FERC's economic analysis of hydro projects:

A review of policy and practice since the Mead decision

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I. Introduction and summary

A. Introduction

In its **Mead** decision of July 13, 1995, FERC modified its economic analysis methodology to cease considering the potential effects of inflation on project economics. It also reemphasized that project economics are not a decision criterion for approval/disapproval of a project. At the same time, individual mitigation measures continue to be accepted or rejected based on cost, with FERC citing its balancing obligation under Federal Power Act (FPA) section 10(a) as the basis for rejecting mitigation measures that are "too expensive."[1] This paper examines the ways in which FERC computes and uses dollar costs and values for the power and non-power aspects of the projects it licenses. It looks both at economic (ie., dollar-denominated) analysis of projects as a whole and economic analysis of individual measures proposed as project conditions.

I have reviewed over 60 FERC documents issued in the last two years, dealing with more than 90 separate FERC projects.[2] The economic analyses in these documents show an enormous range of net economic values for the various projects, and an enormous range of alternative power costs. For individual projects, FERC estimates alternative power costs from 1.7[3] to 12.1[4] cents per kwh. Estimated net values (alternative power cost minus hydro project cost) for proposed projects range from over 5 cents per kwh[5] to under -5 cents per kwh.[6] The only common thread is that in no case has either FERC or its staff denied or proposed to deny a license.

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[1] Of course FERC also rejects mitigation measures on other grounds, such as a lack of evidence that they will produce any actual environmental benefit. The discussion of mitigation measures in this paper focusses on the role of economics in choosing the acceptable set of mitigation measures.

[2] See Appendix A. 18 of the projects have been licensed, with the rest recommended for license approval by FERC staff.

[3] Dairyland project, FERC #1960, Flambeau R., WI

[4] Bear Swamp Pumped Storage, FERC #2334, MA.

[5] Ripogenus (FERC #2572, ME), Cloquet (FERC #2363, MN), and Bear Swamp PS (FERC #2334, MA) projects.

[6] Condit (FERC #2342, WA) project FEIS, October 1996, pp. 5-17, 5-18.

Since the **Mead** decision cost can be a factor in deciding whether FERC will include a proposed mitigation measure as a license condition, but cost is not a factor in deciding whether or not to award a license. Cost can thus limit how much mitigation is required as a licensing condition, but not whether a project should be licensed at all.

A closer review shows that FERC appears to consider costs only in very limited ways. Overall project economics (often referred to in FERC documents as the "ANB," or "annual net benefits" of a project) rarely if ever affects a staff proposal or a FERC licensing decision. Only occasionally is an individual mitigation measure rejected because it would be costly compared to net project benefits, and other mitigation measures are routinely accepted even when net project benefits are negative. FERC does not generally use total mitigation costs as a decision criterion for anything, nor does FERC use net project value as a decision criterion. Projects are approved or proposed for approval even when their computed costs are as much as twice the cost of alternative sources of power, resulting in strongly negative ANBs.[7]

The fact that overall net project value doesn't matter in deciding whether to grant a license doesn't mean that mitigation measures are not rejected because of their cost. Mitigation measures appear to be singled out for more critical review when their dollar costs are relatively high compared to the total energy value of the proposed project.[8] FERC frequently rejects specific mitigation measures on the basis that the cost of the particular measure is too high compared to the benefits that the particular measure would provide.[9] But when it does so, it does so on an ad hoc basis, with (almost always) no quantification in dollar terms of the benefits of the mitigation measure which it is rejecting as too costly. Conversely, mitigation measures that **are** required are almost never justified on an economic basis, but are simply asserted to produce nonpower values (e.g., environmental or recreation benefits) greater than their costs. Some mitigation measures are simply included on the basis that an agency required them pursuant to FPA sections 4(e) or 18, with no environmental or economic justification given at all.

B. Summary of findings and recommendations

My review of NEPA documentation and licenses issued in the 18 months since **Mead** shows that FERC analyzes the economic costs, but rarely the values, of the nonpower aspects of projects.[10] Thus, perhaps not surprisingly, well over 1/3 of all

[7] E.g., the Enloe Dam project in Washington (FERC #10536), licensed 9/13/96, with a forecast project cost of 54 mills/kwh and an alternative cost of power to the licensee of 28 mills per kwh. See also FERC project #s 2283, 11482, and 10854, in each of which FERC staff has proposed licensing with conditions that make the proposed project more than twice as expensive as non-hydro alternatives. Finally, FERC staff has proposed licensing the new Felts Mill project in New York (FERC #4715, 9/96 FEIS) and relicensing the existing Condit project in Washington (FERC #2342, 10/96 FEIS) at costs with mitigation conditions of more than **triple** the cost of alternative sources of power.

[8] The value of the energy output of the project is computed by converting the project's megawatt (Mw) and kilowatthour (kwh) output into dollar terms. It is a gross value, before netting out the cost to produce those Mw and kwh.

[9] See Appendix A.

[10] Section II.B.1.

projects are reported to have negative net economic values.[11] For power generation, both cost and value are calculated.[12] However, power value analyses are frequently flawed by inaccurate assumptions about the source, characteristics, and costs of replacement generation in the event of license denial.[13] Decommissioning costs are rarely taken into account.[14] Cost inflation is (intentionally) ignored, yet future costs are discounted at high rates which make no sense in the absence of inflation.[15]

FERC's economic analysis methods facilitate the inappropriate rejection of mitigation measures with large environmental, recreational, or other nonpower benefits. They also make license denial almost impossible, even when FERC openly admits that dam removal would be environmentally preferable.

I conclude that there are several ways FERC could improve its economic analysis. These include a greater use of market prices to evaluate replacement energy costs and use of a lower discount rate for future costs.[16] Decommissioning costs should be incorporated into both FERC's economic calculations[17] and its licensing decisions.[18] Perhaps most importantly, FERC should perform far more quantification of the dollar benefits (or costs) of the nonpower aspects of projects. Particularly where mitigation measures with both high dollar costs and large environmental benefits are involved, the current subjective balancing of dollars against environmental quality can be greatly improved.[19] FERC should focus on the forward-looking costs and benefits of projects, not their past costs, if only to avoid exacerbating stranded cost problems during this era of electric power restructuring.[20] Finally, FERC should reopen the possibility of letting overall project value affect licensing decisions, contrary to **Mead.** FERC should consider whether a project license should ever be denied or further conditioned in response to a strongly negative net project economic value.[21]

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[11] Section II.D.1.a.

[12] Section II.A.2.a.

[13] Section II.A.2.c.(2)(c)

[14] Section II.C.

[15] Section II.A.2.c.1.

[16] Sections II.E.1.c-d.

[17] Section II.E.1.a.

[18] Section II.E.2.a.

[19] Sections II.E.1.b., II.E.2.b., and II.E.2.d.

[20] Section II.E.2.c.

[21] Section II.E.2.e.

II. FERC's Economic Analysis

A. Economic analysis of power generation

1. What FERC analyzes

FERC generally analyzes overall project power economics from a licensee point of view, using total net cost as the measure.[22] Project impacts which do not accrue to the licensee (e.g., air quality benefits) are not included in the overall project economic analysis even when they have been calculated in dollar terms. This method fails to produce useful data from either a licensee or public point of view.

From a licensee point of view, the relative economic comparison is between the forward-looking costs of hydro operation and those of alternative power sources. Sunk capital costs just don't matter. That is why, as FERC finds itself repeatedly forced to acknowledge, licensees accept licenses which FERC has found to have negative economic value. Indeed, licensees themselves are proposing license conditions which either make economic projects become uneconomic (according to FERC)[23] or make uneconomic projects more so.[24]

From the public's point of view, forward looking costs and benefits are also the only ones that matter, but it is both licensee and public costs and benefits that matter. If imposing a given license condition on the applicant will produce a public benefit equal to or greater than the cost of that condition, then from the public's point of view FERC ought to do so. Only if the private cost to the applicant would be so large as to make the applicant abandon the license entirely (so that the public benefit would in any case not be attainable) should the license condition not be imposed.

