IDENTIFYING AND CALCULATING ECONOMIC BENEFIT THAT GOES BEYOND AVOIDED AND/OR DELAYED COSTS

May 25, 2003

U.S. Environmental Protection Agency
Office of Enforcement and Compliance Monitoring

I. INTRODUCTION

One of the Environmental Protection Agency's (EPA) important responsibilities is ensuring compliance with the federal environmental laws. These laws, and their implementing regulations, set minimum standards for protecting human health and welfare and achieving environmental protection goals, such as clean air and clean water. EPA's Office of Enforcement and Compliance Assurance (OECA) upholds these laws through vigorous enforcement actions that correct the violations and appropriately penalize violators.

A cornerstone of the EPA's civil penalty program is recapture of the economic benefit that a violator may have gained from illegal activity, whenever EPA can effectively measure that gain. Recapture helps level the economic playing field, preventing violators from obtaining an unfair financial advantage over their competitors who timely made the necessary investment in environmental compliance. Generically, penalties serve as incentives to protection of the environment and public health by encouraging the adoption of pollution prevention and recycling practices that limit exposure to liability for pollutant discharges. Finally, appropriate penalties help deter future violations by the violator and by others similarly situated.

EPA has promulgated a generic civil penalty policy, as well as specific penalty policies tailored to suit the needs of particular programs. For example, there is a civil penalty policy specifically designed to address violations of the Clean Water Act. Civil penalties imposed by EPA usually have two components: gravity and economic benefit. The gravity component reflects the seriousness of the violation and is generally determined through the application of the appropriate EPA civil penalty policy.

The economic benefit component focusses on the violator's economic gain from noncompliance, which may occur in three basic ways. It can: 1) delay necessary pollution control expenditures; 2) avoid necessary pollution control expenditures; or 3) gain an illegal competitive advantage (ICA) during the period of noncompliance. This ICA may occur, for example, if a company sells banned products, or captures an extra market share through selling its products at a lower cost than its complying competitors.

The Agency designed the BEN computer model, for settlement purposes, to calculate the economic benefit from these first two types of economic gain. The Agency does not have a standard methodology for calculating the benefit gained from an ICA, which is currently considered on a case-by-case basis. The purpose of this paper is to develop some standard methodologies for identifying and calculating the economic benefit derived from illegal competitive advantage situations. It is anticipated that the EPA will utilize these methodologies, once the Agency is comfortable with their economic foundation, on a routine basis in appropriate cases. This paper outlines proposed methodologies for identifying and calculating the economic benefit derived from situations that go beyond the scope of the BEN model. The second section provides some background on the nature of economic benefit. Section three focuses on identifying cases that fall into thee four broad ICA

categories. It provides both examples and counter examples for each of the ICA categories. The fourth section suggests calculation methodologies for each type of case.

II. BACKGROUND: THE NATURE OF ECONOMIC BENEFIT

Compliance with environmental regulations usually entails a commitment of financial resources, both initially (in the form of a capital investment or one-time expenditure) and over time (in the form of continuing, annually recurring costs). These expenditures should result in better protection of public health or environmental quality, but they are unlikely to yield any direct financial return to the organization. If they would produce a financial return to the entity, then that entity should have already committed those financial resources even in the absence of such environmental regulations. If these financial resources are not used for compliance, then they presumably are invested in projects with an expected financial return to the organization. This concept of alternative investment — that is, the amount the violator would normally expect to make by investing in something other than pollution control — is the basis for calculating the economic benefit of noncompliance.

This background section provides an overview of economic benefit, and then explains how some cases do not fit within the simplifying paradigm of avoided and/or delayed costs.[1] Although economic benefit is not statutorily defined, it is commonly understood and accepted to mean the extent to which a violator is financially better off because of its noncompliance.

A. Economic Benefit From Delaying or Avoiding Compliance Costs

By delaying compliance costs, the violator can earn a return on the funds that should have been committed to the capital investment or one-time expenditure required for pollution control compliance. In other words, violators have the opportunity to invest their funds in projects other than those required to comply with environmental regulations. These other investments are expected to generate a financial return, as opposed to the required pollution control investments that typically generate no direct financial return for a company. Thus, by delaying compliance, the violator's economic benefit is the difference between investing in pollution control and investing in other projects.

