

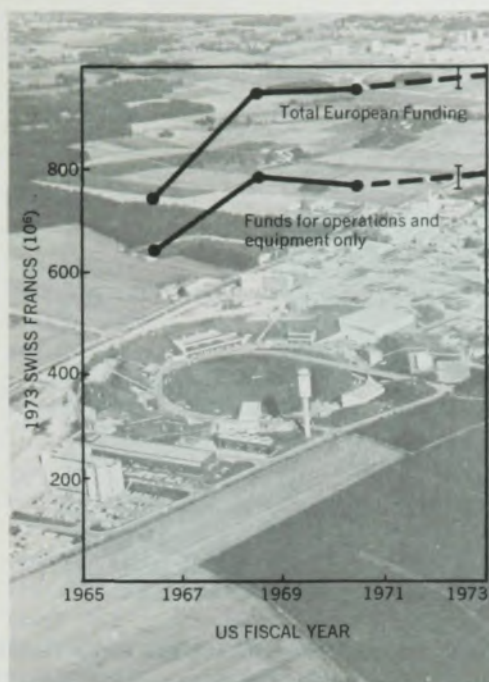
No increase in funds for European high-energy physics

The comparison between American and European funding of high-energy physics in the article by Wolfgang Panofsky in your June issue (page 23) and your editorial comment in the same issue (page 88) are very misleading in respect to the recent trend in European funding levels.

Panofsky, in commenting on figure 3 in his article, says "support of high-energy physics in Western Europe is still increasing at a substantial rate," and you add "Two years ago the European level of funding first exceeded the US level in real dollars and has since climbed to the point where it now exceeds US funding by over \$100 million."

This apparent rise since 1970 does not correspond to an increase in resources in Europe, but simply reflects the recent devaluations of the dollar with respect to Western European currencies—now by 30% compared with the 1970 parity. The effect of this devaluation appears in Panofsky's graph as a rise in 1972 by nearly \$100 million, simply as a result of converting the European data in Swiss francs into a dollar expenditure at the new rate of exchange.

To clarify this point I show in the attached figure the total European annual expenditures in 1966, 1968, 1970, and a provisional estimate for 1972, in 1973 Swiss francs, corrected for inflation as are the figures in Panofsky's curves. This graph shows clearly that there has been essentially no increase in the real financial resources for high-energy physics in Western Europe since 1968. The recent dollar devaluations have had hardly any effect, since only a small fraction of the total costs corresponds to dollar purchases of equipment directly from the US.



Annual costs of European high-energy physics. Difference between two curves is annual cost of construction of large projects, such as ISR, large bubble chambers, and in 1972, start of 300-GeV accelerator.

Within this constant funding, which is not likely to increase in future, will have to be found the major capital expenditures on the 300-GeV accelerator project, which only begin to show up in 1972 and which will increase considerably in the coming years at the expense of operations and equipment funds for the rest of the European high-energy physics program.

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solar sea power plant cycle efficiency is 0.033, which is close to Carnot-cycle efficiency of 0.034. High-performance steam power plants using superheat, reheat, and many stages of feedwater heating have efficiencies that are approximately two-thirds of their corresponding Carnot-cycle efficiency. The solar sea power plant will not be able to employ feedwater heating because the temperature differences involved are too small. Consequently, this type of power plant would have an efficiency at best equal to one-half its Carnot-cycle efficiency or 0.017. We can now examine water-flow rates that would be required for this plant from a more realistic point of view. Any plant that would make a significant impact on our electrical power generation must be 1000 MWe or more. A boiler obtaining heat from sea water entering at 25°C and leaving at 23°C would require a mass flow rate of 5.6×10^{10} pounds per hour to produce 1000 MWe in a power plant with a 0.017 efficiency. Hydroelectric plants operate with efficiencies of the order of 85%. For a 1000-MWe hydroelectric plant, the water-flow rate with a head of 93 feet would be 3.3×10^{10} pounds per hour. This flow rate is about 60% of that through the solar sea power plant, however, this comparison is still not valid because the condenser of the solar sea power plant must also have a sea-water flow rate of 5.6×10^{10} pounds per hour. Therefore, water-flows through the solar sea power plant are triple those through hydroelectric plants operating with a 93 foot head.

If one refers to figure 2 of Zener's article, it appears that an approximate 1000-meter separation would be necessary between the inlet ducts for the boiler and condenser. Consequently, for a 1000-MWe power plant a sea-water flow rate of 5.6×10^{10} pounds per hour would have to travel a distance of the order of 1000 meters, no matter what type of configuration was envisioned for the power plant. A considerable amount of power would be required to force sea water circulation, which has not been accounted for in estimating the efficiency of the solar sea power plant. These power requirements could be kept small if duct cross-sectional areas are of the order 10^5 square feet.

More on solar-sea power

I want to add a few more comments about the article "Solar Sea Power" by Clarence Zener (January, page 48).

Zener is suggesting that a "heat engine operating in tropical oceans on the temperature differential between upper and lower levels could provide a source of economical, pollution-free electricity." The proposed heat engine will

operate on a Rankine cycle using fluids such as ammonia as a working fluid. The working fluid will have a maximum temperature of 20°C and be condensed at 10°C.

Zener states that the sea-water volumetric flow rate through the solar sea power plant boiler is comparable to the water flow through a hydroelectric plant operating with a head of 93 feet. He makes the assumption that the