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[22] In scattered cases that I have reviewed, FERC staff looks at the incremental costs of alternatives instead of or as well as their total cost. See for example, its analysis of the Sinclair Project in Georgia (FERC #1951; DEA, 10/95; Licensed 3/19/96), where the total project costs are identified only once (and are negative) but the incremental project economics are positive as proposed and slightly negative with the FERC staff conditions ultimately adopted. Ironically, the license decision for this particular project misattributes the negative incremental costs to the Applicant (when they are actually due to staff-proposed conditions) and fails completely to perceive that they are the incremental costs of a project that already has negative total net benefits.

[23] E.g., FERC project numbers 2306 (FEIS, 6/96), 2342 (FEIS, 10/96), 2406 (FEA, 10/95), 2529 (FEIS, 8/96), 2539 (DEA, 11/96), 2552 (DEIS, 11/95), 2569 (FEA, 9/96), and 2669 (DEIS, 2/96 and FEIS, 8/96). As shown in Appendix A, these are all projects which, according to FERC staff, have positive annual net benefits as currently licensed but would have negative ANB if relicensed as proposed by the licensees.

[24] E.g., FERC project numbers 2239 (FEIS, 6/96), 2255 (FEIS, 6/96), 2256 (FEIS, 6/96), 2283 (DEIS, 12/95 and FEIS, 7/96), 2291 (FEIS, 6/96), 2389 (DEIS, 11/95), 2404/2419 (FEIS, 8/96), 2475 (DEIS, 11/95), 10854 (DEA, 4/96), 11475 (DEA, 9/96), and 11482 (DEIS, 12/95 and FEIS, 7/96). These projects are all listed in Appendix A as projects which, according to FERC staff, have negative ANB as licensed today, but would have even more negative ANB if relicensed as proposed by the current licensees.

2. How FERC develops its power figures

a. Basic methodology

FERC relies heavily on its staff. In virtually every license decision, the economic figures which appear are taken from staff-prepared environmental documents (EAs, EISs). Dollar values in final documents (FEA's, FEIS's, and the licenses citing them) usually differ from those in the draft documents only because of changes in the mix of mitigation measures. Only occasionally, where market conditions have changed substantially, do the economic figures change in any basic way.[25]

The basic FERC methodology is to take the unamortized capital cost of the project and some financial assumptions (tax rate, interest rate, discount rate), and compute a levelized annual project capital cost over a 30-year period. To this are added annual O&M costs at current levels (thus assuming no future inflation), and the dollar costs of any proposed license conditions (both capital costs, converted to an annual figure, O&M costs, and opportunity costs associated with any change in project operation due to the proposed license conditions). The resulting total project cost is then subtracted from the cost of replacement power to produce the net annual economic benefit of the project. Replacement power costs are either current market costs or current construction plus O&M plus fuel costs of replacement generation. Any replacement costs which are capital costs are converted to a levelized annual cost in the same manner as project capital costs.

b. Basic assumptions

The key policy-driven assumptions in FERC's analysis are that no inflation will be included in the calculations, and that all generation would be replaced (i.e., no demand-side impact due to replacement power costs above project costs). The first of these assumptions is well-publicized; it is the crux of the **Mead** decision. FERC has justified dropping all inflation assumptions by pointing out, correctly, that it and everyone else has a terrible track record at trying to predict future inflation in general, let alone future inflation of specific components of power costs such as fuel.

The assumption that 100 percent of a low-cost hydro project's generation would have to be replaced with higher-cost power is reasonable for projects which make up only a small portion of the owner's portfolio. For projects owned by industrial facilities, however, it is likely that the owner would not replace, for example, 34 mill hydro power

[25] See, e.g. the Ripogenus project in Maine (FERC #2572), where staff indicated an alternative power cost of 83 mills/kwh (staff, DEIS, 11/94) but FERC used an alternative power cost of 74 mills per kwh in its license decision (License, 10/22/96). See also the Neal Shoals (FERC #2315) and 99 Islands (FERC #2331) projects on the Broad River in South Carolina, with alternate power costs of 60 and 38 mills/kwh respectively according to staff (DEA, 4/11/96) but 42 and 34 mills per kwh according to FERC (Licenses, 6/17/96).

with 74 mill purchased power on a kwh-for-kwh basis.[26] Surely there are demand-reducing measures with intermediate costs.

Other basic assumptions include the interest and discount rates used to levelize costs (typically 10 percent per year), the project life (30 years, per **Mead**), tax assumptions used to compute financing costs, and the replacement technology and its capital cost, financing and heat rate (used for projects assumed to be replaced with new generation).

c. Accuracy of the basic assumptions

i. Discount rate is wrong - it incorporates (implicitly) inflation

FERC staff generally uses a 10 percent discount rate assumption.[27] As others have pointed out, such an assumption is completely inconsistent with the use of uninflated dollars for other costs.[28] A more appropriate discount rate would be a real rate (net of inflation) in the 4 percent range. This would be consistent with the expected cost of money (net of inflation) to the Federal government when borrowed for 30 years.[29]

FERC might argue that it uses a discount rate based on the applicants discount rate, not a Federal discount rate. Doing so would be inappropriate (see discussion below about use of a societal perspective rather than an applicant perspective). But even if that is what FERC is doing, a 10 percent discount rate is still too high for virtually all applicants. FERC routinely sets a corporate cost of capital in electric rate proceedings which is in the 10-12 percent range, including inflation. That implies a discount rate, net of inflation, well below 10 percent.[30] There is just no plausible way that 10 percent is an appropriate discount rate to use in a no-inflation analysis.

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[26] The particular numbers are from the Penobscot Mills and Ripogenus projects in Maine (FERC #s 2458 and 2572; licensed 10/22/96).

[27] However, FERC staff's uses a 7 percent discount rate in its analysis of the Cushman project in Washington (FERC #460; DEIS, 11/95, p. 5-7), and 8 percent in its analysis of the White Rapids Project in Wisconsin (FERC #2357; DEIS, 11/95, p. D-4).

[28] Intervenor comments on Edwards project in Maine, FERC #2389, 3/96.

[29] The government has just started selling bonds with an inflation-adjusted yield. These bonds provide a direct measurement of the long-term risk-free cost of money, a good proxy for an appropriate Federal discount rate. The first $7 billion of inflation indexed 10-year bonds currently yield 3.465 percent per year, net of inflation (New York Times, 3/18/97, p. C20). This implies a 30-year inflation-free yield of about 4 percent. Actual 30-year inflation-adjusted bonds are proposed to be sold by the Treasury later in 1997.

[30] For 10-year Treasury bonds, where markets now exist for bonds both with and without an inflation adjustment, the yield differential is currently 3.25 percent per year (6.71 percent/year unindexed versus 3.46 percent/year indexed for inflation; New York Times, 3/18/97, p. C20). This implies that FERC should reduce its discount rate by 3.25 percent for any net-of-inflation analysis, compared to the discount rate it would otherwise use.

ii. Alternative power costs are all over the lot

FERC explains in the **Mead** decision that its alternative power analyses are not intended to be "a comprehensive analysis of a licensee's true alternative cost of power, i.e., an analysis of ... the power which, but for the hydroelectric power, the licensee otherwise would construct or purchase."[31] On the other hand, the alternative power analysis is certainly nothing **other** than an analysis of the cost of "the power which, but for the hydroelectric power, the licensee would construct or purchase." The disclaimer in **Mead** is apparently a disclaimer of the comprehensiveness of the analysis, not its subject. Accordingly, the comments below address only very broad-brush ways in which existing alternative power analyses have incorporated inaccurate assumptions, not ways in which a more "comprehensive" analysis might do better.

