 1973 energy crisis resemble those facing other power suppliers.

The reasons behind TVA's current behavior are rooted in its history. In 1933, the TVA was charged with "planning for the proper use, conservation, and development of the Tennessee River drainage basin and its adjoining territory." TVA started by controlling floods, through building a system of dams, and easing navigation along the steep, turbulent river. As a by-product, TVA produced cheap electricity.

At that time, the country was caught up in a crusade for rural electrification, and the advantages of TVA's cheap power to the poverty-stricken valley were so obvious that TVA obtained an unwritten mandate to proceed with its power generating activities, even though power production was nowhere mentioned in the original TVA legislation. Also TVA lured heavy industry to the valley by offering bulk electric rates that were cheaper than those available to homeowners. The federal government climbed aboard the bandwagon, and located its wartime uranium enrichment facility at Oak Ridge and later an installation at Paducah, Kentucky, because of TVA's bargain bulk rates. In short, the TVA power program grew like Topsy.

Today, although the agency spends $35 million a year, mostly from the federal government, for water resources, fertilizer research, and related activities, the remaining $1.17 billion of the agency's budget goes for its self-financed power program, which has a capacity of

26.7 million kilowatts and serves an area almost the size of Great Britain. One valley observer of TVA since its early days echoes a common view, "Today, TVA is just a big, publicly owned private power company."

But the energy crisis brought down on this unique "power company" a series of crises—just as it did for private investor–owned power companies.

Within weeks of the Arab oil embargo, the prices of coal on national markets tripled and quadrupled. TVA (which was using an average of 718,000 tons of coal per week) believed it was relatively immune to such price swings because of its many long-term supply contracts. But, in the crisis, some suppliers stopped delivering the contracted amounts to TVA and sold their newly precious goods elsewhere at boom prices. Like other utilities, TVA was forced to do a lot of buying on the open market at very high prices. In short, the fossil fuels market had turned inside out, putting power suppliers in a predicament from which neither the TVA, nor many other suppliers, have yet escaped.

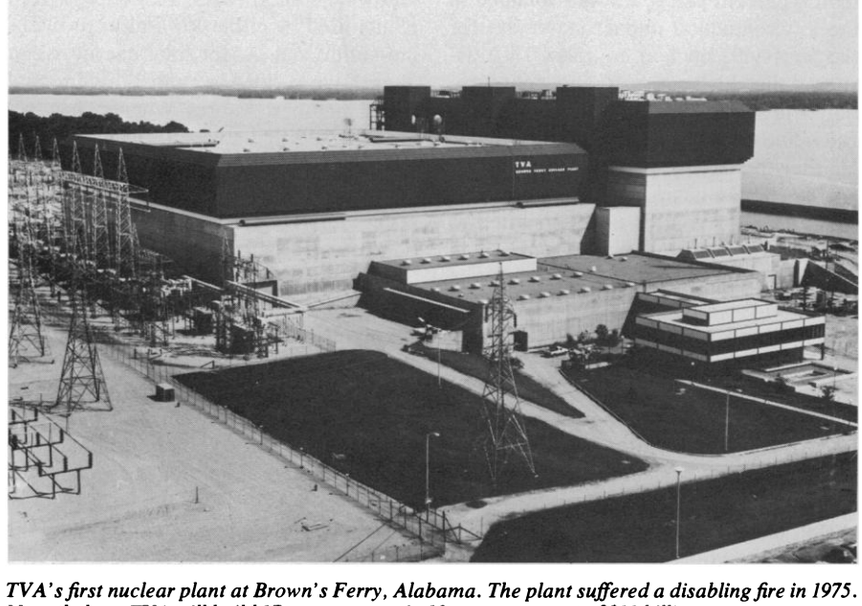
To cover huge new costs, TVA raised its rates (which it can do without prior review by state or federal power commissions). But this caused anger, resentment, and a loud political hullabaloo among valley residents. Not only was TVA at the mercy of its coal suppliers, but the agency whose frequent slogan was "people in partnership" was, for the first time in its history, being hissed, booed, placarded and protested by the very "people" it thought it served best.

In an attempt to stabilize the panicky coal situation, TVA announced it would offer to buy the Peabody Coal Company, which the Federal Trade Commission had ordered to be divested from the Kennecott Corp. Instead of soothing matters, the news brought a new charge—this time of conflict of interest. Should the nation's largest coal purchaser be allowed to acquire the nation's largest coal-supplier? Then, in early 1975, TVA announced: "To meet projected growth in electricity, TVA must complete as much new generating capacity in the next 10 years as it has in the past 40." At the time, according to the Edison Electric Institute (EEI), other electric utilities were canceling or deferring new nuclear plant orders at record rates; the fuel crisis appeared to have reduced the demand for them, as well as the money to buy them with. But TVA announced that 90 percent of its $11.2 billion construction program would go for 17 reactors at seven new sites. And, in view of TVA's sympathy with nuclear power, the agency boasted that the new reactors would be 1200 megawatts, larger than any then in use in the nation, and that the next new power complex, at Hartsville, Tennessee, would have four of these reactors, making it the largest nuclear generating station in the country.

