

LETTER FROM FRANKFURT



Centrifuge to the fore

Europeans are banking on new method to keep U.S. uranium prices honest

by Ted Shoemaker

European plans to build a gas centrifuge plant to separate uranium are based on pure economics, with a little regionalism thrown in. Reactor engineers see the demand for enriched uranium growing so fast that some kind of local supply will be necessary. The centrifuge system looks more economical than the huge gaseous diffusion plants which the nuclear giants, the U.S., U.S.S.R. and Communist China, use for separating the rare U-235 isotope from its relatively non-fissioning companion, U-238.

At a recent meeting at The Hague, top officials from The Netherlands, West Germany and England met to do some preliminary work they hope will lead their respective countries to production of their own enriched uranium.

They would prefer this to being dependent on the United States as they now are.

Aim of the meeting between Gerhard Stoltenberg, German Minister for Scientific Research, Anthony Wedgewood-Benn, British Minister of Technology, and Leo de Block, Dutch Economics Minister, was to combine their countries' separate national programs, which have been heading off in different directions, into a single multinational program. The activity, though rudimentary, indicates that the three countries are serious about building a joint centrifuge plant.

The centrifuge was one of several techniques that the original developers of the atom bomb considered as a means of uranium separation. It lost out to gaseous diffusion, in which the uranium, in the form of a gas, uranium hexafluoride, is pushed through a permeable membrane; the lighter U-235 molecules go through slightly faster than the U-238.

In the centrifuge method, the hex gas is whirled at speeds of about 50,000 revolutions per minute; the heavier U-238 is thrown to the outside while the lighter U-235 tends toward the middle of the centrifuge.

In the United States, work on the centrifuge method has been under a heavy security blanket. The U.S. caution is aimed at the possible spread of nuclear weapons resulting from a uranium separation method that requires neither the capital investment nor power capacity necessary for gaseous diffusion plants.

But European plans for a centrifuge plant aren't aimed at producing bomb-quality uranium. "That isn't included in our plans," snaps Dr. Jacob Kiste-

maker, Dutch project scientist, when asked about the weapons proliferation question.

The difference lies in the amount of U-235 in the final product. For nuclear power reactors, the proportion of U-235 has to be increased from the 0.7 percent of natural uranium to about 3.0 percent, but a bomb requires about 90 percent U-235.

For bomb-quality uranium, the centrifuge method still seems impractical: It has been estimated that up to 100,000 centrifuges would have to be hooked end to end to produce that purity (SN: 3/16, p. 253).

But for reactor-quality uranium, only 15 stages would be necessary, says Dr. Kistemaker. Each unit of 15 centrifuges would purify only a small amount of uranium, but more units could be added at will, providing flexibility in the planning of new facilities. In contrast, a gaseous diffusion plant cannot be built on a small scale.

It is this flexibility that is appealing to the European planners. According to Holland's Dr. Maarten Bogaardt, the small unit size will allow new technology to be incorporated into the facility as it develops, without committing large sums to centrifuges that will soon become obsolescent.

What's more, according to Dr. Bogaardt's calculations, the centrifuge should be economically competitive with diffusion if the scale of production is large enough. Recently released U.S. statistics show a cost of \$140 per kilogram of enriched uranium per year for capital investment and between \$48 and \$63 per kilogram for running costs in a diffusion plant that can handle 5,000 tons of natural uranium a year. In a centrifuge plant handling 2,500 tons a year, the comparable figures are \$131 per kilogram per year investment and \$41 per kilogram running costs, says Dr. Bogaardt.

What the Europeans hope for is a plant that can fill 25 percent of their demand for reactor uranium by 1980—enough to keep prices honest for the rest of the uranium to be imported from the U.S. Present British and French diffusion plants will be unable to meet that goal.

One Bonn official says there is still basic disagreement on the nature and purpose of the plant. Britain is pushing for an industrial type plant soon, while Germany and The Netherlands are contemplating a pilot plant.

A second ministerial meeting will be held in March, probably in London.