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## Is It Time to do a Benefit-Cost Analysis for the Location of a Power Plant?

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IS IT TIME TO DO A BENEFIT-COST ANALYSIS  
FOR THE LOCATION OF A POWER PLANT?

By

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Is it Time to do a Benefit-Cost Analysis  
For the Location of a Power Plant? 1/

I am David J. Allee of 201 Oak Hill Road, Ithaca, New York. I am a Village Trustee, a Professor of Resource Economics at Cornell University, and former Associate Director of the Cornell University Water Resources and Marine Sciences Center. In that last assignment, I coordinated the Cornell University evaluation of the impact of Bell Station on Cayuga Lake, a multi-disciplinary study paid for by New York State Electric and Gas Corporation. I attended grade school in Ithaca, and I and my parents have lived in the area off and on since 1930.

The Public Service Commission and the Department of Environmental Conservation need a valuation-oriented analysis of the alternatives in locating power plants. Certainly the public with its many separate interests needs such an analysis. Modern benefit-cost analysis provides a framework that systematically puts the many parts of these decisions together into a whole. Under the present arrangement, it is too easy for a negative consequence whose correction is not the traditional responsibility of the applicant to slide out from under the examination. Likewise, the applicant does not get the benefit of a systematic summing up of all of the positive effects of its proposal.

There appears to be more meat in a Corps of Engineers project proposal than seems to be required in a power plant application. This is not to say that there is not voluminous data, but rather that analysis which you can sink your teeth into seems to be in short supply. Who has what at stake is rarely identified in value terms. Something akin to the guidelines prepared by the Federal Water Resources Council, their Principles and Standards of Project Planning and Evaluation, is an obvious place to start. In that approach two objectives, national economic development and environmental quality, are used for project formulation and evaluation. Two additional accounts, regional economic development and social well being, are employed to add two more dimensions to the evaluation. In observing the role that such evaluations play in the decision-making process with respect to water projects, it is clear that it is not the production of the infamous benefit-to-cost ratio that is most important, but rather that the proponents of a project are forced to show how one impact relates to another. Dollar values can be placed

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1/ Testimony for a PSC-DEC joint hearing on an application by New York State Electric and Gas Corporation for a permit to locate a coal-fired power plant either on Cayuga Lake or at Somerset, N. Y., on Lake Ontario.

legitimately on many more things than is usually done. Where dollar values don't fit, other common denominators are available and provide a basis for identifying trade-offs and what is at stake in making one decision as opposed to another.

To explore this question further, first, I want to discuss the advantage of thinking about "bribes" as a means of identifying who has what at stake. Then I would like to discuss what might go into the computation of an appropriate "bribe".

When we say that a tube of toothpaste is worth 89¢ what we mean is that someone is willing to pay that for it and someone is willing to sell the tube of toothpaste for that price. Likewise, we can think of what someone should be willing to pay to avoid traffic delays, to visit a recreation area, or simply to be reassured that his favorite lake is protected. The value of flood control, water-based recreation, fisheries protection, reduced traffic delays, reduced risks of traffic accidents, even the value of electrical power, are commonly computed by public agencies evaluating and justifying their projects. The basic principles involved in deciding what these things are worth are closely akin to the notion of a "bribe". In any public action there are losers and there are gainers. If we compute what the losers should be willing to pay to bribe the winners to stop a project and likewise, what the winners should be willing to bribe the losers to let a project proceed, we have the essence of a benefit-cost analysis. The criterion for a good decision is that if the amount we come up with for the winners is larger than that for the losers, the project is efficient. It still may not be fair or desirable from some other grounds, but at least it is efficient. And certainly if the losers' computation exceeds that of the winners' computation, the real question should exist in our minds as to whether the project should go ahead.

What might those who would be hurt by the Cayuga site offer? What will happen at the grade crossings used by the trains to haul the coal to the new site is an example of a "source" of a "bribe" and an example of what the present application does not contain. In the report by the consultants hired by the municipalities to evaluate a previous application (page A-16) it was determined that the present traffic patterns would generate an accident at these grade crossings on a frequency of about every six years and that with the new traffic to service the Cayuga site an accident would occur on the average of about once every four years. This is without the long-discussed Route 96 overpass. It is also pointed out that one accident in four at such grade crossings produces a fatality. However, that report did not go on and add dollar valuations to these predictable events. Just as the methodology that was used to develop these estimates is commonly employed by traffic engineers, so it is also quite common for them to go the next step. The present value of nine traffic accidents instead of six over the next 36 years is something for which an estimate can be prepared that most of us would agree is in the ballpark. One could even concoct a number for the value of the human life that is statistically at stake, although agreement as to the relevancy of that number might be harder to come by than in the cost of the property damaged in these accidents.