Some costs can instead be avoided altogether, as opposed to merely delayed. Avoided costs typically include the continuing, annually recurring costs that a violator would have incurred had it complied with environmental regulations on time (e.g., the costs of labor, raw materials, energy, lease payments and any other expenditures directly associated with the operation and maintenance of pollution control equipment). Annual costs are thereby avoided entirely, as opposed to capital

---

[1] For further details on the BEN computer model, see EPA, *BEN User's Manual (1999)*. Both the BEN Users Manual and the actual BEN model can be can be found at: www.epa.gov/compliance/civil/programs/econmoels/index.html.

investments and one-time expenditures that are usually only delayed (although these too may sometimes be avoided entirely.) Thus, the violator's economic benefit from avoided compliance costs is the sum of the total avoided annual costs plus the return that could be expected on the funds that were used for projects other than pollution control compliance.

The BEN model calculates economic benefit by focusing on the effect that these delayed and avoided pollution control costs have on an entity's cash flows. Cash flow analysis is a standard and widely accepted technique for evaluating costs and investments. In essence, cash flow calculations focus on the real, "out-of-pocket" cash effects resulting from an expenditure. Thus, noncash "paper" expenses, such as depreciation, are considered only to the extent that they affect cash flow.[2]

B. Economic Benefit from Additional Factors

As discussed previously, the BEN model calculates the economic benefit from delaying and/or avoiding required environmental expenditures. A relatively simple computer model like BEN is able to perform these calculations by implicitly assuming that the revenues in a noncompliant and compliant state are identical. BEN can therefore focus exclusively on a violator's pollution control costs, obviating the need for a detailed examination of a violator's business records or competitive market situation. The BEN model's widespread application is made possible by this simplifying assumption regarding revenues. But in some cases the violator's noncompliant actions have allowed (or will allow) it to attain a level of revenues that would have been unattainable had it always been in compliance.

In either type of situation (i.e., under BEN's simplifying assumption, or under more complicated cases), the fundamental definition of economic benefit is still the same: the difference in the net present values of the compliant/on-time and noncompliant/delay scenarios (i.e., the actions and cash flows — both historical and possibly also future — associated with the hypothetical compliance, and the actual noncompliance).[3] In the cases amenable to BEN, the violator's revenues from the compliant and noncompliant states simply cancel each other out, allowing BEN to measure economic benefit through a calculation involving only the costs that would have differed had the

---

[2] BEN also adjusts these cash flows for their effects upon a company's tax liabilities, and then finally for the time value of money. The fundamental financial concept of the time value of money is based on the principle that a dollar today is worth more than a dollar a year from now, since today's dollar can be invested immediately to earn a return over the coming year. (Alternatively, a dollar last year is worth more than a dollar today because investment opportunities existed for last year's dollar.) Therefore, the earlier a cost (or benefit) is incurred, the greater its economic impact. BEN accounts for the time value of money by adjusting all estimated cash flows to their present value equivalents, using a discount or compound rate (depending on the direction of the adjustment) based on the company's cost of capital.

[3] In some cases the economic benefit might be able to be estimated by a change in asset value (either for the company as a whole, or for a specific product, such as illegally developed land), since this in turn reflects projected cash flows.

violator been in compliance. This document addresses cases in which the revenues do not cancel out each other. Since the revenues were higher in the noncompliant state than they would have been in a compliant state, more detailed research and analysis is necessary, going beyond the scope of the BEN model.

III. IDENTIFYING CASES THAT GO BEYOND THE "DELAYED AND AVOIDED COSTS" PARADIGM

This section lays out four broad categories of such cases. For each type, this section provides:

- background information on how these cases can arise;
- the screening question(s) in the BEN model linked to that particular type of benefit; and,
- examples and counterexamples of each type.

EPA include such counterexamples since what does go beyond the BEN model's simplifying paradigm can sometimes be best illustrated by what does not go beyond BEN. The four categories of cases are as follows:

- violator gains additional market share;
- violator sells products or services prohibited by law;
- violator initiates construction or operation prior to government approval; and,
- violator operates at higher capacity than it should have.

A. Violator Gains Additional Market Share

A violator might sell products at a lower price than its compliant competitors because it does not incur environmental compliance costs. By underpricing its competitors while in noncompliance, it can gain additional market share. This additional market share allows the company to generate additional revenue that it would not have been able to generate had it complied.[4] The additional market share could even persist to some extent into the future once the company has come into compliance. Therefore, the benefit from additional market share could conceivably have both a relatively short-term component (i.e., during the compliance period) and a relatively long-term component (i.e., persisting into the future after compliance is achieved).

