Balancing Hydropower and Environmental Values: The Resource Management Implications of the US Electric Consumers Protection Act and the AWARE™ Software

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ABSTRACT: This paper reviews the AWARE™ software distributed by the Electric Power Research Institute (EPRI). The program is designed to facilitate the Federal Energy Regulatory Commission (FERC) license renewal process for US hydropower installations. The discussion reviews the regulatory, legal, and social contexts that give rise to the creation and distribution of AWARE™. The principal legal impetus for AWARE™ is the Electric Consumer Protection Act (ECPA) of 1986 that directs FERC to give equal consideration to power and non-power resources during relicensing. The software is reviewed in this paper from several perspectives including those of natural resource economics, systems modeling, and the social context within which FERC licensing decisions are made. We examine both the software and its underlying methodology and find significant problems with each. Because of its flaws, AWARE™ does little to further ECPA's equal consideration requirement. We find that the conservation and restoration impact of ECPA for US fisheries could be seriously hampered by the widespread use of AWARE™.

KEYWORDS: AWARE™, Electric Consumer Protection Act, hydropower, water resources, Federal Energy Regulatory Commission

1. INTRODUCTION

Many US hydropower installations have been operating under 50-year Federal Energy Regulatory Commission (FERC) licenses that must be renewed. In 1990, the Electric Power Research Institute (EPRI) commissioned Decision Focus,

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Inc. to develop software to help hydropower firms obtain their FERC licenses. The resulting product, AWARE™ (Decision Focus, Inc., 1991), focuses on complying with the power versus non-power balancing requirement of the Electric Consumers Protection Act (ECPA). EPRI also commissioned Decision Focus, Inc. to develop a companion report to AWARE™, namely Boyd et al. (1990), outlining procedures used by AWARE™. The Decision Focus, Inc. report covers various issues that arise during the license review process, but concentrates on estimating economic benefits for hydropower versus instream flow. Boyd et al. (1990) claim that the unique contribution of AWARE™ is that it offers hydropower installation operators intelligent, cost minimising negotiation strategies for renewing their licenses. We review AWARE™ here, and argue that AWARE™ fails to balance or address the array of social forces that gave rise to ECPA. A flexible guide for the license renewal negotiations should be more sensitive to the regulatory implications of the ECPA, and the social forces that generated the legislation.

2. ECPA AND THE FERC RELICENSING ARENA

The Federal Power Act of 1920 (FPA) created the Federal Power Commission (FPC) and stipulated several conditions for any hydropower license authorised in the United States (Grimm, 1990). Subsequently, the Fish and Wildlife CoordinationAct of 1934 (16 USC 661 et seq.) set the stage for resource protection by requiring all public and private agencies to consult with state and federal fish and wildlife agencies before any water-related developments. The FPC was replaced by the Federal Energy Regulatory Commission (FERC) under the Department of Energy Act of 1977 (PL95-617, 92 Stat. 565). Congress passed a series of amendments to the FPA entitled the Electric Consumers Protection Act (ECPA) of 1986. ECPA requires that 'equal consideration' be given to energy production and environmental values (Joint Committee, 1986). Section 4(e) states that the FERC 'shall give equal consideration to the purposes of ... the protection, mitigation of damage to, and enhancement of fish and wildlife (including habitat), protection of recreational opportunities, and the preservation of ... environmental quality'. A Congressional report (US House Committee on Energy and Commerce, 1986) states that the purpose of ECPA is to 'ensure that non-power values are ... as healthy and abundant ... as before' the license.

The demise of many US anadromous fish (fish that spawn in freshwater and mature in seawater) stocks over the past 50 years has led FERC to call for costly outlays and operating changes by hydropower installations as part of the relicensing process. Though Grimm (1990) expressed a concern about the failure of FERC to enforce required consultations, ECPA has had a major impact. Hunt (1991) provides data that shows that the pre-ECPA license renewals during

1984-1986 were readily obtained and that the impacts of fish and wildlife management consultations were minimal. In the post-ECPA period, these consultations led to many changes in the operating regimes of the facilities involved (such as minimum flows) as well as stipulations for significant expenditures for the construction of fish ladders and screens.

3. THE AWARE™ SOFTWARE

AWARE™ attempts to do two things. First, it depicts the tradeoffs between power and non-power values by comparing the net dollar costs and benefits of differing hydropower operational schemes. Second, AWARE™ offers a systematic way of handling uncertainty in value estimation by computing the dollar value of resolving uncertainty through additional data collection. An example may clarify the procedure.

