

THE MARGINALIZATION OF FEDERAL HYDROPOWER

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Abstract. Multipurpose federal reservoirs, and the competing and complementary purposes they serve, constitute a water resource infrastructure that invariably changes over time, reflecting not only changing economic benefits and beneficiaries, but the evolution of social and environmental concerns as well. This research investigates changes in National Economic Development (NED) benefits of a specific purpose commonly encompassed in federal water resource development—hydropower—due to exogenous and endogenous factors, among them the increasing value of water and storage to non-power uses. The objectives of this investigation are (1) to reveal some of the interdependencies between hydropower and other cardinal uses of storage in federal reservoirs, (2) to ascertain, in specific cases, the potential for sustainability improvements by modifying the operation of existing federal projects, and (3) to gauge the overall effectiveness of existing federal policy as a guide to implementation of sustainability concepts and measures in managing the nation's water resources.

BACKGROUND

Though the bulk of the economic benefits produced by federal reservoirs—in fulfilling the rural electrification and economic development needs of the time they were constructed—have historically been assumed to accrue to hydroelectric power, the federal interest extends by law and policy to such non-power objectives as flood control, navigation, municipal and industrial (M&I) water supply, agriculture, recreation, and environmental protection. The extent to which these other objectives were accommodated in the planning process determined the scope and consequently size and cost of federal projects, in accordance with (1) (NED) benefits generated by each purpose, and (2) the separable and joint-use costs of development, computed using a procedure known as the Separable Costs–Remaining Benefits (SCRB) method (Federal Interagency Committee, 1950).

The underlying rationale of SCRБ allocation of costs is two-fold: (1) economic efficiency—one large multipurpose

reservoir is assumed to be more cost-effective than several smaller projects serving fewer or even single objectives; and (2) social equity—defined as each added purpose “paying its own way” so that no purpose subsidizes any other purpose. By defining and quantifying the federal interest in this way, SCRБ provides the basis for federal water resource development.

Since many of the largest federal reservoirs in the southeast were constructed, the share of system load carried by hydro resources has diminished. This is due to the fact that, while demand has grown, hydropower energy and capacity are circumscribed by the availability of streamflow and storage, as well as by the dwindling number of developable reservoir sites. On the supply side, the marginal cost advantage long enjoyed by hydropower is eroding as the availability of low-cost thermal alternatives expands in response to increasing competitiveness within the electric power industry—driven by market deregulation and integration of generation and transmission systems. On the demand side, other economic uses of water and storage are becoming more highly valued than electric power. From the perspectives of environmental quality and social well-being, the public is increasingly concerned about the long-term consequences of exploiting water as a commodity, particularly when, in the case of hydropower, such use might produce little economic benefit at comparatively great and/or irreversible environmental expense.

The current findings of this research suggest that economic benefits provided by several of the hydropower facilities in federal multipurpose reservoirs in the Savannah, Apalachicola-Chattahoochee-Flint (ACF), and Alabama-Coosa-Tallapoosa (ACT) Basins may no longer be sufficient to justify the continued allocation of storage to that purpose. Nonetheless the reservoirs exist, and power releases often support a variety of non-power uses, some of which are critical. In other instances, however, hydropower releases contribute to environmental degradation (e.g. low dissolved oxygen levels or streambank erosion), and/or compete with other objectives such as maintaining high pools for reservoir recreation. While revenues from the sale of hydroelectric power may not repay sunk (capital investment) costs, recovery of the variable costs of

continued facilities operation and maintenance may be possible under new management regimes, in which hydroelectric energy is generated incidental to releases made to accommodate other demands.

In seeking to preserve options for future generations, the question arises as to what mix of economic and environmental purposes existing federal dams with hydroelectric facilities should serve. In this context specific concepts and measures of sustainability applicable to water resource systems are examined, and the efficacy of federal policy is appraised. While imperfect and prone to misinterpretation in specific instances, the underlying principles of existing federal water policy are sound, and continue to provide the exegesis for sustainable water resource planning and management.