The question of delays at those grade crossings is similar. Now there is a 65-car train that goes both ways on a daily basis. With Cayuga Station in operation there would be a 120-car train added daily going both ways somewhere around five to six days per week. This information is contained in the application. However, the next step done by the consultants employed by the municipalities was to determine that there would be around 17 minutes average delay at six crossings for that 120-car train and that during an off-peak traffic period this would inconvenience some 373 cars, during peak periods 491 cars, and if the train went late at night 127 cars. It might be reasonable to use the middle figure for daytime off-peak periods and assume a ten-minute average delay since the first few minutes are probably more annoying than the last few, as those cars enter the queue behind the barriers. It's a simple calculation to find the number of hours and apply a per-hour opportunity cost for the time involved and to come up with a figure of somewhere around \$45,000 per year, perhaps as high as \$90,000 per year associated with the delays at those intersections. This kind of a computation gives a number that puts this factor into perspective. A range does it better. It forces an assumption about what the future may, and perhaps should, hold. It's harder for consideration to slide away from the effect of an alternative because it isn't the responsibility of the applicant to deal with that effect, when it is in the public interest to weigh the effect along with the many others involved.

Other sources of "bribe" estimates includes the taxes and expenditures associated with the construction and operation associated with the proposed Cayuga Station. There are both direct and indirect income effects, all of which are relatively easily estimated, but which have not been estimated. At least not by the applicant. It is quite easy for the effects of these to be under- or over-estimated by the public. At the local level, these are obviously quite relevant. From a state-level point of view, however, there are many factors that make them of less significance. Tax collections from the new construction and expenditures for inputs into the construction itself for wages and for operations after the plant is finished provide an offset to some of the losses that would be borne by some of the losers. At least there is an offset provided in the same community, which is an important factor. The community is being asked to export electricity and import some jobs and some pollution. While the impacts on air, water, the view, on congestion and noise may each be either large or small, partly indicated by estimates included in the application; all represent effects that some losers would be willing to pay to avoid, if there were any way in which such a bribe could be arranged. Obviously, the institutional problem of arranging for such a bribe is on the border of the ridiculous, but thinking about them this way does provide an important way to sum up the effects and whether or not, when all these effects are added up, they are important. Obviously, if the losers could in fact be easily bribed by the winners, the political problem would be much easier. The match-up between those things that would help and those things that hurt is obviously most uneven.

One of the concerns is the choosing between two alternative sites, Cayuga on the one hand and Somerset on the other. In that case, it is

tempting to suggest that tax effects and the direct and indirect income effects of construction and operation expenditures will largely offset each other and be a wash-out. But is that true? Actually, tax and state aid considerations vary tremendously from jurisdiction to jurisdiction. Levels of employment are notoriously higher in some parts of the state than in others. Shouldn't these be systematically spelled out to help make the choice?

It seems clear, however, that tax effects and direct and indirect income effects may be less than what many expect. The new state enabling legislation for tax exemptions for new commercial and industrial real estate investments will probably apply in both sites. Thus, an exemption for 50% of the new assessed valuation will be exempt the first year, and this will decline by 5% for each year, depending upon the choice of the local jurisdiction. But the effects of property values also dissipate some of the impact of the tax gains and construction and operation expenditures. This is most easily seen in the case of property taxes. If your taxes go down, all other things being equal, the value of your property goes up. If instead of a tax reduction you get an increase in services available for your property, this has a similar effect in raising the value of your property. Thus, the effect of increasing the tax base on other properties will be translated into capital gains for the present owners, but future owners of the property will find themselves, if the market is working properly, about as well off as if the property tax change had not taken place. Instead of paying higher taxes, they will pay the previous owner a premium for the opportunity to pay lower taxes.