Consider a hypothetical relicensing project on a river with anadromous fish. FERC will examine three principal flow-related outputs including hydroelectric power production, fish production, and nonmarket recreational activities. For each alternative, the dollar benefits of power production and the costs of power production changes are relatively easy to quantify. Changes in recreational impact and demand may be forecast. However, the impacts of those same changes on fish populations, and their net worth, are difficult to estimate. Generally, it will be much more difficult to estimate changes in the dollar value of nonmarket benefits than it is to estimate hydropower benefits.

The first step in using AWARE™ is to enter data for project operations and various outputs related to streamflow. If quantitative information about a particular value is poor, the user is prompted to enter an estimated value. The software uses the data to calculate the net value associated with each proposed alternative. For example, three alternatives for this hypothetical project might include the status quo, maximisation of fishery habitat, and a rehabilitation alternative with flows mid-way between the other two. Each alternative generates a set of streamflow characteristics (e.g., ramping and flow rates) to explore operational changes that may include minimum flows, recreational releases, rule curve modifications, and peaking versus run-of-the-river operations.

AWARE™ relates these streamflow characteristics to a host of parameters. Capital costs, operation and maintenance costs, energy production, property values, and air emissions from alternative fossil-fuel generators can all be related to the operating characteristics and the value of power produced at the facility under analysis. Useful flow-related, nonmarket variables that can be incorporated into an AWARE™ analysis include estimates of the value of fish and wildlife recreation, water quality and supply, wetlands, and aesthetics. Several objectives pertinent to the licensing process may be explored besides hydropower production, including fish passage, wetland restoration, hatchery construction,

archeological and cultural resource protection, site access, and water quality improvement.

AWARE™ concludes the deterministic analysis by computing results based on dollar values supplied by the user. The results of an AWARE™ analysis, as illustrated in Table 1, are simple sums of the dollar value of each component (energy, fish, recreation) for each alternative, which are then aggregated into 'net social value' totals. Using these results, one can easily determine tradeoffs and rank the operational alternatives. The data entry procedure encourages the user to identify key unknowns in estimating dollar values. In the Table 1 example, the rehabilitation alternative has the highest net social value and would be judged to be the preferred alternative. The AWARE™ program can also perform a sensitivity analysis that examines the effect of various changes in parameters on the relative ranking of the alternatives. Various calculations determine if any combination of high or low estimates for the major unknowns might result in a different ranking of alternatives. If the ranking does change, an expected value can be placed on the benefit of reducing that uncertainty.

Alternative	Component	Amount Produced	Per-Unit Economic Trade-Off	Value	Net Social Value
I.	Energy	450,000 MWh[2]	50/MWh	$22.5[3]	
Status Quo	Fish	120,000 Fish	25/Fish	$ 3.0	
	Recreation	36,000 Days	50/Day	$ 1.8	$27.3[3]
II.	Energy	400,000 MWh	50/MWh	$20.0	
Rehabilitation	Fish	240,000 Fish	25/Fish	$ 6.0	
	Recreation	36,000 Days	50/Day	$ 1.8	$27.8
III.	Energy	100,000 MWh	50/MWh	$ 5.0	
Maximum Habitat	Fish	300,000 Fish	25/Fish	$ 7.5	
	Recreation	36,000 Days	50/Day	$ 1.8	$14.3

TABLE 1
Comparison of the output of three proposed operational alternatives for a hypothetical hydropower project

(Adapted from AWARE™ training session run by Decision Focus, Inc., Denver, Colorado, July 1991.)

4. CRITIQUE OF THE AWARE™ SOFTWARE

The positive features of AWARE™ include its streamlined design and the way it handles uncertainty. The most serious flaw with the software is that its internal workings are not evident to the user. AWARE™ employs vague, undocumented, or sketchy functional relations between the data entered and the results generated. In addition, AWARE™ lacks a convenient way to print data for review and communication, and its documentation is severely fragmented.

