funding, which many British scientists feared threatened the status of the councils (*Science*, 5 November 1971). As a result of recommendations by Lord Rothschild, head of a think tank in the Cabinet Office (which provides staff support for the Cabinet), control over portions of research money was transferred from the research councils to relevant ministries. More palpable, practical results from research were the objective and a "customer-contractor" nexus the method recommended.

The portion of the budget to be transferred totaled 40 percent, and this ranged from a high of 57 percent of the budget of the Agricultural Research Council to virtually nothing in the case of the Science Research Council, which funds most basic research in the physical sciences. This is the middle year of a 3-year transition period, and few traumas seem to have occurred; civil servants and professors have apparently negotiated equably.

To a visitor, the scientific community's reaction to the budget actions seems stoic. One reason may be that the cuts have not yet really been felt. But there is also a widespread acknowledgment that Britain faces a very serious economic situation symptomized by "stagflation" and balance of payments problems. There is a feeling that science and higher education enjoyed a golden era—in more than one sense—in the late 1950's and the 1960's and that lately things have been going wrong. At some universities, notably Essex and Oxford, there are unsettled and genuinely unsettling conflicts over student rights or university discipline,

Low Marks for AEC's Breeder Reactor Study

The federal Environmental Protection Agency has given a failing grade of "inadequate" to the Atomic Energy Commission's year-long, $2-million attempt to assess the environmental effects of a commercial breeder reactor technology. In a summary prefacing its 94-page critique of the AEC's draft statement, the EPA said that so much work would be required to correct all the flaws and fill all the omissions that the AEC would be well advised to ask for a delay in the 14 June deadline set by a federal appeals court for the impact statement's final version.

The National Environmental Policy Act requires federal agencies to assess the environmental and economic costs and benefits of major regulations and programs. These assessments are subject to review by the EPA and other agencies as well as by the public. The AEC's first attempt to satisfy the requirements of the law was rejected as inadequate by the appeals court last year. In March, the AEC released a draft of its second attempt, a massive five-volume tome some 2200 pages long (*Science* 29 March). In this document, as in the first, the AEC concluded that plutonium-fueled breeder reactors could supply a large portion of the nation's electric power by the year 2000, without adverse effects on the environment and with a saving of billions of dollars over the cost of other technologies.

The EPA, in its critique, said it had not tried to render a "final judgment" on these claims. At the same time, the EPA said the AEC's new statement "does not support these conclusions." The environmental agency gave the AEC report its lowest rating, a 3, signifying that the analysis was in need of "substantial revision."

In several ways, the EPA's detailed criticisms closely paralleled those of leading environmental groups, notably the Natural Resources Defense Council and the Scientists' Institute for Public Information, both of which produced lengthy critiques of their own.

Among its major points, the EPA said that the AEC provided vague and mostly qualitative indications of its approach to major problems of reactor safety; that it provided no assurance that plutonium fuel could be protected from theft at an acceptable cost; and that the volume of wastes produced by large numbers of breeders may have been underestimated.

Most of the EPA's criticism, however, centered on the commission's optimistic analysis of the breeder's economic costs and benefits. The EPA points to half a dozen technical flaws or omissions, all of which have the effect of either inflating the projected benefits or minimizing the costs.

In several instances, for example, the AEC seemed to count some benefits twice—including $67 billion that the AEC believes the breeder would save in capital investment that would otherwise go for uranium production and enrichment. At the same time, the EPA said, the AEC had neglected to add into the cost column the $1 billion that private industry is expected to spend on breeder R & D.

Another irregularity concerns the AEC's choice of "discount rate" in its cost-benefit analysis. This is a measure of the cost of diverting money from other projects. In long-term efforts like the breeder program, the total amount of benefits projected is highly sensitive to the discount rate chosen.

For its purposes, the AEC used a rate of 7.5 percent, even though the White House Office of Management and Budget requires the use of a 10 percent rate (except in special cases, none of which, the EPA notes, apply to the breeder).

The EPA observes that the AEC's own analysis—with the higher rate plugged in, but without correcting for "double-counted" benefits and other flaws—shows that the breeder's economic benefits outweigh its costs by only 8.2 percent, a margin the EPA calls "only slightly favorable."

The EPA also concluded that the AEC's own analysis supported the view that deferring the start of the breeder economy "would not be intolerably costly," if such a delay were necessary to solve environmental problems or to explore alternative technologies more fully.

Many of these conclusions were stated in much less diplomatic language in a draft version of the critique, EPA officials acknowledged. The sharp phrasing was deleted, one official said, because "If you're going to nail somebody, it's better to do it with logic, not rhetoric."

—ROBERT GILLETTE