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## Water and Energy in Colorado's Future, Colorado Energy Research Institute

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# WATER AND ENERGY IN COLORADO'S FUTURE.

COLORADO ENERGY RESEARCH INSTITUTE.\*

Boulder: Westview Press. 1981. Pp. 303. \$26.25.

This exceptionally valuable and well printed "in-depth study of the complex relationship between energy development and water use in Colorado" consists of a summary overview, seven sections that are divided into from 3 to 13 chapters, and 18 pages of definitions, bibliography, and index. There are 94 pages of figures and tables, and 126 pages of text. The seven sections present an inventory of existing water and energy resources in Colorado, alternative futures for a 20 year span (using a base case, moderate, high synfuel, and high electricity scenario array), water quantity need by type of energy technology, quality issues, direct impacts, indirect impacts, and legal and institutional effects of water use in energy development.

The technologies included are fossil fueled and nuclear fueled steam electric power, hydroelectric, coal gasification, coal liquification, coal slurry pipelines, oil shale, petroleum refining, uranium milling, geothermal, solar and wind, and biomass.

The text does not put technical language obstacles in the way of the general reader. Tables that provide bar graph comparisons among energy technologies allow all readers easily to see relative water consumption rates; the employment and population growth figures are similarly presented. A further example of the usefulness of the tables is the way total water requirements are broken down by hydrologic regions of the state. Three dimensional figures show how the various technologies work, giving processing plans, production systems, and refining steps, etc.—almost a mini-course on contemporary energy technologies.

Even specialists in individual technologies probably do not have ready access to the range of specific water consumption figures provided by this book. The consumptive uses are presented in clear tables showing state of the art techniques, with breakdown by process stages and with technical assumptions given in the footnotes (such as temperature rises and heat transfer efficiencies). Unfortunately, metric measures are not provided.

The principal strengths of the book reflect its origins in the University of Denver Research Institute and the Colorado State University Department of Civil Engineering. It is a brilliant technical summary. However, even though population growth projections are well presented, the sections of the book devoted to indirect impacts and legal

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\*A 50 page Summary Report on Water and Energy in Colorado was published by Colorado Energy Research Institute in July, 1980.

and institutional effects of water use in energy development are scanty (only 22 pages of text for both sections) and not adequate to the full range of social science issues involved. The effects on agriculture are nowhere decisively addressed. The recreation industry (skiing, fishing, hunting and associated tourism) is not addressed at all. Even with extensive energy development, Colorado's future—the ostensible subject for the analysis in the book—will be clearly dominated by agriculture and recreation. And both of these industries are highly dependent on water quantity and quality. A second book, that analyzes the wider socioeconomic dimensions of the theme as well as this book deals with the engineering-technical dimensions, would raise the whole baseline of analysis of natural resource development in the West.

Having bravely addressed the future, this book falls victim to rapid change within six months of publication! The ink is hardly dry on the High Synfuel projection for the year 2000 (*vid.* Table 3, Summary of Scenarios, p. 15), and the 650,000 bbl/day capacity is already too low by three hundred percent! There has been an upward shift across the board among agencies and industry to a High Synfuel projection of at least 2,000,000 bbl/day capacity by 2000, and a major energy company has even seriously suggested 4,000,000 bbl/day by 2010. With these rapid changes in fundamental calculations of production capacities, and water and manpower requirements, the kind of planning ahead which this book is designed to support becomes extremely difficult. To be sure, the method of analysis and the model of data management provided by this book can survive up and down movements in production capacity figures. But the larger problem of assessing and planning for the impacts of these natural resource developments remains.

If books like this one on "policy options (and) their probable consequences" cannot keep up with the changes, how can the leaders of our political and social institutions be expected to? An unstated but important message of the combined strengths and weaknesses of this book is that with all our technical information, we still cannot effectively predict the effects of natural resource developments. The ultimate impact of these developments is on the response capacities of our social institutions. Our lives and the lives of our new neighbors will be affected more by the capacities for change of our social institutions than by the technical considerations presented so well by this book.

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