Black Box

Many computer models appear as 'black boxes' to the user; AWARE™ is no exception. Data go in and answers come out with only minor insight provided to the user about what went on in between. The data entry section of AWARE™ is tedious, although comprehensive and useful. Unfortunately, it is not clear what some data items are or how they should be calculated. For example, non-economists need highly specific prompts in order to enter values for the 'real social discount rate'. After data are entered, the AWARE™ program checks to ensure that everything needed to describe one or more alternatives has been completely specified. Another few key strokes display model results, but there is no way to 'peer inside' the model to discern the functional relations that are used and whether there are any undocumented assumptions. Further, the results of AWARE™ are difficult to interpret. It is not immediately obvious what is contained in, nor the utility of, the many 'reports' that are generated.

Documentation

The documentation for AWARE™ involves at least four forms. The software itself comes professionally and attractively packaged with its user's manual (Decision Focus, Inc., 1991). The user's manual contains the appropriate information for straightforward software installation. The software's user interface is described clearly and an example session is provided. Section 5 of the user's manual is titled 'Technical Description'. Unfortunately, this section contains only the barest overview and no technical description of the software's algorithms.

A partially context-sensitive help system is provided within AWARE™. This on-line help is a useful supplement to the user's manual, but it does not clarify what data are important or what calculations are happening inside the black box. Two sample data sets accompany the software. These data sets,with the user's manual and the on-line help, provide a starting point for experimentation with the software. However, when we attempted to enter a new data set, questions arose that neither the user's manual nor the on-line help could answer. The only source of more detailed documentation is Boyd et al. (1990) which,

unfortunately, does not automatically accompany the software. Though this document is more specific and detailed, it also fails to fully describe the algorithms. Better documentation would greatly enhance the utility of the program.

Uncertainty

A strength of AWARE™ is the way in which it handles uncertainty. AWARE™ deals with only three possible values for uncertain input (low, expected, and high) and, as previously noted, highlights uncertainties that could alter a decision outcome. AWARE™ then calculates the value of information that would be necessary to resolve the uncertainty by tabulating the expected value of having perfect information. This approach is refreshingly pragmatic. Certain subtleties are overlooked, however, including the possibility that the utility of the expected value of a set of events is markedly different from the value of the expected utility of these events (Arrow, 1971).

AWARE™ also deals with uncertainty by providing a database of references to publications in which researchers have used or defined values for many power and non-power attributes. The idea of a such repository is a good one. However, the AWARE™ reference database is poorly organised and incomplete. For example, the list of publications that contain off-site benefits estimates for fishery resources needs to be amplified and updated or the AWARE™ user who does not consult a resource economist might undervalue the nonmarket amenities provided by instream flows.

5. CRITIQUE OF THE AWARE™ METHODOLOGY

Though the software and documentation could be updated and improved, we have serious doubts about AWARE™'s premises. We question whether the methodology satisfies ECPA's 'equal consideration' intent, whether hydropower advocates acknowledge the full range of non-power values, and whether regionally specific, unbiased values are given adequate credit in the balancing process. We also question the flexibility of some of AWARE™'s algorithms.

Equal Consideration

Although AWARE™ was specifically created to help license applicants give equal consideration to all resource values, the methodology does not accommodate a win-win perspective in FERC license consultations. AWARE™ defines the net social benefit from a change in operations as the net change in the economic value of power and other resource outputs by subtracting costs from

	Power Value	Non-power Value	Net Social Value
Alternative 1	+ $725,000	- $75,000	+ $650,000
Alternative 2	+ $575,000	+ $25,000	+ $600,000

TABLE 2
Decision example: Northeast Project. Changes in value from the baseline

benefits for each pertinent alternative. The preferred alternative maximises the net benefits conferred .

Consider another example used in an AWARE™ training session run by Decision Focus, Inc. (in Denver, Colorado, July, 1991). The results in Table 2 show the approximate changes in net social benefits provided by the hydropower facility. Under Alternative 1, the non-power resources would be diminished in value from the baseline condition, while the net social value provided by the power resource would be augmented. Under Alternative 2, the net social value provided by both resources would be increased. The training workbook indicates that, based on this comparison, the choice that provides the greatest net social benefit is Alternative 1 because $650,000 is greater than $600,000. This selection ignores the fact that this choice augments only one side of the ledger. Alternative 2 adds value to both sides, a fundamental catalyst for reaching accord in many natural resource negotiations. Fisher and Ury (1983) advocate principled bargaining that searches for solutions that can benefit both sides in negotiations (i.e., win-win solutions). From this perspective, Alternative 2 is more equitable than Alternative1 because neither side has to sacrifice all to accommodate the other. Economics can facilitate agreement with this approach, but it is not the sole criterion for choosing a preferred alternative. Information about whether the utility can operate under Alternative 2, or whether some fishery resource is completely depleted under Alternative 1, is necessary in implementing this more complex interpretation of equal consideration.