(a) Some alternative power cost analyses are fine, within the limits of the Mead decision

Where applicants are part of regional pools or are closely interconnected with large regional suppliers with well-known selling prices, FERC has begun to use those prices. For instance, in licensing the Enloe Dam project in Washington (FERC #10536) FERC used BPA new resource costs (of 28 mills/kwh) as the alternative power cost, superseding much higher figures which had appeared in the EA.[32]

With implementation of FERC Order 888 and state-by-state restructuring, market prices for electricity will be available nationwide. Use of market prices should supersede use of generation proxy costs, since the latter are merely FERC's guess at which of a variety of alternatives would determine the cost of replacement power.

(b) Non-utility power costs are arguably too high

When analyzing alternative power costs for non-utility applicants, the clear temptation is to use the retail price of electricity which those applicants pay for any grid-supplied electricity they buy. This can produce alternative power costs far above those of a utility. The reason is that the alternative power costs which are normally used are wholesale costs of generation, whereas tariff prices are retail prices that include distribution and transmission costs. With the general unbundling of prices likely to occur as part of restructuring, retail prices for just generation should become available (they will exist in California by 1998). Thus future FERC cases involving non-utility licensee's should no longer use bundled retail prices as alternate power costs.

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[31] Mead, 7/13/95, p. 8, fn. 9.

[32] License for project 10536, 9/13/96, p. 38. In dollar terms, FERC's reanalysis turned a staff-estimated net project **benefit** of $1.28 million per year into a Commission-estimated net project **cost** of $0.77 million per year.

(c) Alternative power costs based on new construction are sometimes too high, and are increasingly irrelevant

In numerous cases, FERC bases the cost of alternative power supplies on the cost of building a new generation facility, either a combined cycle plant (CC) or a combustion turbine plant (CT). Gas-fueled CCs and CTs are indeed the predominant source of new generation now being built and planned in the U.S., so using them as proxies for alternative power supplies is not unreasonable. However, in some cases FERC has used cost assumptions which seem quite unreasonable (e.g., fuel prices that are too high, heat rates that are too low, life cycles that are too short, and capital costs that are too high). It is also unclear whether FERC has been reasonable in choosing whether to use a CC or CT as the proxy in various cases. The appropriate one to use is the lower-cost one, since that is what an applicant would build if it were actually denied a license and were then to build a CC or CT for replacement power. Which one is lower cost is a project-specific question, but answering it does not require the kind of excessively detailed analysis which FERC rejected in **Mead.**

However, where market prices are available, FERC does not even have to try and predict whether CCs or CTs would be the cheaper source of replacement power, or if some other source would be cheaper yet. The market price directly supplies the required information as to the cost of replacing the hydro plant in question. Thus, the whole issue of proxy plants as a source of alternative power costs should increasingly become a non-issue.

(d) Alternative power costs that ignore current surpluses are too high

FERC assumes that replacement power costs would include the cost of replacing 100 percent of both the energy and capacity of the project in question. For an applicant with excess capacity, license denial would require replacement energy but not immediate replacement capacity. In the U.S. today, particularly in the West, many utilities have excess capacity. Thus, the appropriate cost to use for alternative power cost analyses should be the current cost of energy plus the cost of capacity **bought at some time in the future**, and appropriately discounted back to the present.[33] As discussed in the previous section, the source of energy and capacity costs can be market prices rather than proxy values based on construction and operation costs associated with particular technologies which may or may not be the least-cost option.

d. Impacts of basic assumptions

As discussed above, FERC has licensed (or FERC staff has proposed licensing) every one of the 90+ projects I have reviewed. None of the assumptions affect the results in terms of whether projects get licensed. None of them should affect the results, according to **Mead**, in terms of what mitigation measures to require. Variations in

[33] In at least one case FERC has done exactly this kind of discounting, where a capital cost (in this case, an upstream fish passage facility rather than an alternative power source) would not be incurred for some years after relicensing). See the Menominee River Multiple Project DEIS, 11/95, p. D-4.

assumptions do affect the results in terms of what the calculated net project benefits will be or what the calculated costs of decommissioning would be if they were calculated.

The discussion below addresses how specific changes in economic assumptions would affect the results of FERC's economic analyses as they are now performed.

i. Fossil fuel inflation would make hydro project economics look better.

Many energy analysts (myself among them) believe that long-term fuel price inflation will outpace general inflation. This means that FERC, by ignoring inflation in post-Mead analyses, has understated the relative cost of nonhydro power sources. If so, FERC is overstating the benefits of proposed projects.

ii. Lower discount rates raise the total cost of any alternative considered.

Using a more correct discount rate would increase the levelized cost of both hydro and nonhydro projects. Only if different alternatives have different expense paths over time do the relative merits of alternatives change. Correcting discount rates will tend to increase the attractiveness of alternatives with large near-term costs relative to alternatives with ongoing costs or back-loaded costs.

iii. CC/CT cost assumptions overstate fuel costs (so far, but not necessarily in the future) and understate heat rates and (sometimes) plant life.

The various errors in CC/CT cost assumptions which I believe have occurred in FERC analyses have partially offsetting effects. Extremely low heat rates[34] make gas-fired powerplant costs look too low. Noncurrent gas prices make them look too high. Assuming lifetimes of less than 30 years makes gas-fired powerplants look more expensive than they really are. The net impact varies but I believe tends to be an overstatement of alternative power costs and thus an overstatement of project benefits.

e. Consistency of FERC's analysis

i. Consistent with Mead in ignoring inflation

FERC has been very consistent in the post-Mead cases in omitting inflation from its analyses of both project costs and alternative power costs. The only place in which inflation has continued to enter into FERC's economic analyses is in the use of a 10 percent discount rate, as discussed above.

ii. Generally consistent in quantifying total cost and not incremental cost

[34] 6200 Btu per kwh in several cases, which is beyond current technology on a total cost basis, albeit sometimes achievable on a marginal cost basis.

FERC has been generally consistent (with a few exceptions) in quantifying total costs and not marginal costs. Unfortunately, as discussed elsewhere in this paper, a focus on total costs is misleading.

iii. Not too consistent on alternative power cost

FERC's alternative power cost analyses have not been very consistent. The alternatives used vary as to technology (CC, CT, purchase), fuel price, and heat rate. Some of this variation, perhaps most of it, is appropriate in terms of the varying alternatives faced by different applicants. However, there is generally no explanation of why FERC staff has chosen one alternative over another as the alternative whose cost will form the basis for the alternative power analysis.

B. Economic analysis of nonpower values

1. Failure to perform analysis

There is a well-established literature on the nonpower costs and benefits of dams. HRC has specifically requested that I not focus in this paper on how to do nonpower economic analysis, but rather on how FERC incorporates nonpower values into its analysis. The answer is simple: FERC does virtually no quantitative analysis of nonpower values in dollar terms, yet routinely "balances" the dollar costs of nonpower mitigation measures against their environmental benefits.

How can FERC "balance" without analysis? Usually just by assertion. Measures are repeatedly adopted or rejected in environmental documents based on staff's judgment that their economic costs outweigh their non-economic benefits, without any attempt to quantify their non-economic benefits in dollar terms.[35] In other cases, mitigation measures are rejected because they have "high" costs, without any analysis of whether they may also have high benefits. In yet other cases, benefits are asserted to be low or hard to measure, and are rejected on that basis, even when there is quantitative analysis from intervenors which **does** express benefits in dollar terms. Since the measures so rejected tend to be high-cost measures, it is tempting to believe that what is really going on is a rejection based on cost that is just being described as a rejection based on lack of environmental benefit in order to hide the absence of any true balancing of costs against benefits.[36]

Finally, some measures are rejected based on cost relative to net overall project benefits. For example, an October 1996 FERC license for the Penobscot Mills project (FERC #2458), finds that the project as licensed will have a net positive benefit to the licensee of 39.62 mills/kwh,[37] yet rejects a measure to create salmon habitat[38] which would cost 2.44 mills/kwh on the grounds that "the modest fisheries benefit likely to

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[35] In other words, FERC will say something like, "this measure costs $1 million but will only protect a few fish, so it is not worth the cost." Imagine if FERC were to say, "this project will cost $1 million but will only produce a few megawatts, so it is not worth the cost," without making any attempt to express the power value in dollar terms as well as Mw terms. Without quantifying the value of the benefit in dollars, how can FERC say that a given dollar cost is too much to spend for a given benefit, whether that benefit is a power benefit **or** a non-power benefit?