---

[4] A violator could conceivably increase its market share without any revenue increase to date, yet somehow be "poised" to benefit at some point in the future by generating additional revenue. The economic benefit would stem from this future revenue expectation, which could also manifest itself in a greater asset value for the company.

The Agency presumes that these situations do not arise very often, since compliance costs typically do not constitute a large proportion of total variable production costs, and since companies have flexibility in setting prices. Therefore, compliant companies should usually be able to match the prices of noncompliant companies, at least in the short-term (which the Agency assumes is typically the term of the noncompliance period). Nevertheless, some exceptions will occur, and the Agency leaves open the possibility of investigating those cases that go beyond the scope of the BEN model.

In most cases, the compliance costs' magnitude is not sufficient to create a significant change in cost structure and pricing. Furthermore, most compliance costs — whether capital investments or annually recurring operating costs — are of a generally fixed nature, invariant to production levels (with a certain broad range) and hence not affecting variable production costs. Even if cost structure and pricing changes do occur, a violator's compliant competitors may still be able to match its price-reduction strategies.

Specifying in advance the circumstances that would lead to market share gains from noncompliance is exceedingly difficult. One indicator might be the delay or avoidance of compliance costs that represent a significant percentage of variable production costs. (If the compliance costs are fixed with respect to the level of production, then they are most probably irrelevant to the market share issue regardless of their scope.) Unfortunately, the definition of "significant" would vary enormously by industry and market, and would also be difficult for the typical BEN user to estimate in advance on a routine basis. Even if the delayed and/or avoided costs were a significant percentage of the variable production costs (by any definition), the causation between the cost advantage and the market share would still probably need to be established before any analysis of the market share would make sense. The example and counterexample that follow below help illustrate these concepts.

The screening question in the BEN model linked to this category is:

Did noncompliance create a cost advantage that allowed market share gains?

Example #1: A potential contractor submits a bid under a government agency's Request for Proposals. The company does not have the discretion to bid any price, but rather must submit a proposal that reflects its costs plus a fixed fee. The proposal is subject to detailed scrutiny from the contracting agency for the realism of its price. The company has a cost advantage because of its existing or perhaps even planned noncompliance (unknown to the government agency, and perhaps even unknown to the company), which allows it to underbid its competitors and win the contract. The violator thereby gains additional market share from its successful contract bid — and consequently additional revenue — because of its noncompliance, in a manner that goes beyond what BEN would measure by focusing narrowly on the present value of the avoided and delayed costs.

Furthermore, if future government contracts emphasize the experience that the company has gained through its contract, then it conceivably may be able to continue to maintain some portion

of its enhanced market share even when it raises prices (because of compliance). In this case, the cost difference between winning and second-place proposals is the key measure. If the avoided compliance costs equal or exceed the cost difference between the proposals, then the violator may have achieved increased market share and revenue because of its noncompliance.

Counterexample #1: An auto shop using illegal disposal methods charges the same prices as its competitors and spends its avoided costs on advertising. The money spent on advertising earns a positive return for the company, money that otherwise would not have earned a positive return had it been spent on proper disposal methods. But under a hypothetical on-time compliance scenario, the auto shop could have obtained the necessary additional funds both to advertise and to comply. Therefore, the company can generate the same level of revenues in either a noncompliant or compliant state. BEN captures the economic benefit, especially because it applies the company's cost of capital (i.e., its expected rate of return) to the avoided costs of proper disposal techniques. The extent of the cost advantage in this situation is unknown. If the violator is charging the same prices as its competitors, then clearly the increased market share is unrelated to any cost advantage from noncompliance. (Even if the violator is charging lower prices than its compliant competitors, the linkage between the auto shop's increased market share and its noncompliance is still not necessarily established.)

After considering the previous material, the analyst may wish to address the following additional screening questions if proceeding with an examination of market share. Positive answers to these questions still do not necessarily imply that any observed market share increase is the result of noncompliance — only the analyst's judgment in combination with case-specific facts can answer the central issue of causality.