Suspect Premises

The focus of Boyd et al. (1990) and of AWARE™ is the balancing of alternative uses stipulated by ECPA. Different uses are valued in distinct fashions by various population segments. The distinction between projecting the magnitude of impacts or outputs and stating their relative desirability is basic to any commensuration analysis (Lord et al., 1979). Magnitude is an objectively measurable entity, while desirability is an equally important but subjective

component that varies in intensity among various population groups. A methodology constructed to weigh alternatives should avoid bias by incorporating two criteria. First, confusion between the objective values and their subjective desirability must be avoided. Second, the subjective valuation applied to any resource must not rest on individual judgement, nor reflect the position of only one segment of a diverse, affected population.

A key issue is whether or not there is a broad social mandate for ECPA across a wide segment of the populace. Several authors (Walsh et al., 1984; Loomis et al., 1990; Douglas and Johnson, 1993) have suggested that nonmarket benefits are far larger than direct preservation or restoration costs. In contrast, Boyd et al. (1990) argue that a simple economic analysis demonstrates that the social costs of these outlays are greater than the social benefits of restored anadromous fish. However, their narrow economic argument is poorly documented and grossly one-sided in many respects. When one side of a water allocation balance ledger, such as the hydropower values in the several examples in AWARE™ and Boyd et al., is one or more orders of magnitude greater than the other side, the objectivity of the input values are suspect. If the ledger were so grossly one-sided, subsequent federal legislation should omit the balancing requirement. There must either be a social mandate for balancing hydropower protection with resource protection or a very strong special interest group promoting this perspective. Failure to reach common ground in resource valuation will likely increase discord among various water users in the long run.

Value Calculations

Certain equations used in AWARE™ can mislead a novice. A resource economist will have no difficulty in understanding the simple formula for the current annual consumer surplus value of a recreational fishery:

Recreational fishing value =
(Number of angling days per annum) X (Value per angling day).

The value of an angling day is the average willingness-to-pay or the consumer surplus of a day spent fishing. The consumer surplus is a dollar measure of the market or nonmarket benefits provided by a market good or nonmarket environmental amenity (Just et al., 1982). The magnitude of the consumer surplus reflects the quality of the good in question as well as the paucity or abundance of substitute commodities. The fishing recreational benefits formula is valid only as long as the variation in consumer surplus is modest. For example, a change in hydropower operations that caused a 30% change in mean flow during the angling season would typically change the quality of the angling experience and the value of an angling day. An increase in quality also produces an increase in angling days demanded at the site. Both terms of the simple formula are altered by a large change in flow, thereby limiting the applicability of the equation.

The Need for Regional Valuation

A tacit assumption underlying the approach of Boyd et al. (1990) is that nonmarket wildlife resource values are roughly interchangeable across many locales. This assumption may be entirely appropriate for a widely distributed species such as deer. However, when wildlife resources such as anadromous fish become badly depleted, the assumption of interchangeability may be grossly inaccurate. Loomis et al. (1990) estimated total benefits of over $2 billion per annum for partially restoring California's San Joaquin River chinook salmon stocks. This high value reflects the fact that many California and Pacific Coast fish stocks have been lost. Further, Loomis et al. carefully estimated per-household off-site benefits for California and non-California households. The sizeable variation in mean per-household benefits between Californians and out-of-state residents provides convincing evidence that propinquity of the resource can add significant value. Thus, regionally specific values should be used in any analysis.

The Need for Unbiased Values

Boyd et al. (1990) lack adequate benchmark estimates of the nonmarket benefits provided by fishery resources and instream flows. Some information on nonmarket amenity values is implicit in the examples that Boyd et al. used to illustrate their methodology. The most serious difficulty with the values offered by Boyd et al. comes from their suggestion that replacement costs for fish be used as surrogate existence values. The term 'existence value' in the economics literature refers to the benefits that individuals attribute to knowing that certain environmental resources or amenities exist. Boyd et al. aptly note that existence values are controversial, but neglect to point out that the controversy stems almost entirely from the large dollar magnitudes of the existence values reported in the literature (Loomis et al., 1990; Olsen et al., 1991).