[36] The next paragraph may give an example of this. In that proceeding, FERC staff in its environmental analysis and FERC in the license asserted the environmental benefits of the proposed measure would be small, without ever quantifying them in terms of either an environmental parameter or a dollar value. Appendix A lists proposed modifications of project licenses which I have identified that would have a dollar cost greater than 10 percent of the gross (not net) dollar benefits of project generation, and shows that two-thirds of the proposed modifications were proposed (by FERC staff) to be rejected (some of the one-third that were accepted represent mandatory conditions pursuant to FPA sections 4(e) and/or 18).

[37] License, 10/22/96, p. 33.

[38] The measure, a 350-cfs flow in a now-dry channel, is already a restricted version of measures proposed by other Federal agencies and rejected after 10(j) consultation.

occur" does not justify "the **significant** adverse impact on the project's energy benefits."[39] But FERC makes no effort whatsoever to explain why a 2.44 mill/kwh (6 percent) benefit reduction would be "significant" for the project with the greatest net benefits of any of the 18 post-Mead licenses I have reviewed. It also makes no effort to explain why the cost of a mitigation measure should be compared to the net benefits of the project as a whole (rather than to the non-power benefits of the particular measure). After all, by that standard, a project with a negative net economic benefit would not be able to have any mitigation measures at all as license conditions.[40]

a. Nonpower values are rarely measured in dollar terms

With the exception of air quality (see next section), the FERC documents I have reviewed have virtually no quantification of any nonpower value in dollar terms. I describe some exceptions in section c., below. In contrast, the three intervenor documents I reviewed each quantified nonpower values which were larger than the cost of achieving them.[41]

b. Air pollution values are most often quantified, but the quantitative results are not incorporated into the rest of the economic analysis

Air pollution values are by far the most frequently quantified nonpower value. In many cases, FERC calculates the tons of certain air pollutants whose emission is avoided by the project in question, and then calculates the dollar cost of preventing the emission of that many tons of pollutant. The result is a dollar valuation of the benefit of the project in terms of air pollution avoidance. While there are various theoretical objections to FERC's methodology,[42] it is certainly a reasonable approach.

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[39] License, 10/22/96, p. 24 (emphasis added).

[40] In Mead itself, FERC adopted license conditions which it estimated would reduce the net economic benefits of the project by over 35 percent, compared to the Applicant's proposed conditions. See Appendix A.

[41] In the North Georgia project relicensing (FERC #2354), the Georgia Conservancy quantified the dollar benefits to tourism of reviving Tallulah Falls. In the Edwards project relicensing in Maine (FERC #2389), intervenor analysis quantified the dollar value of the fishery which would result from dam removal. In the Condit project relicensing in Washington, American Rivers' experts quantified the dollar benefits of a variety of nonpower benefits (commercial and sport fishing, recreation, and others) which would accrue from dam removal.

[42] It assumes the value of pollution control equals the cost of control. The real value of pollution control is in the avoided health and environmental consequences of pollution. If pollution control laws are being implemented rationally (from an economic point of view), that real value will be greater than the cost of control. If pollution control laws are **not** being implemented rationally, then the cost of control is **more** than the value of control. Likewise, FERC analyses assume values for the emission rates of the resources which would be used if the project in question were not licensed. Whether FERC is correctly identifying either the marginal resources which would replace a given hydro project, or their emission rates, is subject to question.

The trouble is, the resultant dollar values are not used for anything. They are not incorporated into the calculation of net project benefits, because FERC does that on an applicant basis rather than a societal basis. They are not incorporated into a 10(a) balancing calculation, because there are no other environmental consequences of the project which have been calculated on dollar terms so as to be comparable with air quality benefits and project net power costs. They are just calculated and printed.

1. In a few cases FERC has quantified nonpower values other than air pollution

In individual proceedings FERC has quantified in dollar terms the nonpower values associated with fish entrainment (and its avoidance),[43] fish passage benefits,[44] cabin rentals,[45] and recreation benefits.[46] Fish entrainment values, where calculated, are used to provide a quantitative basis for rejection of fish screens or other physical measures to prevent fish entrainment.[47]

2. Use of nonpower economic values in FERC analysis

   a. Individual measures with nonpower values are adopted without an economic analysis on an ad hoc basis

Measures intended to increase nonpower values are routinely included in licenses as conditions, but the basis for doing so appears to be qualitative and ad hoc. Just to give one example, the DEIS for four projects on the Menominee River includes a package of mitigation measures which "would enhance fisheries and recreation values," while conceding "the effects cannot be quantified, but we do not expect them to be significant ...."[48] Subsequently the DEIS purports to show that inclusion of this package of measures

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[43] FERC projects #1267 (FEA, 10/5/95, p. 140), 2315 (License, 6/17/96, p. 15), 2331 (License, 6/17/96, p. 8), 2402 (License, 8/29/95, p. 15), 2406 (FEA, 10/5/95, p. 127), 2465 (FEA, 10/5/95, p. 134), 2506 (License, 7/13/95, p. 21)
The 6/96 Wisconsin River Basin FEIS in Wisconsin (FERC #s 1999, 2113, 2212, 2239, 2255, 2256, 2291, 2292, 2476, 2590) rejected fish screens after an analysis that quantified the dollar value of avoided fish entrainment.

[44] Cushman project in Washington (FERC #460; DEIS, 11/95, p. B-21, Table B-7).

[45] Condit project in Washington, FERC #2342 (DEIS, 11/95, p. 4-93, and FEIS, 10/96, p. 4-96).

[46] Wisconsin River Basin projects in Wisconsin (FEIS, 6/96, p. 4-98, Table 4-14; see also p. 4-168).

[47] FERC projects #2315 (License, 6/17/96, p. 15, rejecting fish screens), 2331 (License, 6/17/96, p. 8, rejecting fish screens), 2402 (License, 8/29/95, p. 14, rejecting fish screens), 2406 (FEA, 10/5/95, p. 144, rejecting fish screens), 2506 (License, 7/13/95, p. 22, rejecting a barrier net and sluiceway). The 6/96 Wisconsin River Basin FEIS in Wisconsin (FERC #s 1999, 2113, 2212, 2239, 2255, 2256, 2291, 2292, 2476, 2590) also rejected fish screens after an analysis that quantified the dollar value of avoided fish entrainment.

[48] Menominee River Multiple Project DEIS (FERC #s 2536, 2357, 2394, 2433), 11/95, p. 4-58.

is worthwhile by including a table ranking the various alternatives on their combined economic and environmental benefits.[49] But the table simply assigns an equal weight to each category included, and contains six environmental categories but only three energy or economic categories. So environmentally preferable alternatives automatically get a higher ranking than economically preferable alternatives. This benefits the environment in this particular case, but the table could also have been constructed to give the opposite result.[50]

b. The costs of measures are included in net benefits analysis

FERC's reluctance to quantify the dollar value of mitigation measures does not extend to quantifying their costs. For each measure included in a particular alternative, FERC tries to quantify the dollar cost of implementing that measure. Thus, in the example given in the preceding paragraph, the dollar costs of the staff-proposed mitigation measures are included in the economic analysis of the staff proposal.[51]

3. Consequences of not quantifying nonpower values in dollar terms

By not estimating the economic value of nonpower attributes of the projects it reviews, FERC incorrectly rejects high-cost mitigation measures which would also have large nonpower benefits.[52] At the same time, it may be accepting "routine" low-cost "mitigation" measures whose nonpower benefits are even lower than their cost. In reviewing measures proposed by agencies under FPA sections 10(a) and 10(j), FERC rarely rejects a low-cost measure.