Depression era life in the Tennessee Valley before the arrival of TVA. Frequent flooding caused soil erosion and made farming difficult. Electricity was nonexistent in many homes.

But the effects of TVA's promotion of nuclear power were dampened—at least in public opinion—suddenly on 22 March 1975, when the TVA's one nuclear plant in operation—which the agency had designed itself—suffered the worst fire in nuclear industry history. It turned out to have been started by a workman using a candle, following improper procedures, and working in a poorly designed cable room. The Nuclear Regulatory Commission investigated the Brown's Ferry incident. Meanwhile the Senate Public Works committee prepared to hold, in June, the first TVA oversight hearings it had held in 30-odd years; their purpose was mainly to air the Peabody Coal Co. controversy, but also to allow TVA and its critics a chance to voice their views on the entire range of controversial issues that had by then accumulated.

For, in the course of these upheavals, something else had happened. TVA was forced to explain itself—in environmen-



TVA's first nuclear plant at Brown's Ferry, Alabama. The plant suffered a disabling fire in 1975. Nonetheless, TVA will build 17 new reactors in 10 years at a cost of $11 billion or more.

tal impact statements, in nuclear licensing hearings, at the board-of-directors meetings that were finally opened to the public as a result of a press campaign in early 1975. Whereas other federal agencies (particularly "good-guy agencies" whose missions are to serve the public) have become accustomed to the need for conducting their business openly, this appears to have been a new experience for the TVA. As a result, although for years TVA's actions have gone unquestioned in Washington and in the valley, a debate has developed, between TVA and its critics, on whether a doubling of capacity is needed, on the wisdom of nuclear power and TVA's support of the breeder reactor, and on conservation and rate reforms.

The need to double capacity in 10 years. As EEI's data on new power plant cancellations and deferrals show, the nation's utilities, since 1974, have been slowing their plans for expansion, and the slowdown continues into 1976. It seems obvious that the higher costs of power have caused once-assured forecasts of future demand for electricity to be tossed aside. An electric utility engineer's nightmare is that he will build expensive new generating plants that no one will use—but that he'll have to pay for; a contrasting nightmare is that he won't build enough new plants—and some December afternoon, while factories, businesses and schools are purring with activity, a number of homeowners will switch on lights and electric heaters, demanding more "peak" power than the system can supply.

TVA economists are forecasting that demand for TVA power will rise about as fast as it always has, and that "peak" demand will grow even faster—more than 6 percent per year. As explained in the environmental impact statement for the Hartsville nuclear complex TVA assumes that higher prices and conservation will lessen this growth in demand. But almost offsetting this trend will be another trend—the "substitution effect" —when homeowners and businesses that formerly used coal or oil fuel switch to electricity. But the decisive factor in TVA's forecasts is secret: Industry's unannounced plans, supposedly revealed in private talks with TVA, to move into the area. Publicly, TVA argues that the price of energy elsewhere in the country will make energy-intensive industries, attracted by TVA's relatively cheap rates, move into the valley in record numbers. In sum, TVA seems to be saying that the valley's industrial growth will be little different from that of the past.

But in other quarters, there are questions about whether the scenic valley area should go on industrializing at the frantic pace of the last 40 years. Advocates of no growth, or slow growth, have criticized TVA's expansion plans; they get something of an audience in the valley because their ideas play on the regional schizophrenia about whether the New South should become like New York. Says John Seigenthaler, publisher of the liberal Nashville *Tennessean*, "The South has always wanted to have it both ways. It has thought it could have the industry and prosperity of the North, but still preserve a slower, more balanced, more agrarian style of life."

Freeman, in his Nashville speech, raised a more specific criticism. The energy intensive industries (metals, chemicals, pulp and paper, and others)

> . . . are capital intensive, not labor intensive. . . . If you look at the facts on the number of jobs per dollar of investment in the industries the TVA power attracts to the region, it is about one job for every $30,000 to $35,000 of investment. For the nation as a whole, employment is roughly about double that. . . .

In other words, he was saying that, if prosperity in the form of jobs is the valley's true economic goal, then perhaps TVA should not be encouraging these industries to move there in the first place.