- Did the violator's total revenues or number of units sold increase during the period of noncompliance? *Identifies potential short-term market share gains.*

- Did the price of the violator's products decrease during the period of noncompliance relative to the prices of competing products? *Identifies potential cost and price advantage associated with avoided compliance.*

- Does the violator sell products or services in a relatively price-sensitive market? (I.e., are customers likely to switch products if prices change?) *Identifies situation where short-term market share gains are possible.*

- Does the violator sell products or services that are associated with "brand loyalty" or high "switching costs"? (I.e., would customers be likely to continue buying the violator's product if the price advantage disappears?) *Identifies situation where long-term market share gain is possible (although, conversely, initial short-term gain is more difficult).*

The first two questions address the actual changes in pricing strategy the company may have been able to pursue because of its noncompliance. A company with identifiable changes in pricing and identifiable increases in sales may enjoy an economic advantage from a change in market share. The remaining two questions address the violator's market. Relatively price-sensitive markets may yield considerable short-term market share advantages to a violator, but these advantages are unlikely to be sustainable in a competitive market once the cost advantage of noncompliance is removed. Products or services with brand loyalty or high switching costs may yield more lasting market share changes, although conversely such characteristics may impede a violator's ability to gain market share with lower prices.

B. Violator Sells Products or Services Prohibited by Law

EPA has the regulatory authority to prohibit the sale of certain products, or the performance of certain services, either permanently or until EPA reviews and approves them.[5] If the violator produces and sells a prohibited product or service, it will generate additional revenues that it would not have been able to generate had it sold only compliant products or services. BEN is therefore incapable of calculating the economic benefit.

The screening question in the BEN model linked to this category is:

> *Did the violator sell prohibited products/services that no additional costs could have made legal?*

This question identifies compliance scenarios requiring the violator to abstain entirely from the economic activity associated with noncompliance. This includes violations involving prohibited products or activities where no legal alternative would have produced the same revenues. The key consideration in answering this question is determining whether a traditional, alternative compliance scenario (typically entailing additional production costs) was available. The following example and counter example illustrate these principals.

Example #2: A company sells a highly effective pesticide, even though EPA has banned its domestic use. Since the product could not have been made legal simply by incurring additional environmental control costs, the company would not have been able to generate the revenue from

---

[5] See, for example, the premanufacture notice program under the Toxic Substances Control Act, 15 U.S.C. Section 2604 and the stop sale, use and removal authority under the Federal Insecticide, Fungicide and Rodenticide Act, 7 U.S.C. Section 136(k). This differs from a company that produces an approved product through a prohibited process where the final product possesses all the same characteristics from the consumer's point of view, regardless of the production process (e.g., oil sold from a noncompliant underground storage tank, or a metal part finished with an illegal coating). The economic benefit in such cases would be based on a typical BEN run on the pollution control costs that the violator delayed and/or avoided by producing the approved product through the prohibited process (e.g., the delayed costs of proper tank inspection, or the avoided incremental costs of a legal — and presumably more expensive — coating).

the pesticide's sales had it complied with EPA's ban. BEN is therefore incapable of calculating the economic benefit because there are no avoided or delayed expenditures of significance.

Counterexample #3: A company mixes overstock of a restricted agricultural chemical into one of its "improved" popular lawn care products. If the company had instead used an approved chemical, its production costs would have been higher, but the final product would have provided its customers with identical characteristics (leading to identical sales revenue).[6] Therefore, BEN captures the economic benefit by focusing on the avoided incremental costs of the approved — and more expensive — chemical ingredient.

This question also addresses violators who perform prohibited services or actions, such as a developer who fills a protected salt marsh to build summer homes. If such filling could not have been legal under any circumstances, and if no other sufficiently comparable shoreline land was available for development, then the case is beyond BEN's scope. (By contrast, if the developer could have simply paid more money to purchase sufficiently comparable land nearby that did not require filling for construction, then the case is amenable to BEN.)

This question does not address any situation where the approval for a product or an activity was not — and could not have been — available at the time of the violation, but did — or will — become available at a later date. These situations fall under the category addressed by the next section, which focuses on early-mover advantage.

C. Violator Initiates Construction or Operation Prior to Government Approval

Some regulatory requirements prohibit construction or operation until EPA or another government agency issues a permit.[7] When a violator initiates construction or operation prior to this approval, it can begin operating earlier than it would have been able to had it complied with the law (e.g., if operation begins earlier than it should have, the violator can generate sales it should not have made and thereby gain a head start in developing its market share). The violator may gain an "early mover" advantage in a new market, generating revenues earlier than would have been possible in a compliant state. BEN is therefore incapable of calculating the economic benefit.