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[49] Menominee River Multiple Project DEIS, 11/95, p. 5-18, Table 5-8.

[50] For example, if economic benefits had been divided into capital costs and annual costs, and total energy and capacity had been split into separate categories, and the six environmental categories had been aggregated into three, then the results of the table could have been reversed.

[51] Menominee River Multiple Project DEIS, 11/95, p. 4-57.

[52] See, for example, the sport fishing, recreation, and Native values associated with dam removal on the Condit project in Washington (FERC #2342), which FERC acknowledged exist but did not quantify (DEIS, 11/95). Intervenor analysis by HRC members found that, by quantifying these values in dollar terms, and correcting other FERC staff errors, the dam removal option changed from 82 mills per kwh more expensive than relicensing with staff conditions (DEIS) to 20 mills per kwh cheaper than relicensing with staff conditions (Intervenor analysis, 3/5/96). The FEIS responded to comments on the DEIS by changing the quantification of power benefits, which made dam removal 34 mills/kwh more expensive than relicensing instead of 82 mills/kwh more expensive (FEIS, 10/96, p. 5-18). But the FEIS continued to leave non-power values out of its economic analysis, despite the fact that others had quantified them in economic terms and staff acknowledged their importance: "dam removal ... would also produce substantial, permanent, environmental, recreational, and cultural benefits that are not included in our economic analysis." (FEIS, 10/96, p. 2-33).

In another example, intervenor quantification of potential tourism benefits at the North Georgia project (FERC #2354) showed that the economic benefits of restoring Tallulah Gorge flows would outweigh the power benefits of the project (Georgia Conservancy, 12/28/95). FERC staff, without benefit of quantitative economic analysis, proposed partial restoration of flows using intuitive but unquantitative analysis to decide the level of flow restoration to propose (DEIS, 10/95, FEIS, 6/96). FERC adopted Staff's proposals (License, 10/3/96).

Most importantly, the absence of nonpower economic analysis means that FERC has abdicated to its staff's intuition and prejudices the balancing of economics and the environment which it admits is its duty under section 10(a). By simply writing in an EA or EIS that a given measure is too expensive relative to its benefits, or has benefits too uncertain relative to its costs, staff gives the Commission the ability to avoid imposing controversial mitigation conditions without any quantitative basis for doing so.

C. Decommissioning analysis

1. Present practice

FERC has made clear that it will not normally order decommissioning or decommissioning funding.[53] In particular cases, it has even refused to order **studies** of the cost of decommissioning.[54] Thus, the decommissioning analysis in almost all FERC proceedings is minimal at best, usually just a rejection of the decommissioning alternative with a citation to the Commission's policy statement of 12/14/94.[55]

At the same time, FERC has made clear that, for relicensings, the alternative to license approval is decommissioning,[56] that decommissioning can be expensive, and that the expense of decommissioning may cause licensees to accept a license with conditions which would be economically untenable in the case of a new license.[57]

2. Consequences of present practices

Without knowing the cost of decommissioning, FERC cannot actually identify whether either the public or the applicant will gain economically from the granting of a license.

The reason is simple. In the absence of a license, decommissioning will have to occur. Licensing therefore saves the cost of alternative sources of power (as FERC knows, and routinely **does** include in its economic analysis of project net benefits), but it also saves the cost of decommissioning. That is one reason, as FERC has acknowledged, that applicants can be willing to accept licenses whose FERC-computed net benefits are

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[53] FERC, Policy Statement, 12/14/94. The Policy Statement also makes clear that "decommissioning" can refer to any of a range of alternatives, from just shutting down turbines to physically dismantling all project features and restoring the affected environment to its pre-license condition.

[54] E.g., FERC projects #1862 (FEIS, 7/96), 2402 (License, 8/95), 2404/2419 (FEIS, 8/96), 2506 (Mead)(FEA, 7/95), 2357/2394/2433/2536 (DEIS, 11/95), and 11291 (DEA, 12/96). See Appendix A.

[55] FERC, Docket RM93-23-000. In that policy statement FERC affirmed its authority to order decommissioning (with Commissioner Bailey arguing in dissent that it had no such authority), but found that it would generally not require a decommissioning fund (Policy Statement, pp. 33-34) and "where existing projects are involved, license denial would be rare" (Policy Statement, p. 2).

[56] Policy statement, 12/1/4/96, p. 3: "In those instances where it has been determined that a project will no longer be licensed ... the project **must** be decommissioned." (emphasis added)

[57] Mead, 7/13/95, p. 8.

negative. Applicants know that they are saving decommissioning costs, so that an apparently negative-benefit license is still a better deal for them than no license at all, and the associated decommissioning costs.

D. Use of economic figures in decisionmaking

1. How FERC uses its economic analysis

a. License issuance

FERC staff usually summarizes its project-level economic analysis by providing data on the cost of alternative power and the net cost of the overall project under three or four scenarios. These scenarios consist of relicensing with no additional mitigation (no-action) and relicensing with applicant-proposed mitigation, staff-proposed mitigation, and, where applicable, intervenor- or agency-proposed mitigation. Cost data are provided in terms of either dollars and/or mills/kwh.

No use is made of the figures which result from the project-level economic analysis. As FERC warned in **Mead**, negative net benefits are not a grounds for license denial. In 40 percent of the cases I have examined, FERC staff finds the project to have a net negative value with either the applicant-proposed or the staff-proposed mitigation.[58]

Licensing decisions echo the FERC staff analysis, usually reporting just the cost of replacement power and the net value of the project as licensed. Once again, negative values for projects are simply reported, and not given any weight towards affecting the licensing decision. At most, the license decision includes language explaining that applicants may choose to decline a license, or may accept a license with negative economics because their own economic analysis is more favorable than FERC's. Given FERC's use of total cost rather than marginal cost, and FERC's failure to consider the decommissioning costs associated with rejecting a license, it is in fact **not** surprising that applicants accept such licenses. It's FERC's economic analysis that is at fault, not that of applicants who accept licenses with conditions leading to (according to FERC) negative net benefits.

There is a clear policy bias toward issuing a license in all cases. FERC is clearly willing to condition licenses, perhaps even to the point that an applicant will reject one,[59] but has consistently shied away from taking the position that there is any project whose impacts cannot be mitigated.

b. Choice of mitigation

On individual mitigation measures, there is no clear policy. De facto policy appears to be to start from the Applicant's position, add agency mitigation pursuant to FPA sections 4(e), 10(a), 10(j) and 18, and then make adjustments from there. FERC is

[58] See Appendix A. The staff-calculated ANB is negative for 37 out of 91 projects in either the licensee-proposed case or the staff-proposed case.

[59] As both Tacoma Public Utilities and Pacificorp (in its comments on the Condit DEIS, FERC #2342) have threatened publicly.

clearly willing to reject agency-proposed mitigation based on cost,[60] and routinely rejects or ignores intervenor-proposed mitigation measures.

2. Consistency and trends

a. License issuance

As discussed above, FERC is completely consistent from one case to the next with regard to license issuance: no projects are rejected on economic grounds.

b. Choice of mitigation

FERC is all too consistent in giving short shrift to intervenor positions. It is curiously inconsistent in its responses to agency-proposed mitigation. On the one hand, it will reject agency-proposed mitigation based on assertions that the proposed measure has not been shown to provide environmental benefits, or that the benefits are too uncertain compared to the costs. On the other hand, it will accept agency-proposed mitigation even when it clearly believes the agency proposal is both costly **and** environmentally counter-productive.[61] How FERC decides when to reject agency positions it does not believe, and when to accept them anyway, is not at all clear.