A nuclear future. TVA argues that to meet projected future demand, coal-fired plants will be too expensive because of fuel prices and the costs of pollution controls. TVA's arguments for nuclear power are mainly economic. The Hartsville environmental impact statement declares that energy from the nuclear complex will be approximately 3 mills per killowatt-hour cheaper than energy from plants fired by either low-sulfur or medium-sulfur coal. As for solar energy, as an alternative, TVA's most influential board member, Aubrey Wagner, has frequently said that solar power will not be available before the year 2000 or another century.

On another level, TVA's nuclear boosterism is emotional. TVA has actively supported the U.S. atomic energy effort ever since it became involved in supplying cheap power to Oak Ridge, Paducah, and to the breeder reactor program at Clinch River. In fact, the federal civilian nuclear program and the TVA were born of a common rationale, to assure a steady supply of cheap electricity.

There is, therefore, a certain logic to TVA, in its vast nuclear building program, becoming the nation's testing ground for the ultimate success or failure of nuclear power. As one Knoxville newspaper editor said

> We in this region grew up with nuclear energy and we're proud of what it did to serve the country during the War and afterwards. I guess we don't have the same fears about it that other people have. . . . It's just not that big a deal.

But valley environmentalists are trying to weaken these old ties and question TVA's economic justifications for nuclear power. In hearings, some of them have noted that it is curious that TVA's neighbor to the north, the American Electric Power Company (AEP), has come to the opposite economic conclusion. The AEP enjoys many of TVA's advantages of scale, yet it has announced that, because of its closeness to Appalachian coal, it can build new coal-fired plants more cheaply than it could build nuclear plants. AEP says it will eschew building new nuclear plants altogether in the future.

A critic with some national perspective is Charles Komanoff, of the Council of Economic Priorities, a private, nonprofit group in New York. Komanoff has finished a major study of the economics of coal power and nuclear power and has examined TVA's statements on the subject for the Hartsville complex. He says that TVA's expectations for its nuclear powered plants are "absurdly optimistic." For example, at Hartsville, TVA assumes that the reactors will have a 70 to 80 percent capacity factor (percent of time in operation). By comparison, because of the fire, the Brown's Ferry plant, in 1975, had a capacity factor of 14 percent. Based on his analysis of all U.S. reactors, Komanoff says, "I would say a more realistic assumption for these big reactors would be to assume a capacity factor of 50 to 60 percent." Komanoff's own calculations show that power from 1200-megawatt reactors of the type that TVA plans to build will be 27 percent more expensive than power from low sulfur coal plants and 17 percent more expensive than power from medium sulfur coal plants equipped with scrubbers to limit pollution.

TVA's critics have raised the safety issue also since the Brown's Ferry fire. Nuclear advocates cite the fire as evidence of how safe nuclear plants can be because the manual emergency control systems all functioned, and no radiation escaped from the plant. But critics cite the regulatory commission's report on the fire, which charges TVA with inept fire fighting along with errors in the design of the plant.

A telling detail noted, for example, is that the local Athens fire department's

hoses could not connect with emergency water pipes at the plant.

Finally, TVA's critics ask whether the agency's commitment to the breeder reactor is too partisan and propagandistic for an agency charged with looking after the resources and the people of the valley. The TVA is supplying power to the Clinch River project at rates far lower than those local residents have to pay. TVA is the leader among a consortium of 270 utilities that are participating in nuclear power development activities—part of the Energy Research and Development Administration's plans to familiarize the power companies with breeder design. Finally, when the breeder is constructed, which its advocates say will be in 1986, TVA will distribute its power. TVA officials tend to be breeder advocates. Wagner, for example, has often been quoted as saying that the breeder must not be delayed. What all this ignores, say the critics of TVA, is that the breeder is one of the most hotly contested federal energy programs. They say the government has been spending lavishly on the breeder, drawing vitally needed energy research money away from work on solar, geothermal, heat storage, and other promising technologies. The critics just wonder whether TVA has any business injecting itself into this debate, and have urged TVA itself to put more emphasis on alternative technologies such as solar power, methods of electrical storage, and waste heat utilization.

Rate reform. TVA argues that demand for power will go up despite conservation efforts, and that its proposed nuclear power plants will therefore be needed. TVA's critics counter that, if the agency would use its existing generating plants more efficiently, all this new ca-

New Medical Admission Test Unveiled After 5 Years of R & D

The 30-year-old MCAT (Medical College Admission Test) is being cast aside for a new, modernized, longer MCAT, 5 years in the development, that will be administered for the first time next spring.