It has been stated by New York State Electric and Gas that its customers will have to absorb around \$15,000,000 as a one-time expense for higher wage rates and a more expensive configuration for the water intake and discharge at the Somerset site, in comparison to the Cayuga site. Distribution costs and coal transportation costs may be higher as well, although these, unfortunately, have not been estimated. But note that utility rates operate quite similarly to property taxes in the effect on the value of the property which is served. In other words, an increase in utility rates will be somewhat dissipated by the fact that present property owners will suffer a capital loss, a slight reduction in the value of their property, because their energy rates are somewhat higher. Thus, future buyers of this property will pay a little less for the property and a little more for the utility rates and from their standpoint, they'll be much closer to being even than if this adjustment did not take place. Offsetting in part the change in utility rates will be the New York State Electric and Gas customers' willingness to absorb some higher energy costs given that there is in fact a difference in the environmental damages that might result from one location over the other. NYSEG customers are also users of Cayuga Lake and for the same reasons that it may cost a bit more to distribute the power from Somerset, so it may be that NYSEG customers value the environmental impacts on Cayuga higher than they do those on the Somerset site. Cayuga is closer to the geographical center of the service area. But no analysis has been done to date on how various people value the environmental effects of what is proposed, at least not as indicated in the material presented in the land use section of the application.

After the decision with respect to the need for a plant at all, then there is the question of a choice of site. Cayuga or Somerset? How should the choice be approached? Obviously, in the view of many the value of not using a unique natural site is an important element of the decision. Not using a unique site means keeping it for direct consumption, as it is, rather than to be used for the production of an intermediate product such as electrical energy. There are two important aspects of this choice. First is the reversibility of the choice. Obviously, if it is chosen not to use a site, it is relatively easy to change back the other way; at least, it's easier compared to the reverse of moving the plant out. The direct consumption of the attributes of a natural area is an important characteristic, according to many students of this subject, in that there are few or poor substitutes for these attributes. However, in the case of an intermediate product such as electrical energy, there are more and better substitutes available. These are questions of degree and subject to evaluation and estimation. The point is such analyses do not appear to have been completed and would shed much light on the choice that has to be made.

A place to start is with the \$15,000,000 a year which the utility has put forward as a firm one-time savings in costs between locating on Cayuga rather than Somerset. This can be thought of as being equivalent to an annual amount of about \$1.5 million. While this does not reflect an adjustment for changes in transmission costs and coal transportation costs, neither does it reflect an adjustment for the additional costs of crossing railroad tracks in Ithaca or other costs and benefits that could be measured in a similar way. For discussion's sake to say that there is around \$1.5 million per year at stake in terms of conventional benefits might not be too far from the mark. The point is that if the impact on the unique values of Cayuga as a natural environment over those of Somerset are also worth around \$1.5 million per year, we have something of a stand-off in the choice between the two sites.

Note that the usual benefit-cost analysis approach does not consider changes in value of unique natural areas over time, but should in this situation. There are at least three factors that may make unique natural areas more valuable relative to the intermediate good, electrical power, over time. The price of power is sure to go up but these factors suggest the value of natural areas will go up even faster. The first is the relative effect of technology. Technology is quite capable of finding substitutes for electrical energy as we now use it. The President is determined that it should. We may turn to less space to heat, we may turn to other sources such as nuclear power, or we may end up making conventional power plants more efficient. Probably the effects of technology will be a combination of these and many other kinds of changes which totalled up should dampen the relative power scarcity that would otherwise take place without technological advance. But what can technology be expected to do for the value of natural areas? It is the consensus of most opinion that it will simply make them a little bit easier to get to but cannot increase their supply or increase to any significant degree the enjoyment that people get from them.

The second consideration is the effect of income on the willingness to pay for the amenities of a natural site; that is, the effect of income

on the preference for the free aspects of consuming the natural features of an area like Cayuga Lake relative to the preference for most of the uses of electricity. As any user of a public park can testify, the demand for natural areas has increased very rapidly in recent years. Neither Cayuga Lake nor the Somerset portion of the shore of Lake Ontario is the playground of the rich. Most of the users of lakes and their shorelines are middle-income people. As the bulk of the population has gained in income there has been a shift in tastes, relatively, to the enjoyment of natural areas. While there has been an explosion in the use of wilderness areas, other outdoor recreation has not been far behind. As incomes go up, people still want more electric power, but they want lakeshores even more.

