study team on robotics has already presented a strategy paper to the group which is expected to result in investments within the next few months. The group also has plans for investing in biotechnology in areas not covered by Celltech, the company set up by the board last year.

As yet the group does not know precisely how much public money it will have to spend. The precise structure of the new organization should become clearer in September.

Judy Redfearn

Tidal energy

The big dam

The economic feasibility of a tidal barrage for generating electricity across the Severn estuary in south-west England will depend on how many nuclear power stations are attached to the national grid. In most circumstances, however, a barrage would be a good investment, according to a report by the Severn Barrage Committee published last week. The committee, set up in 1978 under Sir Hermann Bondi, then chief scientist at the Department of Energy, and whose deliberations have cost £2.3 million, has also concluded that a barrage is technically feasible but has called for detailed studies of its potential environmental, industrial and social impact.

The outlook for a barrage across the Severn estuary, which has one of the greatest tidal ranges in the world, has improved considerably in the past two years, according to the committee. Approximately 40 per cent more energy should be obtainable from an inner barrage, the scheme favoured by the committee, than was originally thought. And electricity generation should be possible nine rather than 16 years after the start of construction.

The committee estimates that the most cost-effective scheme would cost about £5,600 million and would generate 13 TWh a year from an installed capacity of 7,200 MW. That scheme is for an inner barrage from Brean Down to Lavernock Point consisting of large prefabricated concrete units housing turbines and sluices. A more ambitious barrage built further out to sea, costing £8,900 million and generating 20 TWh from 12,000 MW capacity, would be less economic and involve greater risk during construction. The inner barrage scheme, on which the committee has based most of its calculations, has the added advantage that a second barrage could be added at a later stage. The two together would provide as much energy as the outer barrage at a similar overall cost.

Because of the variability in tidal energy, a barrage would reduce the need for other generating capacity only by about 1,000 GW, according to the committee, most savings being in fossil fuel. And as nuclear power is also capital-intensive and low on fuel costs, the attractiveness of a barrage will to a large extent depend on future plans

for nuclear power. Under the Central Electricity Generating Board scenario, which assumes a fairly rapid growth in nuclear power stations, the barrage is marginally unattractive, says the committee. But it could provide an attractive alternative if nuclear plans are modified only slightly.

The committee seems convinced that a Severn barrage should at least be seriously considered as a possible alternative to investment in nuclear power. Before a decision is finally taken, however, it recommends further studies of the effects on water levels, wildlife and local amenities and the capacity of British industry to cope with such a project. If the government decides to take investigations further, the next step should be an acceptability and preliminary design study costing £20 million and the building of prototype concrete units at a cost of £25 million.

Judy Redfearn

US nuclear weapons

Lasers purify

Washington

A Washington environmentalist group is trying to prevent the Department of Energy from carrying out an expanded programme of research into laser isotope techniques for separating plutonium for US nuclear weapons from spent nuclear fuel.

A classified research programme into laser isotope separations, using copper vapour lasers for uranium enrichment, has been carried out at a relatively low level of funding at the Department of Energy's Lawrence Livermore National Laboratory and the Los Alamos National Laboratory since the mid-1970s — in both 1980 and 1981 total funding for the programme was \$5 million.

In testimony before a congressional committee in March which has just been declassified, the Department of Energy requested an increase in funds to \$155 million over the next three years to support this research and its application to plutonium enrichment. This money would include the construction of a pilot plant, and the department is also discussing plans to construct a \$200 million multipurpose plutonium isotope production plant.

In a letter sent last week to the Secretary of Energy, Mr James Edwards, a staff scientist and an attorney with the Natural Resources Defense Council say that the plutonium laser isotope separation programme "carries grave nuclear weapons proliferation risks" and is "totally inconsistent with the fundamental objective of President Reagan's nuclear non-proliferation policy".

They point out that although the department has identified several other applications for the process — such as the enrichment of fuel-grade plutonium as fuel for the breeder reactor research programme — "it appears that these applications would not serve as adequate justification for the program, particularly in light of the severe proliferation dangers".

In their presentation to the congressional committee, Department of Energy officials said that the purpose of the expanded programme was to make available for weapons use approximately 70 tonnes of plutonium by reprocessing commercial spent fuel and then enriching the plutonium to weapons-grade by laser isotope separation. It would be possible to convert fuel-grade plutonium produced by the department's nuclear reactor in Hanford, Washington, to weapons-grade.

One of the purposes of the laser isotope separation process is to enrich plutonium to weapons grade by reducing the concentration of the major contaminant isotope Pu-240, which is not spontaneously fissile. According to testimony given to Congress by F. Charles Gilbert, assistant secretary for nuclear materials at the Department of Energy, plutonium is placed in one of four categories depending on the concentration of the Pu-240 contaminant: reactor-grade for 19 per cent or greater, fuel-grade for between 7 and 19 per cent, weapons-grade for less than 7 per cent, and supergrade for between 2 and 3 per cent.

The laser enrichment process has two non-military uses. The first is the separation of the Pu-238 isotope, which is used in space satellites and heart pacemakers, as well as for a heat source in thermoelectric generators. The second is the separation of the Pu-241 isotope which decays to Am-241 which is used in smoke detectors and for logging wells. According to the Department of Energy, the non-weapons applications at present require less than two per cent of the output of the Savannah River plant, which is the current source of supergrade plutonium.

David Dickson