The Association of American Medical Colleges (AAMC), sponsor of the test, says the old MCAT has become obsolete, and a new one is needed to keep abreast of scientific advances, to adapt to the increasing flexibility in medical school curricula, and to better test "the ability to confront and solve the kinds of problems that face the physician" these days.

The test was developed at a cost of $1 million by the American Institutes for Research in the Behavioral Sciences of Palo Alto, California, which spent 2 years developing specifications in consultation with medical schools, premed faculties, doctors, and students; and 3 years developing the actual test.

The new MCAT will take 6 hours to complete—twice as long as the old one. The number of items has been increased from 221 to 363. The new MCAT, which reflects recent refinements in testing procedures, is far more sophisticated than the old one. Although it does not require more knowledge on the part of the student, it will test a much greater array of skills relating to ability to assimilate knowledge, to perceive relevance, consistency, accuracy, and objectivity, and to recognize relationships and trends.

The science section of the old MCAT has been broken into two parts—science knowledge, and science problems. The latter is more a test of ability than knowledge and contains new kinds of questions.

One sample question, for instance, describes ways in which drug resistance may be acquired by a fungal cell and outlines what happened when a neomycin-resistant strain of fungus was cultured. There follow three multiple-choice questions containing further hypothetical elaborations of the phenomenon which require the student to extrapolate from the data. This is certainly a far cry from the old-style "A carbonium atom is . . ." (select the answer from four possibilities).

The verbal portion of the test has been expanded from 20 to 90 minutes. Instead of simple vocabulary and analog questions ("hoof is to cow what paw is to . . .?"), the test contains short essays followed by statements the student is required to relate to the information by deciding whether they support it, contradict it, or neither.

The "quantitative" section of the old MCAT required the ability to solve simple mathematical, algebra, and geometry problems, and read charts and graphs. The new quantitative section puts these concepts in contexts that require additional analytical skills. The idea, says an AAMC official, is to test "the ability of medical school applicants to analyze and evaluate information in much the same way that a physician in practice might diagnose a medical problem." A chart, for example, must not only be understood, but conclusions must be extrapolated from it.

AAMC officials emphasize that the test is not designed to weed out those unsuitable for medical education but to give admissions officers a finer tool for evaluating a student in light of his or her experience and professional goals. Now that medical students can no longer be expected to learn "everything," the trend is toward much more individualized curricula.

The new test leaves out the old MCAT's section on "general knowledge." Officials found that this factor had a very low priority among the other factors influencing selection; also, they said, medical students are coming from such diverse cultural backgrounds that it is impossible to devise a standard measure for general knowledge.

The test is now being evaluated at 20 medical schools, and continuing evaluation studies "will be directed at identifying as precisely as possible the constraints that should be placed on the use of the scores reported," says James Erdmann, director of AAMC's Division of Educational Measurement and Research.

Measuring the Medical Personality?

Meanwhile, says Erdmann, AAMC is taking a look at the possibility of developing a test that goes beyond measuring achievement and cognitive skills—to measuring the "personal qualities" that make for a good doctor. Erdmann says the development of this test would rely on the study of practicing clinicians to "identify clusters of behaviors" that correlate with success in treating patients, that is, relating to them nicely, diagnosing them correctly, instilling confidence, and persuading them to follow treatment regimens. Translating all this into a test would involve quantification of such things as the relationship of a doctor's biographical characteristics to the stability of his or her personal qualities. That test, obviously, is still down the road.—C.H.

pacity would not be needed. The Federal Energy Administration, represented by Craig R. Johnson, has publicly chided the TVA for not cooperating with FEA on rate reform projects that might use capacity more efficiently. At hearings in Chattanooga last June, Johnson specifically urged TVA to try peak-hour pricing, also known as time-of-day pricing, to make electricity more expensive during peak times and to discourage use. (This is being tried by the Long Island Lighting Company on a limited number of its biggest, bulk users of power). Later to *Science*, FEA officials explained why time-of-day pricing would mean less new construction.

> Nationally, we estimate time-of-day pricing can reduce the capacity additional needs by about 25 percent. If TVA is planning to build an added 28 million kilowatts of capacity, we would estimate that time-of-day pricing and other load management efforts could reduce that to 21 million kilowatts.

Another proposal in the valley—and one that is being tried by Pacific Gas and Electric Co. in California—is to reverse the old formula by which residents are charged the highest rates and, instead, offer the smallest users of electricity—presumably poor residents—a special "lifeline" rate that would be far lower than the normal residential rate, up to a certain level of use. In short, TVA's critics would like to see the old rate structure overhauled, or at the very least, some working experimentation with alternative rate structures.