After reading numerous FERC environmental documents, there seems to be a certain sameness to them. Perhaps in response to regulatory pressures to cut staff and streamline licensing, FERC staff seems to focus on deciding which agency-proposed conditions to accept.[62] Intervenors are given less attention, or their alternatives are rejected outright without detailed analysis.[63] If this pattern continues, FERC could end up

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[60] Appendix A has a column listing mitigation measures which FERC or its staff has rejected on grounds of their cost (as opposed to measures rejected on the grounds that they are ineffective or that data as to their effectiveness is inadequate). Of course, FERC's authority to reject agency-proposed measures only applies to those measures proposed pursuant to FPA sections 10(a) and 10(j).

[61] Nisqually FEIS (FERC #1862), July 1996. In this FEIS, FERC staff finds that increasing minimum flows from 5 cfs to 30 cfs in the LaGrande bypass reach "would place anadromous fishery production at risk" (p. 4-49), agrees with 10(j) recommendations that it do so anyway at an annual cost of $247,600 (p. 6-10), and then explains to the Nisqually Indians (who object to a 30 cfs minimum flow) that "we agree with your concerns" but are adopting 30 cfs anyway "in deference to the expertise of the resource agencies" (p. A-60).

[62] Virtually every FERC NEPA document contains a list of agency recommendations under FPA sections 10(a) and 10(j) and identifies which ones were accepted and which rejected. The great majority are accepted, although high cost measures are usually rejected. See fn. 37, supra.

[63] For example, run-of-river operations as a potential condition on the Nisqually project (FERC number 1862) are rejected in the FEIS with a two-paragraph discussion based on four reasons: "adverse effects on power production and downstream instream flow requirements and the loss of downstream flood protection benefits, and because no state or federal fish and wildlife management agency recommends ROR operation" (p. 2-10), despite the fact that FERC had previously promised to analyze a run-of-river flow regime (pp. A-72, A-73).

Of the four reasons given for not analyzing the ROR option, cost should have been irrelevant since a quantitative analysis would have shown that an 85 gwh reduction in output (pp. 2-9, 2-10) would cost under $2.4 million per year with FERC's energy values (p. 5-7), and the net annual benefit of the project is over $10 million. Similarly, the staff's concerns about the economic cost of lost capacity in late summer (p.

simply approving all applications with the addition of all low-cost agency recommendations. FERC's decisionmaking role would be reduced to arbitrating between conflicting agency recommendations when they occur, and deciding which of the higher-cost agency recommendations to reject on the grounds that their (unquantified in dollar terms) environmental benefits are less than their (quantified) economic costs.

E. Recommendations

1. Changes to present analytical practices

a. Decommissioning analysis

What can FERC do, short of revisiting its policy statement on decommissioning? One simple analytic measure would be to include the cost of decommissioning in its economic analyses even if it is not going to be included as a license condition. Analysts may argue that the cost of decommissioning 30 years in the future will be low in current terms; that's fine, but it's not zero.

Analyzing decommissioning without requiring decommissioning funding would be consistent with FERC's policy statement on decommissioning. FERC routinely analyzes other mitigation measures which it does not adopt, and it routinely analyzes the cost of replacement power which the Applicant will not actually buy if the license is granted. Analyzing decommissioning would allow FERC to find those few cases where license denial is appropriate.[64]

b. "Balancing" pursuant to FPA section 10(a)

2-10) are economically trivial since late summer is a time when the Northwest has immense capacity reserves relative to demand. Even using FERC staff's own summer capacity values and assuming a further loss of 30 Mw of capacity above the 9 Mw already assumed by staff from already-proposed measures (p. 5-4), the economic cost of loss capacity in late summer would be under $170,000 per month. So the total economic costs staff refers to but does not quantify (p. 2-10) are at most 1/4 of the net power benefits of the project. The alleged negative impacts on downstream flow requirements are apparently entirely spurious, since the previous description of those requirements specifically says that they can be less when natural inflow is less (p. 2-5, Table 2-1, fn. 2).

As for lost flood control benefits, there is no analysis whatsoever of what impact if any the alleged loss of flood control benefits would have.

In short, staff appears to have rejected the ROR option out of hand not on its potential merits, which are never identified or analyzed (but at least some of which must exist, or no one would have raised the issue), and not on its demerits, but primarily because no **agency** requested it. Whether agencies would have supported ROR operations if offered as an option is a question that appears not have occurred to FERC staff.

[64] FERC, Policy Statement, Docket RM93-23-000, 12/14/94, p. 2: "The Commission anticipates that, where existing projects are involved, license denial would rarely occur." Without quantitative analysis, it is hard to see how FERC could **ever** find that decommissioning was preferable under section 10(a) to relicensing with conditions. At an absolute minimum, decommissioning costs should be analyzed for any project whose net economic benefits are otherwise computed by FERC to be less than zero.

FPA section 10(a) requires FERC to balance different values, power and non-power, in evaluating whether to issue a license. The same balancing is applied to individual mitigation measures. This balancing is currently occurring, in principle. FERC routinely says a given measure is included because its environmental benefits outweigh its costs, or is rejected because its benefits do not outweigh its costs.[65] But there's normally no quantitative analysis. When there is, it sometimes consists of measuring the economic cost of the measure against the economic benefits of the project (a non sequitur) instead of against the environmental benefits of the measure.

By expressing at least some non-power values in dollar terms, as it already does for the power output of projects, FERC would be able to do less apples-to-oranges comparisons under its balancing mandate, and more apples-to-apples comparisons. This would not be a change in policy, but only in analytical methodology. FERC already converts power values from their natural energy and capacity units (Mw and kwh) into dollar terms; it would just be doing the same thing for fish, recreation, and other non-power products which dams produce or could produce.

FERC may argue that nonpower values are not easily measured because "no direct market exists for most nondevelopmental resources."[66] "Most" is not "all." There are river-based resources other than power that are market-priced resources, commercial fisheries and commercial rafting for example. Others have well-developed methodologies for computation of their economic value, such as recreational benefit analysis.[67]

Where standard methods exist, and where the nonpower resource is itself a commercial resource with prices, there is no reason not to convert nonpower values (e.g., user-days of whitewater rafting, pounds of fish caught by commercial fishermen) into dollar terms. In particular, when another party has already done the analysis, there is really no excuse for FERC not to provide dollar values.[68]

c. More appropriate discount rates

The use of a 10 percent discount rate greatly understates the value (in current dollars) of money spent in future years. Use of a lower discount rate would, I believe, be more appropriate from a policy point of view. It would also be consistent with FERC's

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[65] In at least one case, FERC staff has proposed a mitigation measure despite believing it has both negative environmental consequences **and** economic costs. See the discussion in a footnote below of FERC staff's proposed adoption of a 30-cfs minimum flow for the LaGrande bypassed reach of the Nisqually River (Nisqually project, FERC #1862, FEIS, 7/96). FERC staff proposes to adopt an agency-proposed measure under FPA section 10(j) which the FEIS says is both bad for fish and expensive (Nisqually FEIS, pp. 4-49, 6-10, A-60, A-91).

[66] FERC, North Georgia project (FERC #2354) FEIS, 6/96, p. F-80.

[67] For example, FERC did a quantitative analysis of the dollar benefits of recreation in the Wisconsin River Basin FEIS in June 1996 (pp. 4-156, 4-157).