Replacement costs, the surrogate suggested by Boyd et al. (1990), typically underestimates the value of anadromous fisheries by a factor of 10 or more. Replacement values listed in Boyd et al., of $1.23 per fish represents a single hatchery replacement whereas existence values for instream flows and anadromous fish stocks are large compared with on-site values (Walsh et al., 1984; Loomis, 1987; Loomis et al., 1990). Loomis et al. (1990) estimated nonmarket benefits of partially restoring a chinook salmon stock on California's San Joaquin River to be roughly $138,000 per spawning fish per year, and annual total benefits of over $2 billion per annum.

The fact that nonmarket benefit values for restoring anadromous fish may be highly competitive with consumer surplus values for hydropower (Douglas and Johnson, 1993) will come as a profound shock to AWARE™ software users who have learned their resource economics from Boyd et al. (1990). Neither Boyd et

al., nor the 50-page bibliography in the AWARE™ software package lists any of the recent literature on existence values. We note that despite their controversial status, existence values have achieved rebuttable presumption status in federal courts (Arrow et al., 1993) and, therefore, must be examined carefully.

6. UNRESOLVED ISSUES

AWARE™, or any similar resource decision model, must be considered in the larger context of the social valuation of natural resources. FERC must make pressing relicensing decisions using the best available data, but there are some legitimate questions about resource valuation that should not be disregarded just because we do not know how to answer them.

Non-economic Values

The National Wildlife Foundation (1992), in its review of Boyd et al. (1990), raised the pertinent issue of whether estimating just the gross nonmarket dollar benefits provided by alternative uses (e.g., fishing, rafting) of streamflows is a valid interpretation of ECPA's balancing requirement. The more subtle and complex procedure suggested by the National Wildlife Foundation (1992) would consider all benefits estimates as entries on a tally sheet that would also include other environmental values. The Foundation's view is that the spectrum of environmental values that should be considered during the relicensing process includes some values that cannot be quantified and other values for which nonmarket dollar benefits cannot be estimated. The notion that outdoor recreation activities express harmony and communion between humans and nature that cannot be captured by simple scaler measures is important. There must be consideration of qualitatively different kinds of values. For example, tribal religious values are intrinsically connected with fisheries. More generally, net economic benefit is not the only relevant criterion for allocating water resources between market and nonmarket uses. Environmental values that cannot be quantified readily may be pertinent in the ECPA mandated 'equal consideration' balancing process.

Making Negotiations More Inclusive

Alteration of the operations of hydropower facilities is a major social cost of restoring the nation's anadromous fish, but this cost is only one of several. In the Pacific Northwest, dams and adverse impacts from logging and cattle-grazing have contributed to the drastic decline in the size of anadromous fish stocks (Vetterick et al., 1991). Fishery and hydropower interests would probably benefit from careful socioeconomic analyses that document the fact that both hydropower and fish stocks are socially valuable. The power industry made an

important tactical error in failing to recognise that fishery interests, too, seek low cost methods for improving aquatic habitat.

A consequence of the negotiation strategy embodied in AWARE™ is that it pits the hydropower industry and fishery resource advocates against each other in a two-party zero sum game. Economic valuation procedures need not lead to win-lose negotiation strategies. Even if the social benefits of increasing aquatic habitat, fish stocks, and the value of nonmarket instream flow outputs greatly outweigh the social costs of operational changes in hydropower for a certain relicense application, it does not necessarily follow that it will be in society's best interests to curtail hydropower production. There may be other actions that would benefit both hydropower and natural resource values. For example, increasing irrigation efficiency might enhance instream flows for both hydropower and fishery production. Large increases in aquatic habitat might be obtained at modest social costs by regulation of non-point pollution from agriculture or logging. Preventing cattle from overgrazing stream banks is a form of improved land management that could lower stream sediment loads.

There are several competing groups of water users. Each FERC license or relicense decision is just one of a series of discussions that span an extended time period and involve several parties including developers, natural resource managers, environmental advocates, regulators, and the public. The sequence of interrelated resource management consultations should be assessed from the perspective of the ongoing, long term relations among all parties to the negotiations (Lamb and Taylor, 1990). The AWARE™ user should be able to place his particular allocation issues in the larger water resource arena. It is reasonable to conjecture that after sizable outlays for screens and ladders have been made, and flow release alterations that facilitate fish stocks are more widespread, it may be worthwhile to focus on the amelioration of other adverse fishery impacts.