Two of the BEN model's screening questions linked to this are:

> *Did noncompliance allow start of production/sales earlier than under hypothetical compliance?*

---

[6] If the substitute of an alternative chemical would not have provided customers with exactly identical characteristics in the marketplace, then this counterexample becomes instead a valid example.

[7] Although the violator may obtain eventually governmental approval anyway (implying no environmental damage), a penalty based on benefit recapture is nevertheless necessary, as EPA's policy is designed to maintain incentives to comply promptly with regulations.

Would permit have affected operations so significantly as to alter gross revenues?

The first question presents a simple screen for identifying violators who may gain by being an "early mover" as a result of avoiding regulatory or permitting processes. While BEN captures the delayed and/or avoided costs associated with obtaining a permit or installing equipment, the model does not address the potential advantage of a violator who has started operations ahead of a legal timetable. One key consideration in answering this question is determining whether the company realistically could have started the permit process earlier and then still proceeded on the same operations schedule. The following example and counterexample illustrate these issues:

Example #3: A telecommunications company must obtain a dredging permit to lay a previously unavailable type of cable between the mainland and an island. Because of competitive pressures to be the first on the island to offer the services from this type of cable, the company proceeds on an accelerated schedule. Had the company gone through the permitting process, it would have been delayed substantially. To comply, the company could not have incurred the permitting costs earlier (which would be amenable to a BEN analysis), since this type of cable did not even exist previously. Because a compliant company would not have been able to offer the new services so early, the company's noncompliance allowed it to obtain a higher level of revenues than would have been possible had it complied. BEN is therefore incapable of calculating the economic benefit.

By being earlier to this market with the technology, the violator is able to generate revenues earlier than it would have been able to had it complied by waiting for the permit. (Obtaining the permit earlier was not an option, since the cable did not even exist at an earlier date.) Furthermore, the company may enjoy a future economic benefit from the lasting market share advantage it may gain over its compliant — and hence Johnny-come-lately — competitors.

Counterexample #3: A resource extraction company must obtain permits to site and then drill a series of wells over a several-year period. The company never does so and therefore avoids the permitting costs, an aspect of the economic benefit that BEN addresses. Had the company applied for these permits, it could have done so over an earlier time period that would have allowed the siting and drilling of the wells to proceed on the same schedule and in they same manner that they actually did (without any permit). Hence, no additional analysis beyond the BEN model is necessary.[8]

The second question, regarding the permit that significantly alters gross revenues, addresses a second aspect of this category. In addition to changes in project schedules, permits can change or restrict operations in a way that would alter revenues. Violators who avoid these permits enjoy the economic benefit associated with the additional revenues, which BEN does not capture. To answer this question properly the analyst must have knowledge of the permit provisions.

---

[8] If the hypothetically obtained permit would have significantly altered any aspect — besides production costs — of the eventual siting and drilling of the wells, then this case would require research and analysis beyond the BEN model. Furthermore, if the permit could not have even been obtained on time (for whatever reasons), then this case would once again be beyond BEN's scope.

The hypothetical cases in the following example and counterexample are the same as for the previous screening question (i.e., earlier start of production/sales), since this question addresses an additional facet related to the same avoided permitting.

Example #4: Had the telecommunications company gone through the proper permitting process, it might not only have needed to incur additional compliance costs and delay its operations, but the permitted operations might have been altered in some other fashion. Perhaps the cable's capacity would have been lower, limiting the number of customers the company could serve or the services it could offer. Since this would have affected the company's revenues, the economic benefit is beyond the scope of the BEN model for yet another reason.

Counterexample #4: The resource extraction company that failed to obtain drilling permits would have been able to proceed legally in the same manner that it actually did, even if it had obtained the proper permit on-time. (That is, the eventually granted permit did not affect its operations in any way.) Although the company did avoid the permitting costs, the BEN model captures the economic benefit from such avoided costs. A common objection to this reasoning is that the company violated the law and was subsequently highly profitable, but unless the hypothetically obtained on-time permit would have altered operations in any significant way, then the company presumably would have been just as profitable (*but for* the higher permitting costs, which BEN captures fully).