[68] In both the North Georgia (FERC #2354) and Condit (FERC #2342) FEIS's, FERC staff criticized quantitative analysis by intervenors which converted nonpower values into dollars, yet provided no alternative analysis of its own.

attempt in **Mead** to get out of the inflation-forecasting business, particularly now that market-based inflation-free interest rates can be directly observed.

d. Use power values reflecting regional marginal costs - obviates need for thermal alternative analysis with potential flaws (see e., below, re thermal plant analysis)

In **Mead**, FERC decided that forecasting the future cost of fuel was beyond its capabilities. It does not appear to do much better at forecasting the technology whose costs it should use a proxy for the value of hydro generation, or at analyzing the technical characteristics of that technology. By simply using market prices for replacement generation, FERC can step around the whole problem of identifying a proxy generation source and pricing it.

e. Better analysis of thermal alternatives

i. Reconsider project life for thermal alternatives

FERC appears to assume a project life for some thermal alternatives of less than 30 years. This is unrealistic - even combustion turbines are being kept in service for 30 years these days. To the extent hydropower is valued at the cost of a thermal alternative, and the thermal alternative is assumed to need replacing during the term of the hydro license, then FERC is overstating the cost of the thermal alternative and hence overstating the value of hydropower.

Changing to a market price methodology rather than a thermal alternative methodology, as FERC has done in recent cases,[69] automatically eliminates any issue over thermal project lifetime. If FERC does use a thermal project alternative to value hydropower, use of a longer thermal project lifetime will result in lower alternative power values, and hence lower net project benefits in FERC's calculations.

ii. More appropriate heat rates and fuel costs for thermal alternatives

If FERC continues to use thermal alternatives to calculate power values, it could improve its analysis by using more realistic heat rates and fuel prices. This issue was discussed in the intervenor testimony in the Edwards case (FERC #2389).[70]

Part of the problem may simply be regulatory lag. Lengthy delays in licensing proceedings can result in FERC documents citing historical data which is several years out of date, which in the case of fuel prices can mean substantial errors which could be easily fixed by using more recent data. The errors in heat rates are harder to explain. If FERC staff is intentionally assuming very low heat rates on the grounds that, over the projected license term, heat rates are expected to improve, they are correct in their

[69] E.g., for the Nisqually (FERC #1862, FEIS, 7/96) and Condit (FERC #2342, FEIS, 10/96) projects.

[70] Richard B. Parker, "Economic Analysis of Edwards Project Alternatives: a critique of the FERC DEIS," March, 1996, pp. 13-17.

expectation but are violating the **Mead** case direction to do analysis based on present facts and not future projections. It is no more consistent with **Mead** to project heat rates in future years than to project inflation rates in future years.

iii. More careful choice of thermal alternatives - e.g., CTs vs. CCs

Combustion turbines (CTs) differ from combined cycles (CCs) in being cheaper to build, but more expensive to run. The choice of one over the other depends on the capacity factor at which they are going to be run. For operations only a few hours per year, a CT will be the cheaper choice because its higher fuel costs will only be incurred a few hours per year and will be outweighed by its lower capital costs. As plant use increases, the cost advantage of CTs over CCs diminishes, and CCs can become less expensive at some capacity factor.

In choosing a thermal alternative in cases where a thermal alternative is used to value hydropower production, FERC does not appear to have been careful in choosing between a CT and CC. While the **Mead** decision correctly states that the real-world choice of generation (or non-generation) energy technologies is complex, a simple static analysis[71] could easily be performed by FERC in individual proceedings where staff needs to choose between CCs and CTs. Specifically, FERC staff could look at the expected capacity factor of the hydro project being analyzed, and quickly compute whether a CC or CT would be less expensive at that particular capacity factor. The thermal alternative for analytical purposes would then be the cheaper of the two.

The result of a more careful choice among thermal alternatives could only be a lower power value or the same power value as at present. This analytical improvement would thus tend to make calculated hydro project net benefits smaller.

2. Policy changes

a. Decommissioning

There are several actions the Commission can take to reflect the real possibility of decommissioning, whether sooner or later, which will not require changing the existing policy statement.

i. Include future decommissioning costs as part of economic analysis - even if heavily discounted

FERC should start including future decommissioning costs as part of the cost of a project in evaluating project economics. Relicensings are not forever. Even if project owners are excused from pre-funding decommissioning, on the grounds that their financial solvency is not in doubt, they will still have to pay decommissioning costs at the

[71] A static analysis is one which ignores how the CC or CT would fit into the rest of the utility system, and ignores how operations might change over time. It simply assumes a fixed capacity factor for all years and calculates the resulting cost. This is what FERC already does in its thermal alternative analyses.

end of their license term.[72] FERC has emphasized that it "will not accept the lack of adequate preparation as justification for not decommissioning a project."[73] Surely a quantification of the future cost of decommissioning is a prerequisite to "adequate preparation." Without it, FERC can hardly say that it has accurately analyzed the economic consequences of license approval.

The fact that decommissioning costs 30 years in the future will be greatly minimized by the discounting process is true, but is no reason to ignore them, particularly if discount rates of less than 10 percent are going to be used (see discussion above regarding discount rates).

ii. Measure economic value against the current cost of decommissioning, since that's the alternative to license approval

FERC should do its analysis of project economics with near-term decommissioning as part of the cost of alternative power sources. In the same way that project benefits include the dollars saved by not having to acquire alternative sources of power, project benefits also include the dollars saved by deferring for 30 or 40 years the cost of decommissioning.

Where it has done a serious analysis of decommissioning as an alternative, FERC has already done precisely the kind of analysis suggested in the preceding paragraph.[74] The trouble is that FERC has rarely considered decommissioning seriously. Even in cases where decommissioning is not going to be adopted, including decommissioning costs in the economic analysis would give a much more accurate view of the project's economics. At the very least, decommissioning costs should be analyzed in cases where project economics are already negative without decommissioning.

iii. Always choose near-term decommissioning over relicensing if decommissioning is economically preferable **and** environmentally preferable (if it's one but not the other, then 10(a) balancing is required)

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[72] In the alternative, if FERC wants to assume relicensing will continue indefinitely, it should include future relicensing costs as part of the cost of the operations during the license being applied for. That is when they will be incurred. Ignoring both future relicensing costs **and** future decommissioning costs is equivalent to assuming neither will occur, which is absurd. Given the extraordinary sums applicants have been spending on relicensing (approaching or even exceeding the entire sunk cost of their projects, and sometimes far in excess of the cost of annual O&M), it is particularly appropriate to include future relicensing costs in the economic analysis if future decommissioning costs are to be ignored.

(The Clyde River project in Vermont (FERC #2306) is an example of a project whose owner is clearly more focussed on licensing its project than operating it. Project relicensing costs are equal to 95 percent of the applicant's net investment in the project itself and are equal to 9 years of O&M costs (DEIS, 6/96, p. 5-2).)

[73] Policy Statement, 12/14/96, p. 4.

[74] See, e.g., the Condit (FERC #2342) project DEIS, 11/95, quantifying the cost of license denial as the sum of decommissioning costs plus replacement power costs.

FERC has made clear its intention to always try to craft conditions such that a proposed project (with conditions) will comply with FPA section 10(a).[75] If the consequences of doing so result in a project whose economic costs are greater than those associated with decommissioning, and whose environmental benefits are no greater than those associated with decommissioning, then the Commission should choose decommissioning. To do otherwise would be to choose an alternative which is worse in one of the criteria to be balanced under FPA section 10(a), power value, and no better under the other (non-power value).

While it may seem obvious that FERC should not license a project which is both economically and environmentally inferior (or at least no better) than no project at all, it does not seem to be current policy. Rather, FERC's position seems to be that if it can find mitigation measures which offset the negative impacts that a project would otherwise have, then it will offer a license no matter how much those measures cost. It will thus become the applicant's choice whether mitigation is more costly than decommissioning, a choice that FERC itself ought to be making.