Negotiation Strategies and the Political Process

We do not think that there is a single best negotiation approach or technique for dealing with hydropower streamflow allocation issues. This fact has an important theoretical correlative. Namely, it may be fruitless to search for the ideal set of social weights that can be used as a guide in achieving the optimal allocation of water resources (Arrow, 1963; Just et al., 1982). Arrow's famous 'impossibility theorem' (Arrow, 1963) demonstrates the logical futility of a search for a set of social weights (e.g., the social welfare function) for allocating goods and services, and this theorem seems perfectly applicable to the water resource arena.

We think that open-ended information gathering on adverse agricultural, logging, mining, and municipal impacts is one key starting point for a more successful involvement by the hydropower industry in the FERC negotiation process. The hydropower industry could be effective in gathering data that documents the futility of habitat restoration efforts based on the assumption that reduction of adverse dam impacts will completely restore US anadromous

fisheries. The same data gathering and dissemination effort might document the enhanced value of habitat restoration efforts when coupled with effective anadromous fish harvesting regulations. Computer data bases that include this type of information might allow small hydropower installations to face the challenge of license renewal more effectively. However, skillful, intelligent use of this type of data by the hydropower industry requires replacing the adversarial bargaining approach incorporated in AWARE™ with an inclusive approach that embraces concerted action on the panoply of factors that affect the nation's stream flows and fishery resources.

We also noted several shortcomings of the criteria of net economic benefits when applied to the FERC relicensing arena. The application of skills and techniques for achieving negotiated settlement in the FERC arena is an integral part of the science of government. Thus the AWARE™ approach to bargaining should be judged in terms of the fluid, supple, pragmatic criteria for effective government that Aristotle offers in *The Politics*. In *The Politics* Aristotle notes that it is virtually impossible to compile a complete ensemble of fixed formulas that will be the basis of a science of government because the science of governing is a practical science. The effective practitioner of the practical sciences must not only have some mastery of the pertinent theoretical scientific principles, but must exhibit good judgement and forceful intelligence in relating the unique particular circumstances of various pressing problems to broad theoretical principles. Aristotle's discussion (*The Politics*) of the applied science of government is notably congruent with the current analysis because he emphasises the need for accurate, pertinent information in political forums.

7. CONCLUSION

The AWARE™ software has a professional appearance and is easy to use. However, the AWARE™ software has several key flaws. It may be highly regarded by hydropower producers, but the software does not provide a useful guide for FERC personnel in relicensing decisions.

The criteria of net economic benefits as measured by consumer surplus for market goods or some appropriate surrogate for consumer surplus for nonmarket amenities is useful and widely used. However, it is not a perfect measure of social welfare for the water allocation arena (Arrow, 1963; Just et al., 1982). Perfect measures aside, AWARE™ does not use net economic benefits in an unbiased, scholarly manner. Equal consideration implies much more than having ledger entries with non-power values. First, we agree with Alexis de Toqueville (Meyer and Kern edition, 1969) who pointed out two centuries ago that the creation of a law most often reflects a perceived social need. Second, non-power values must be treated in a non-biased manner and calculated correctly. Third, we must allow for values that cannot be converted to economic currency and always be vigilant for negotiation solutions that benefit all parties. Equal consideration implies an

element of balance that is lacking in AWARE™ and its methodology.

Bargaining strategies for water resources must bridge the broad gulf between those who believe that 'Objectivity is the greatest threat to (natural resources in) the United States today' (McPhee, 1971: 241, quoting David Brower) and those who believe that computer programs such as AWARE™ provide an alternative to decision paralysis. In addition, resource managers must carefully consider whether any value-balancing model might usurp some of their legal authority. Both ECPA and the Fish and Wildlife Coordination Act call for the exercise of expertise by state and federal fish and wildlife agencies to determine the needs of biotic aquatic resources when hydropower facilities are constructed or modified. Resource valuation models such as AWARE™ cannot remove that authority.

We think that several flawed assumptions in AWARE™ and Boyd et al. (1990) characterise the negotiation strategies of US and North American development interests, including: (1) the premise that conservationists are interested in limiting the revenues of developers; (2) the premise that resource allocation negotiations are static zero sum situations with two players who have antipodal interests; and (3) the assumption that legal statutes protecting resources are typically the work of ill-informed politicians serving narrow constituencies. We must move beyond AWARE™ to find joint solutions to our pressing problems.

NOTES

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[2] MWh = Megawatt-hours.
[3] In millions.

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