D. Violator Operates at Higher Capacity Than It Should Have

A firm may be able to comply with applicable environmental regulations by maintaining its output or throughput below a given threshold level. Alternatively, environmental regulations may specifically dictate that compliance requires maintaining output or throughput below a given threshold level. A violator might produce above this threshold level in order to take advantage of high product prices. Alternatively, a violator might realize its lowest unit production costs at an output level that exceeds the level at which it can maintain environmental compliance. In either situation, the violator is able to generate revenues in a noncompliant state that would not have been possible in a compliant state. This renders BEN incapable of calculating the economic benefit.

The screening question in the BEN model linked to this category is:

Did compliance require a reduction in throughput/output?

This question identifies situations where a company has violated regulations by exceeding mandated output or throughput levels, either because the regulations specifically require a certain level, or because the economically rational compliance option dictates such a level. The violator did not avoid any additional compliance costs by producing the additional output, but the company benefitted from the higher revenues associated with the illegal incremental output. Addressing this question requires determining whether traditional compliance alternatives to lower production existed at the time that were technologically, legally, and economically feasible. If such alternatives

were available, then their higher compliance costs are amenable to a traditional BEN analysis. The following example and counter example illustrate this discussion:

Example #5: A rock crushing facility has explicit and legally binding limits upon its daily operating hours and production tonnage, regardless of its emission levels. It operates in excess of these limits. No additional environmental control costs would have made this excess production compliant. Since the violator's illegal excess production generated revenues that would not have been possible in a compliant state, the BEN model is incapable of measuring the economic benefit.

Counterexample #5: A manufacturer's air emissions exceed mandated levels. It eventually installs the necessary control equipment, which also would have been feasible (both technologically and economically) at the very beginning of the noncompliance period. Alternatively, the company could have instead come into compliance by reducing its throughput, but at an ultimately greater opportunity cost (i.e., lost production, revenue, and hence profits) than installing the control equipment. A BEN model analysis of the avoided and delayed control costs captures the economic benefit: the existence of less economically rational compliance options is universal to all cases, yet irrelevant to economic benefit.

IV. HOW TO CALCULATE ECONOMIC BENEFIT THAT GOES BEYOND BEN

In the types of cases discussed so far, the proper evaluation of economic benefit should involve verifying that the BEN model is inappropriate to the case-specific facts, and then formulating an analytical approach that captures the extent of the violator's economic benefit. This section first provides some suggested analytical approaches, and then applies them to the examples presented in previous sections. As the beginning of this document stated, no simple computer model is capable of calculating the benefit in these types of cases. In addition, these benefit analyses will usually be more complex than those of delayed and avoided costs.

This section strives to adhere to two key goals:

- Initial information collection and analysis should be as simple as possible to minimize the expenditure of Agency resources. While EPA seeks to identify and analyze any cases that merit a thorough analysis, this section focuses on the use of publicly available information and analytical approaches that will assist EPA in making an preliminary determination of the extent of the economic benefit and the possible need for a more thorough investigation.

- EPA analysis should be clear and defensible. This guidance focuses on standard information sources and accepted economic principles that can be used to support an initial determination. This document though is not intended to limit EPA's analytical options should the Agency decide that the

circumstances of a particular case suggest an approach or a level of effort not addressed in this document.

A full-scale assessment of the economic benefit is likely to require company- and market-specific information. This section therefore cannot provide sufficient information to direct a complete analysis, but merely attempts to point the analyst in a productive direction.

A. Fundamental Guidelines

Any economic benefit analysis should adhere to the same fundamental principles as BEN. Specifically, economic benefit is the difference between the after-tax net present values of the cash flows associated with the two scenarios: the hypothetical compliance scenario, and the actual noncompliance scenario.[9]

The first — and most important — step will therefore entail identifying the cash flows relevant to each scenario. (Cash flows that are identical between the two scenarios — both in their amount and timing — will cancel out each other and hence not enter the analysis.) Once this is accomplished, the next two steps are relatively straightforward: determine the after-tax value of the cash flows, and then adjust them to present values as of the penalty payment date using an estimate of the violator's cost of capital. Therefore, the analysis in the examples below focuses only on the estimation of the relevant cash flows, since the adjustments for taxation and the time value of money are not specific to these types of cases.

B. Examples

This section uses the previous sections' examples to illustrate the calculation of economic benefit in the four categories previously identified:

1. violator gains additional market share;
2. violator sells products or services prohibited by law;
3. violator initiates construction or operation prior to government approval; and,
4. violator operates at higher capacity than it should have.