Note that many of the values associated with a beautiful lake come for free. They're part of your income that's not measured in your paycheck. Thus, if you determine what someone would be willing to pay from his cash income to enjoy a lake environment, you'll get a smaller figure than if you could ask the question the other way around. Namely, the bribe to compensate someone for the loss of the opportunity would be larger than what he would be willing to pay. Likewise, it would take more to compensate someone for a reduction in the quality of that experience than they might be willing to pay to avoid that reduction in quality. By observing what people do spend to get to a lake it is possible to estimate what they appear to be willing to pay. The compensatory approach to the estimate of a "bribe" is harder to determine.

The question must be asked. Is Cayuga more unique than the Somerset region of Lake Ontario? Do the Finger Lakes enjoy higher prestige as a recreation resource than the Great Lakes? Would the effect of building a power plant on Cayuga Lake produce a greater reduction in natural environmental values than putting it on Lake Ontario? Obviously, a part of this question is the fact that the Cayuga site already contains a small power plant and the effect to be evaluated is of adding a second, larger plant. Three general categories of values can be identified. These, in turn, can be divided into two types of users -- those who are resident in the immediate region, and those who are visitors to the region. The first category are the direct users, those who actually partake of the views, of the fishing, of the boating, of the swimming, of the picnicking, that are offered by the natural environment. For both residents and visitors there are usable techniques, at least as good as those used to estimate the costs of traffic delays, for estimating the change in values as a result of use changes that might result. These techniques are not as widely used as those for traffic-delay costs, but given a requirement for their use, they would be quickly improved and refined. The cost of applying them should not be greater than that for a typical opinion survey. Two other categories may be equally important but harder to estimate. One has been called the option value and the other the vicarious value inherent in the use of a natural area. Many people may not have come to the Great Lakes or to the Finger Lakes but know of them and would like to keep the option of such a visit open, and as part of this option they would prefer maintaining the quality of that experience. Also, there are those who may never expect to visit either region but gain satisfaction in knowing that the values they represent



are being protected and that others are in fact enjoying them. One needs to only reflect on the politics of the forever wild and the Adirondack and Catskill Forest Preserves to recognize that option and vicarious values are real demands for our natural resources.

Obviously, much depends on an application of judgment as to the relative uniqueness between the Finger Lakes and the Great Lakes in concluding whether or not a million and a half dollars of value per year may be at stake. Making such judgments is the task of the permit granting process -- or at least it should be. But let us look at some figures. There are about 100,000 people who live in the area of Cayuga Lake and in the area of the Somerset site. There may be another 100,000 who visit the two areas each year, conservatively speaking, certainly for Cayuga Lake. Obviously, such figures can be more accurately estimated. 200,000 people would have to care enough more for the Cayuga site and the effect of the plant to each value the change at \$7.50 per year to make a total of \$1.5 million. That is certainly in the realm of the possible. At the other end of the scale, how many people would need to value the difference at say 20¢ per year to make a million and a half? That result also seems to be in the realm of the possible. Note also that the projections for the 1985 population in the service area for New York State Electric and Gas according to a company statement is 1.8 million people. They would only need to value the difference between Cayuga and Somerset at a level of 85¢ apiece per year to make the site choice close to a toss-up. The point is that these are figures that can be estimated.

In conclusion, the criteria that follow from the kind of analysis proposed here for making a choice would include the following. First, does the intermediate good proposal, i.e. a power plant, make economic sense without considering the impact on the natural site values involved? For this a partial estimate of the advantage of one site over the other can be made and certainly in greater detail than has been done so far. This would be of great help in judging the choice. Second, does the change in the unique natural values that would result from locating the plant in one place over the other balance off the advantages from the first set of considerations? Note that if it looks close a delay until changes over time become clear would be indicated since the effect of locating it is more irreversible. If the net value of the uniqueness effect of Cayuga were to clearly exceed the advantages of Somerset on other grounds, it would seem reasonable to let that difference be the guide. The advantage can only become larger over time. Technology is bound to work in favor of making the uniqueness of a natural area more valuable. Income effects will probably make the more unique area even more valuable. Methodology exists for estimating a dollar value for many of the non-market values involved. Surely the quality of the debate over the different sites would be improved if such estimates were made and became the focus for more of the discussion.

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