THE ENGINEERING ECONOMICS OF LARGE SCALE DESALTING

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The engineering economics of large scale desalting by P. W. MacAvoy

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1. INTRODUCTION

Very little is known of the social and economic effects from adding desalting plants to any country's stock of capital. There is no historical evidence on these effects because the plants now in operation are too small or too recent to have had measurable results. There has been only limited analytical work which can be used to forecast future effects.

Yet the results could be complex, widespread, and important. New supplies of water in regions without rainfall would change not only the organization of industry and agriculture there, but also bring the cultures of sparsely populated areas closer to those in more populated and advanced countries of the world. The productivity of labor and capital throughout the economy should be increased as a result both of more and higher quality water. The composition of national output would be changed from adding this type of capital, and water as an intermediate product, rather than some other kind of capital such as those resulting in more highway transport and fertilizer as intermediate products. The question is whether general assessments can be made of these effects, so as to establish some priority for general investment in developing and refining this new technology over the next decade.

Benefit-Cost Analysis of Desalting Plants

There is no general economic theory on the effects from desalting. At least the case is not made here for a set of equations which describe changes in national products from desalting as compared to alternative investments. The fear is that this would not be operational at this time, because not enough research has been done on relationships between desalted water and final products to set the form of the supply and demand equations for the water sectors of national economies.

On the other hand, little can be learned from the engineering design studies of particular desalting plants at particular locations. The ground rules for these studies differ so greatly, and the environmental characteristics are so distinctive, that general conclusions on effects do not evolve from the particular cases.

The first step towards measuring the effects of desalting has to combine general arguments with case studies. The general argument here is that an orthodox theory of corporate investment can be used to analyze social and economic effects. The costs of constructing and operating a desalting plant are calculated in terms appropriate for making investment decisions in the economy. This is to require that costs for the resources put into these plants be measured in terms of their value in their best alternative uses. The benefits from desalting encompass the values of additional products from the water (net of the costs of other resources used in producing these additional products). The

theory suggests the possibility of making economic assessments of the social effects as well, in terms of indications of the dollar preferences of society for the new "way of life" rather than the old. The measuring rod of the project is the rate of return -- that rate of discount equating the cost and benefit series when both are viewed from the perspective of the present.

This analysis is so general that it provides no more than a framework; in fact, it applies to all investment projects without reference to desalting plants. It can be expanded upon by dealing specifically with desalting -- with the particular conditions of costs and benefits associated with desalting plants no matter where located. The following two chapters set out these conditions. The next chapter deals with techniques for estimating the cost of water from desalting plants where these plants have certain characteristics different from electric or other large-scale energy-using systems. The third chapter deals with specific benefits from water plants rather than water reservoir systems, and from distilled water rather than surface water.

The analysis is still not very specific at this stage As a beginning towards specifying more exact relationships, it will be formulated more completely by examination of one large-scale desalting project. This study should work out the input-product relationships in detail sufficient to forecast the costs of water. The benefits of water also should be forecasted, both as an example of calculations for the unique water quality characteristics of desalting plant output, and as a first attempt to