1. Violator Gains Additional Market Share

If the screening questions outlined above indicate that a violator enjoys a significant cost advantage as a result of the violation, and company information shows sales increasing during the

[9] As mentioned previously, in some cases the economic benefit might be able to be estimated by a change in asset value, since this in turn reflects projected cash flows.

period of noncompliance, then the potential exists for economic benefit from changes in market share. This is still only the potential: proof of the causality between noncompliance and market share gain requires careful analysis of the case-specific facts, which is beyond the scope of this document. To calculate the actual economic benefit (if any), the analyst must next develop cash flows associated with both the actual scenario and an alternative "compliance scenario" cash flow.

This section illustrates only a simple market share gain scenario and calculation involving a company with a single product. If a violator has multiple facilities and product lines, then even further and more extensive analysis would be necessary to identify market share gain.

The first step is to focus on the market share gain during the noncompliance period (as opposed to market share gain persisting into the future). A reasonable and defensible compliance scenario is necessary to describe what market share would have been had the violator not enjoyed a cost advantage. Any such description must have the support of a strong argument, especially for any changes in market share being attributable to the noncompliance. Furthermore, the longer the compliance period the more likely that a more sophisticated analysis of specific market trends may be necessary.

If the actual market share of the violator is unknown, then the baseline assumption for the compliance scenario could be that the violator's sales revenues would have continued to increase at the pre-violation rate, with any increase in excess of that attributable to noncompliance.

In the example of the government contractor presented in Section II A, above, the actual change in market share is equal to the value of the government contract. Without the cost advantage that the company enjoyed from its noncompliance, a competitor would likely have won the contract, reducing the company's actual market share by the entire value of the contract. In this example the two scenarios are simple:

Compliance scenario cash flow	=	*0*	*[i.e., contract awarded to competitor]*
Noncompliance scenario cash flow	=	+	*actual contract revenue*
		—	*variable costs*
		+	*projected revenue for remaining contract life*
		—	*projected variable costs*

In this context, variable costs include at least the costs specific to running the contract. The legitimacy of including apportioned overhead costs, by contrast, is generally a case-specific issue, although executive compensation (as a reward for the enhanced profitability from illegal market share) would generally not be relevant.

This analysis thus far addresses only short-term advantage from the increased market share over the course of the current contract.[10] In this example, any market share impact would presumably disappear at the contract closeout, except perhaps for a small (and almost unquantifiable) advantage from the company's enhanced experience.

In other industries and circumstances, a violator may conceivably defend market share gains for a considerable length of time, and may continue to accrue economic benefit as a result of the earlier noncompliance. Examples of markets in which long-term market share advantages may arise are markets for products with "high switching costs" (e.g., computer hardware and software markets), or markets with no substitute products and/or very few producers (e.g., insulin or other pharmaceuticals markets). These characteristics though would conversely hinder a violator's initial ability to gain market share.

Quantification requires identifying both the extent of the market share increase and its probable duration. A careful analysis of each of the following aspects is necessary: market size, the number and market power of competitors, the ability or inability of additional competitors to enter the market (i.e., barriers to entry), and the availability of substitute products.

The U.S. Department of Justice and the Federal Trade Commission frequently assess changes in market power, both prospectively (addressing potential mergers) and retrospectively (investigating possible anti-trust violations). The two agencies' *1992 Horizontal Merger Guidelines* identifies several key market conditions under which a company may exercise considerable market power, and/or where merger activities might create or enhance the market power of a company or facilitate its exercise. These merger guidelines may provide assistance in examining the economic benefit from persisting market share gain. (Note however that the complete analysis, as well as many anti-trust issues, as outlined in the *Merger Guidelines* are generally irrelevant to economic benefit, e.g., consumer benefits of a price reduction).

2. Violator Sells Products or Services Prohibited by Law

Two similar types of violations involve illegal product sales:

a. a violator sells a product or service that has not yet been approved (i.e., reviewed and permitted); and,

b. a violator sells a product or service that has been banned outright.

---

[10] In some cases the advantage would disappear as soon as compliance is achieved and costs increase, but in this specific instance (i.e., a "cost-plus-fixed-fee" contract) the violator may be able to recover cost increases contractually through the remaining contract term. Conversely, if the contract is fixed-price and the violator comes into compliance partway through the contract period (without being able to recover its compliance costs) then the violator may realize no economic benefit at all from illegally gained market share.