TVA has resisted these suggestions. Instead of joining an FEA demonstration project, TVA decided to participate in a study of alternatives conducted by a business group that had already written TVA's environmental impact statement on rates and rejected all proposed alternate reforms. The impact statement argues TVA's side eloquently. Peak-hour pricing, it says, would mean "meters would have to be installed for the 2.1 million residential customers" TVA serves at a cost of $200 million with "questionable" benefit. As for "lifeline" rates for the poor, it said

> The fact that underprivileged or other socially handicapped citizens have income problems . . . with which society should deal cannot be contested, but manipulating utility rate structures is probably not the best way to solve such problems. . . .
> The lifeline proposal would require the utility to assume the role of a welfare agency. . . . This is a role which electric utilities are generally not equipped to perform.

In general, TVA argues that its rates now correctly reflect the cost of providing different kinds of electrical services. It costs more to provide power to residents; therefore, TVA says, residents should pay more. Finally, the statement rejects all rate reforms because

> as a practical matter, the overall effect of changes in rates and rate structures on the environment and the quality of human life is remote and impossible to trace with any accuracy.

Conservation. Since the energy crisis, conservation has emerged as the most promising means, in the view of reformers, to reduce energy consumption and the need for new capacity. But TVA's stance seems far less radical. TVA literature gives play to conservation, and TVA spokesmen note that, in 1975, the agency demonstrated the merits of various conservation efforts—such as insulation—in 80 homes in the valley and plans to expand that to approximately 1000 homes in the coming year. But one of TVA's critics on conservation matters, Neil McBride, a public interest lawyer with the East Tennessee Research Corporation, notes that TVA's conservation programs lag behind those promulgated by the FEA, a sister agency, and those instituted elsewhere in the country. As for the 80 homes, McBride says, "We already know that insulation can lower heating bills. TVA ought to be promoting the most efficient way to insulate the 2.1 million homes it serves." In 1975, according to TVA testimony before the Senate, the agency spent $1.5 million on conservation.

Pollution. TVA has been in the forefront of the utilities' long-standing fight with the Environmental Protection Agency (EPA) over whether they should be forced to install scrubbers in the stacks of plants that burn medium sulfur coal. Scrubbers are estimated to raise the cost of new plant construction by 15 percent; nonetheless EPA has required they be installed to abate airborne pollution from sulfur dioxide and sulfates.

The conflict between being a government agency, and, at the same time, a big, power company is apparent on pollution issues. As a federal agency, TVA is urged by environmentalists to go along with federal rules on scrubbers, strip mine land reclamation, and other subjects. By contrast, as a power supplier, TVA, like many other utilities, fights such things tooth and nail. In fact, TVA is alleged to have maintained that adequate scrubber technology did not exist as late as 1975, when in fact, at that time, several Japanese and at least one American firm were employing scrubbers successfully. The land reclamation rules written into TVA coal purchase contracts are accused by environmentalists of being too weak. TVA is the country's largest purchaser of strip-mined coal.

The answer to why, in the post-1973 energy crisis world, the TVA is not living up to the reformist reputation it established for itself during the Great Depression, seems elusive. One common theory is that, since TVA entered the region 43 years ago as a foreign, allegedly socialist force, it has cultivated ties with major opinion leaders in the seven-state region. Today it has good relations with most organized labor unions (despite some disputes with mineworkers and the construction trades). This may help explain its championship of nuclear power because, nationally, organized labor has supported nuclear power plants and has sometimes fought bitterly against critics.

TVA and the Establishment

Likewise, TVA is close to the region's business community through myriad groups, such as the Tennessee River Valley Association, a group of businessmen and newspaper editors who lobbied the NRC to reopen Brown's Ferry after the fire. Such friendships may explain TVA's dedication to economic expansion, which has been worshipped by the New South's business community in the last 40 years. At the very least, these friendships mean that, were the TVA to suddenly announce massive conservation plans and the coming of a slow-growth economy to the region, significant powerful elements of the valley would be deeply opposed.

Nationally, TVA has not been heard from much during the debates that have raged in Washington over national energy policy; nor is its example cited in the energy literature. Says one former employee, "The management there has become very inward looking. They have little to do with other utilities or with federal policymaking."

TVA's situation is almost the reverse of what it was four decades ago, when amid cries of "Socialist" and "Yankee" it began trying to help the poor people there build more prosperous lives. TVA's friends today are the establishment: business, labor, state government. Its newest foes are the "socially handicapped": the poor people, the antiestablishment advocates of public interest, and environmentalists.

But then, in the energy world today many things do seem to be upside down or inside out. There is some question as to whether the TVA is providing the sort of model it should for national energy policy.—DEBORAH SHAPLEY