The fundamental problem, Taylor says, is that these companies do not make enough profits, or as he put it, they do not earn enough to pay out a "competitive" rate of return. He thinks an absolute minimum rate of return today should be 16 percent—not the 12 percent most utilities aim for, but fail to achieve. Because the utilities are not paying high rates of return, they are not attracting enough investors. "Couple that with a fairly ravenous appetite for new capital, and you have a problem," Taylor says.

One straightforward solution would be for the utilities to raise prices. They have been trying to do that, but local commissions that control rates have not kept up with the utilities' demands. According to the Edison Electric Institute (EEI), the association of investor-owned companies, utilities asked for increases amounting to $797 million in 1970 and got $533 million—roughly two-thirds of what they wanted. Ten years later, they asked for $8.4 billion and got only $4 billion—less than half of what they sought. Rate commissions will probably continue to be tight-fisted in the 1980's, Taylor thinks, even though they may strangle the companies they regulate. The public is not in a mood to accept large rate increases, and will vote out of office commissioners seen as too generous to the utilities.

> "It just doesn't make sense to keep on building more and more plants ad nauseam," Taylor thinks.

Many companies ignored the public's attitude in the 1970's. They tried to finance growth as usual by borrowing money and using new accounting techniques to give balance sheets a healthier look. The results are reflected in two figures recently calculated by EEI, one dealing with debt and the other with accounting. A healthy company obviously takes in more income than it pays out in interest, and as a rule a company selling long-term bonds must earn at least twice what it pays in interest. The electric utility industry began the decade earning three times what it owed in interest. Now the industry is slipping again toward the low point it hit in the recession of 1974, when it earned only 2.4 times what was owed.

Meanwhile, an accounting gimmick called Allowance for Equity Funds Used During Construction (AFUDC) has become enormously popular. It allows a company to count as current income cash which will not be available until later when a plant has been completed and begins producing a marketable product. AFUDC is a bookkeeping fiction, "funny money," as one industry critic calls it. It is safe to use the gimmick, provided the equipment it pays for is built and brings in the promised cash. It is not safe if the plant is canceled, for then the utility must pay off its construction debts without being able to use the new plant as an income producer. According to EEI, the volume of AFUDC funds in industry accounts has doubled since 1970. In fact, more than half the total earnings of the electric utility industry are now AFUDC speculative dollars. Furthermore, if AFUDC dollars are eliminated from the accounts, the industry is just barely earning enough to pay twice its interest costs each year.

"They are buying electric plants on a Master Charge account," says Amory Lovins, the British representative of Friends of the Earth and a tenacious critic of the industry. Somebody will have to pay for the equipment bought on credit, and it will be difficult to charge the bill to customers if the plants prove to be unneeded. Lovins and others point out that this is the great flaw of AFUDC: it allows the account books to reflect a demand and a willingness to pay for electricity which may not exist in reality.

On average, the nation already has a surplus electric generating capacity of about 35 percent, with regional reserve capacities this winter ranging from a low of 22 percent in the West to a high of over 50 percent in the South. Because the utilities have consistently overestimated demand for power in the last 6 years, a number of analysts are suggesting that it may be time for a pause in construction. Financial and regulatory constraints have already put a damper on new projects. According to a Government Accounting Office (GAO) report issued on 8 December, 184 large generating units (over 250 megawatts) were canceled between 1974 and 1978. The GAO also found that most projects have been delayed, and that the length of the average delay has grown since 1974 from 14 to 23 months. More cutbacks may be coming.

The slowdown is desirable—according to Taylor of Standard & Poor's—if the public really is determined to forbid higher electric rates. For "if you can't earn a reasonable rate of return on investment, why continue to invest? It just doesn't make sense to keep on building

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Briefing

Carter Team Departs with Words of Warning

A doomsday clarion sounded in Washington this January, played with suitable dolor by members of the departing Carter Administration. The President led the event with his farewell address, speaking of our potential to create "a World War II every second" with nuclear weapons and of the "shadows that fall across our future" because we are running out of basic resources. Carter asked Americans to learn restraint and try to see domestic problems in terms of the "essential unity of our species and our planet."

Gus Speth, chairman of the Council on Environmental Quality (CEQ), got into the specifics the same day, 14 January, by releasing a report titled *Global Future: Time to Act.* Written jointly by the State Department and the CEQ, the 242-page document serves as an activist's antidote to an earlier work by the same authors, *The Global 2000 Report to the President* (see *Science*, 1 August 1980, p. 575), which forecast a future of scarcity. Both papers paint a grim 21st century, mired in poverty and pollution, except that the new paper offers dozens of suggestions for avoiding the misery it foretells.

The study was commissioned by the President last July and drew upon the work of planners in 19 federal agencies. It is a handbook for improving the world, and like all general manifestos of the kind, it is often bland. Major concerns are scattered everywhere, along with growing threats and essential needs. Nevertheless, the paper convincingly argues that, quite apart from moral duty, America's self-interest should impel us to do all that is possible to check the growth of the world's population and its appetite for resources.