Research Perspective

Educators have observed that knowledge is not necessarily developed in a linear manner—while theory leads to practice, practice also leads to theory. In a pivotal study, Boyer (1990) lists four types of scholarship, briefly described as follows:

- *The scholarship of discovery* builds the stock of basic knowledge, defines the intellectual climate of academic institutions, and is in fact what most academics mean by the term “pure research.”
- *The scholarship of integration* is synthesis—interpreting and putting in perspective isolated facts. While closely related to discovery, it explores the boundaries where different fields overlap, and is thus considered “interdisciplinary.”
- *The scholarship of application* deals with the application of knowledge to consequential problems—individual, institutional, and social.
- *The scholarship of teaching* is the education of and inculcation of pre-analytic vision in future scholars. Teaching is closely related to application because research is consequential only when understood by others.

Boyer’s argument maintains that, while discovery lies at the heart of scholarship, it is not always achieved directly—by commitment to knowledge for its own sake. “Necessity is the mother of invention” is the dictum for the incentivization of technological improvement by real or perceived economic and social need. Technological improvement may extend basic knowledge by integrating existing theory and data in new ways, or by evoking new realms of study.

This study falls into the categories of *integration* and *application*—it integrates emerging concepts of

sustainability and federal project purpose planning policies and procedures, and applies these to the current and future management of multipurpose water resource systems. Consequential and immediate problems are addressed, many of which are exemplified by the aggravation of economic and environmental pressures on competing and complementary uses of water in the Savannah, the Apalachicola-Chattahoochee-Flint (ACF), and the Alabama-Coosa-Tallapoosa (ACT) River Basins. The approaches to alleviating natural resource scarcity offered in this instance are not, and are not intended to be, comprehensive. Nonetheless they may be viewed as archetypical of new interpretations and applications of existing policies to define and promote sustainable water resource development in previously unforeseen ways. More importantly, they provide a starting point for the formulation of new policies promoting efficient use of water resources while preserving the greatest number of options for future generations.

PROBLEM STATEMENT

The fundamental problem addressed in this research is the determination of whether opportunities exist for significantly improving the utility of water resource management in the southeastern United States through application or modification of current public policy. While considerable efforts have been expended in recent years in the area of water resource operations research, the focus has for the most part been on systems analysis techniques rather than on policy review or a rethinking of the basic functions water resource systems are designed to serve. One point of departure for this investigation, then, is a re-examination of some of the basic principles underlying current federal water resource development policy in light of changing environmental imperatives and societal preferences. The intent is to identify possibilities for extending the range of feasible planning, design, and operational options available to system operators and users of water and storage in the future. As opposed to proposing new methods for optimizing the performance of water resource systems for the purposes they currently serve, this research examines new policy avenues to identifying and operationalizing the social good afforded by the potential depreciation of federal hydropower assets in the Savannah, ACF, and ACT Basins.

Contribution of the Research

The principal contribution of this study is the identification of specific opportunities afforded by marginalization of federal hydropower for relaxing some of

the historical constraints on the management of existing federal multipurpose reservoirs. These constraints are particularly burdensome to the users of water and storage in the Savannah, ACF, and ACT Basins, where they exacerbate ongoing water conflicts and impede consensus on priority of use and basinwide water allocation formulas. By removing unnecessary obstructions, the process of defining long-term objectives is simplified, improving prospects for managing the nation's water resources to benefit the present as well as future generations.

Scope of the Investigation

The principal areas of focus of this research are as follows:

- Review of current policies and procedures for federal water project implementation, including SCRB procedures for allocating costs of multipurpose federal projects.
- Estimation of National Economic Development (NED) benefits of federal hydropower in the Savannah, ACF, and ACT River Basins.
- Articulation of sustainability concepts, measures, and criteria for water resource systems.
- Identification of operational and policy changes to promote economic efficiency and/or sustainability objectives.

In this instance, the utility of storage allocated to the hydropower purpose in federal reservoirs in the Savannah, ACF, and ACT Basins is investigated to determine if federal economic and environmental principles can be accommodated under prevailing water availability and demand conditions. Economic benefits of hydropower are designated in current federal policy as the replacement costs of the next-best thermal resource alternatives for capacity and energy supplied by federal hydroelectric generating facilities.

REFERENCES

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