Of course, if near-term decommissioning is not better than (or equal to) relicensing in terms of both power and nonpower values, then Commission balancing is called for pursuant to FPA section 10(a). Such balancing would consist of either a weighing of the economic advantages of license denial against the higher environmental values of license approval,[76] or the reverse.[77]

b. Quantify dollar benefits of mitigation when the stakes are large

FERC staff defends its routine failure to quantify the benefits of mitigation measures in dollar terms by saying that such analysis is difficult to do and subject to controversy.[78] So is power value analysis, as the **Mead** decision emphasized. Even if

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[75] FERC, Policy Statement, 12/14/94, p. 2.

[76] See, for example, the Enloe Dam project (FERC #10536), licensed despite a FERC-calculated net economic cost of 26 mills per kwh more than alternative power sources, in part because FERC asserts that fish passage facilities could only be installed by approving a license for this new power project at an existing dam (FERC, License, 9/13/96).

[77] See, for example, the Condit project (FERC #2342) DEIS (11/95), in which FERC staff recommended relicensing over dam removal on cost grounds while acknowledging the environmental superiority of dam removal.

(As a separate issue, FERC failed to quantify in dollar terms the environmental benefits of dam removal. Doing so would have shown dam removal to be superior in dollar terms as well as environmental terms, according to intervenors who **did** perform a quantitative analysis.)

[78] See for example, FERC staff's statement in the North Georgia project (FERC #2354) FEIS in June 1996 (p. F-80): "Because no direct market exists for most nondevelopmental resources, their dollar value must be estimated using criteria such as relative worth, utility, or importance. Though the value of a nondevelopmental resource can depend on many aspects, three costs have a major influence: what people will pay to use the resource now, what they'll pay to use it in the future, and what they'll pay to preserve it. Unlike developmental resource values, getting people to agree on exactly what costs they should include to derive a value for a unit of nondevelopmental resource is very difficult."

See also the FERC staff response to FOR comments in the Kern 3 (FERC #2290) FEA in April 1996, where FERC staff declined to quantify environmental externalities in dollar costs, stating "Others of these costs (e.g., fish values) are not included because they include significant components that are

FERC thinks quantifying the dollar benefits of mitigation measures is generally beyond its capabilities, it should do such analysis as a matter of policy when major mitigation options offer large benefits in exchange for large costs.

When the dollar value of a nonpower benefit is small, it is arguably not worth the effort and controversy to try to assign a vale to it. But when the dollar value is clearly large, assigning a zero value by default can only distort the resulting net benefit analysis. In a relatively small number of FERC proceedings, major changes in the project are proposed by intervenors or agencies which are intended to have equally major environmental benefits. Dam dismantlement is the most extreme example of such major changes. In such cases, where the economic costs (in either direct mitigation costs, or in foregone power generation) are high but the environmental benefit is also high, FERC should quantitatively analyze the dollar value of the environmental benefit.

Section 10(a) of the FPA requires FERC to balance nonpower values against power values. If power values are converted into dollars,[79] but nonpower values are not, then the section 10(a) balancing is necessarily a comparison of apples and oranges. Such a comparison is certainly legal, but it is difficult and open to the perception of arbitrariness and capriciousness. It will be necessary in many if not all cases, since many impacts of hydro projects cannot be reduced to dollar terms. But if the tools for comparison on a dollar-to-dollar basis exist, FERC should use them, at least when the stakes are large.

c. Analyze forward-looking costs as well as total costs

In Order 888, FERC has presented its vision of an increasingly competitive electric power industry. That vision recognizes that in the transition to competition some utility assets which were built in the expectation of continuing markets will now face the test of the competitive market and find no takers for their output at prices that cover their embedded costs. The result will be "stranded" costs - the above-market costs of already-built resources.

By using total-cost analysis (including the cost of recovery of capital investments that have already been made) rather than incremental cost analysis, FERC risks creating more stranded costs through its relicensing process. Only a marginal cost analysis can

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contingent values. Introduction of contingent values in the costs would require that similar speculative analyses be quantitatively introduced throughout the analysis (e.g., in arriving at the "full true value" of the power benefits)." FERC staff appears to be saying they can't quantify one environmental cost of the project in dollar terms because then they would have to quantify them all (a **non sequitur**), and that they can't quantify a cost which is dependent on willingness to pay ("contingent value"). But where markets exist for a product (whether kwh or whitewater rafting), FERC's objection about "contingent value" is unfounded. It is no more speculative to say that people would pay X dollars/day for incremental rafting opportunities (if they are already paying X for existing rafting) than to say people would pay Y dollars/kwh for replacement energy if they are currently paying Y dollars/kwh on the open market for electricity.

The fact that the Army Corps of Engineers already routinely quantifies the non-power impacts of its proposed projects is further evidence that such quantification is not beyond FERC's powers.

[79] FERC hydropower analyses always convert kwh and Mw power values into dollar terms, leaving only such ancillary services (see FERC Order 888) as black start capability and load-following capability unquantified in dollar terms.

indicate whether a project will be economically competitive with the available alternatives on a forward-looking basis. FERC should not be surprised if projects approved with only a total-cost analysis then show up before it in future proceedings seeking stranded cost recovery.

Including a cost analysis which only looks at forward-looking costs would enable FERC to see whether a project will have above-market costs even if its sunk costs are ignored. Such projects would still be licensable under the **Mead** decision, but at least the applicant and FERC would each have had some warning of the unfavorable project economics. FERC could include a license condition on plants which are licensed with forecasted negative economics stating that if those negative economic forecasts turn out to be true, the applicant will have no right to claim stranded cost recovery.[80]

d. Use societal perspective, not just applicant perspective

FERC's position since Mead is that it will not deny a project based on apparently negative economics, but will leave to the applicant the decision as to whether to accept the license as offered. Given that decision, why should FERC even bother analyzing the economics of applications from an applicant point of view? Since the stated purpose of economic analysis is now to aid in the 10(a) balancing analysis,[81] economic analysis should be done from a public point of view. That probably would imply lower discount rates and, most importantly, quantification of environmental and recreational benefits to the public which would result from alternative licensing conditions or decisions. An analysis which computes the costs of measures to the applicant but not their benefits to the public does not adequately portray the impact of the project from the public's point of view.

e. Consider when, if ever, a license should be denied or further conditioned because of negative economics

Currently, FERC's willingness to license projects with negative economic benefits means that licenses for economically undesirable projects may be rejected by applicants but will not be denied by FERC.[82] However, current FERC policy does not rule out license conditions which are a response to expected or potential negative project economics. For example, FERC **does** include a condition in licenses requiring licensees to provide proof of financing before starting any licensed construction. This condition is intended to avoid the situation where a project with negative economics is licensed, then

[80] See subsection d, below, proposing this and other ideas to deal with the policy implications of issuing licenses for projects with projected negative net benefits.

[81] Mead, p. 7: "The basic purpose of the Commission's economic analysis is to ... support an informed decision concerning what is in the **public** interest with respect to a proposed license." (emphasis added)

[82] Mead decision, 7/13/95, p. 10.

abandoned part way through construction when its licensee (or the licensee's bankers) discover that FERC was right about the project's economics.[83]

FERC should consider extending this condition for relicensings to require the posting of a bond for projects with negative economic benefits to guarantee the funding not just of licensed capital expenditures but also of any required annual mitigation conditions. Alternatively (or in addition), FERC could state that owners of licensed projects with negative economics would not have the right to claim stranded cost recovery later for cost obligations which they voluntarily entered into by accepting the license.

[83] The Sayles Flat project in California (FERC #3195) is an example of a project which was licensed (in 1983) but was unable to successfully finance construction, resulting in ongoing environmental problems at the partially constructed project site. A FERC DEA published 1/2/97 now recommends accepting the surrender of the Sayles Flat license without full removal of the abandoned project works (**California Energy Markets**, 1/10/97, pp. 3-4).