Speth was asked to pick out the most important recommendation in the packet. His favorite, he told reporters, is the one that asks the federal government to create a new office in the White House whose sole task would be to worry about global resource and population problems, help the President write an annual message on the subject, and see to it that federal powers are used to attack

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these problems. The office, Speth thinks, would employ about 30 people. They would work in conjunction with a larger, quasi-public institute established to collect and analyze data on global trends.

The idea of putting a new caution-preaching office in the White House is not likely to go over well with the Reagan Administration. On the contrary, the new President seems ready to embark on a course of sharpened competition with the rest of the world. Self-assertion and growth, not restraint and accommodation, are the bywords of the new government.

The *Global Future* report argues, however, that the problems it foresees are unavoidable, and that it is in the nation's interest to grapple with them sooner rather than later. It will not be sufficient to compete more aggressively for the world's wealth, the report concludes, for if every nation follows that course, all will be impoverished more rapidly. The United States should lead the way toward "sustainable" economic development, the CEQ says, by aiding foreign governments in breaking cycles of poverty and resource depletion.

The most pressing issue is population growth. Between now and the year 2000, the world's population will grow from 4.5 billion to more than 6 billion, an increase in two decades almost equal to the entire human population of 1930. Ninety percent of the growth will be in poor countries. As conditions become more desperate, there will be a greater likelihood of war or economic chaos—both of which will affect America's welfare. The United States should begin to relieve the pressures now, the report suggests, by doubling the amount of money spent on international aid to family planning (demands for aid now outstrip funds for the first time), paying for new research on contraceptives, and developing a "population policy."

America also should take the lead in providing developmental economic aid, the report says. As nations climb above the poverty level, it is argued, they will be more able to master their own resource shortages. (America now ranks 15th among the donor countries in terms of aid given as a fraction of gross national product.) International cooperation is needed to prevent further destruction of croplands, to develop renewable energy supplies in poor countries (chiefly fuel-wood forests); to maintain the world's diminishing tropical forests (40 percent of those remaining may disappear by 2000); conserve endangered species (15 percent of those extant could be gone by 2000); allocate contested fresh water supplies; and, finally, to restrain the burning of fossil fuels—the chief source of carbon dioxide released in the atmosphere, a threat to the global climate.

For what these proposals are meant to accomplish, Speth says, they are cheap: only $1.5 billion a year.

By Flood, if Not by Fire, CEQ Says

In another warning, the Council on Environmental Quality (CEQ) issued a special paper on 13 January, focusing exclusively on the recent accumulation of carbon dioxide (CO_2) in the atmosphere. The report, *Global Energy Futures and the Carbon Dioxide Problem*, backs the hypothesis which says that marked increases in CO_2 concentrations observed in the last 180 years have probably been produced by increased use of fossil fuel. Unless the rate of CO_2 production is slowed, the paper finds, the gas will create a significant problem for the world in the 21st century. Radiated heat from the surface of the earth will be trapped by the atmosphere, leading to warmer temperatures, altered wind and rain patterns around the globe, and higher ocean levels.

If fossil fuel burning continues without increase at its present rate, the CO_2 concentration in the atmosphere will reach a point equal to twice the preindustrial (1800) level by the year 2175. But if fossil fuel use is allowed to increase at the 1940 to 1973 average rate of 4 percent a year, the doubling of CO_2 will occur in 2025. The faster the waste gas collects, the more severe will be the climatic impacts.

Because the expected increases in CO_2 concentration are "unprecedented in the modern history of climate," the report says, there is no way to be certain what the effects will be, but temperatures will probably rise gradually, the impact being felt a decade or two after the CO_2 has caused a change. The most striking forecast in this report is that the doubling of CO_2 in the atmosphere could cause the disintegration of the West Antarctic ice sheet and raise the sea level by 5 to 8 meters. The flood tides, it is estimated, would cover the present dwellings of 11 million Americans.

This and other potential dangers lead the CEQ to recommend that "the United States should strive here and abroad to keep open a variety of energy options and not become committed to an extended period of unrestricted fossil fuel use." In addition, the CEQ plugs for more research on the effects of CO_2 on climate and urges the federal government to consider lobbying for an international goal of keeping the CO_2 concentration at less than twice the preindustrial level.

EPA to Investigate Tree Smog

Ronald Reagan is not the only person concerned about pollution by trees. Last December the Environmental Protection Agency (EPA) announced that it had awarded a 2-year contract worth $114,000 to a company that proposes to find out how much trees contribute to city smog.

One of the scientists who will work on the project, Alan Lloyd of the Environmental Research and Technology Corporation in California, says that the EPA has been kicking the question around for 3 or 4 years.

Executives from some industries affected by the EPA's rules controlling photochemical smog (ozone) have been trying to get the agency to look into tree emissions, for they argue that industry should not be held to a higher standard of purity than nature. Because oaks and pines are known to emit certain hydrocarbons (isoprene and alpha pinene), it's been suggested that city smog is not entirely man-made, but partly a natural phenomenon.

Lloyd's task will be to produce a model of nature's chemistry to be used in combination with auto emission models and weather models to come up with an estimate of the amount of blame to be assigned to trees.

Eliot Marshall