Product sales in advance of proper approval are essentially the same as operations without a permit. In these cases, the cash flow analysis may need to extend beyond the noncompliance period, since initial start-up costs might suppress earnings, even though the product will eventually be profitable. This approach is described in more detail in the section that analyzes the economic benefit of operating without a permit.

In the example of the banned pesticide (which could not be made legal by incurring any additional regulatory costs), the analysis focuses on the historical income associated with the product, minus the variable cost of producing the item.[11] This revenue is the noncompliance scenario cash flow, since the violator should not have sold the product. The compliance scenario is simply the absence of any cash flows, since the violator should not have received any revenue (nor incurred any costs) related to the illegal product.

Compliance scenario cash flow	=	*0*	*[i.e., product not manufactured or sold]*
Noncompliance scenario cash flow	=	+	*actual product revenue*
		—	*variable costs*

The key challenge in identifying the economic benefit associated with selling a banned product is identifying the total revenues and legitimate costs directly associated with selling the product. This requires an analysis of both product-level and company-level cost and sales data from the violator. If a violator makes several products and only one is illegal, then the analysis may be more involved. Furthermore, the economic benefit should focus not on the reported profit or taxable income of the violator, but on the banned product's cash flows (which can differ significantly from accounting notions of profit). Another issue is determining the legitimacy of including apportioned overhead costs, which is generally a case-specific issue (just as in the previous analysis of market share gains).[12] By contrast, executive compensation (as a reward for the illegal product's profitability) would generally not be a relevant cash flow.

---

[11] If the violator replaces the illegal product with a legal (yet less effective) substitute for the same application, the violator could conceivably enjoy a lasting market share advantage into the future, based upon the illegal product's effectiveness and hence lingering consumer perceptions about the effectiveness of the violator's entire product line. The economic benefit from such a rare effect is likely to be relatively small yet exceedingly difficult to quantify.

[12] The assignment of overhead costs to a specific product is a case-specific issue and may be relevant to the economic benefit cash flow analysis if such overhead costs are directly and legitimately associated with a specific product. By contrast, costs incurred to evade detection or prosecution of such illegal activity are not relevant to the economic benefit analysis.

3. Violator Initiates Construction or Operation Prior to Government Approval

If a company is first to market with a new product because of construction and operation of a facility without a permit, it may enjoy an economic benefit both immediately (by selling products or services prior to the time when it could have legally done so) and in the long term, as a result of improved market share from its "early mover" status. In this case, the only avoided cost captured in a BEN analysis would be the avoided cost associated with the permitting process, although the total economic benefit comprises the following:

\+ *Present value of net cash flow over life of the actual project*
— *Present value of net cash flow over life of the hypothetically compliant project*

This calculation requires the careful construction of on-time and actual compliance scenarios over the life of the facility, which would then capture both the short-term economic benefit (if any), and long-term advantage from market position.[13]

Determining expected cash flows requires information on typical facility life span and profitability, the level of competition in the industry, and possibly the violator's actual business plan. On-file permit applications may provide information about potential competitors and the violator's gains (if, for instance, a prior permit was withdrawn after the violator began operations). If no identifiable competitors have sought to enter the market, then an analyst must consider the length of the permitting cycle and the product development cycle to determine whether competition could have otherwise developed during the avoided permitting process.[14]

In the example of avoiding the dredging permit in Section II C, above, the telecommunications company is the first to bring the new cable technology to market on the island, 18 months earlier than it would have otherwise. In its first year, the company controls 100 percent of this new market. At the end of the second year, perhaps the violator has 66 percent and a compliant competitor has 34 percent. If a market equilibrium is soon established of an even share between the two companies, then the hypothetical compliance scenario could assume that the violator's market share would have been 50 percent from the beginning. By contrast, if the violator persists in maintaining a larger market share than its competitor, then a more detailed analysis of

---

[13] With a new facility, initial cash flow might not reflect eventual full efficiency because of the burden of start-up costs, and may even be negative. For this reason an assessment based only on cash flows earned during noncompliance may significantly underestimate the future economic benefit to the violator. The analysis should consider the expected cash flows over the entire future lifecycle of the project (for both the compliant and noncompliant scenarios) to account for such changes in profitability over time.

[14] In certain situations a vastly simplifying yet still reasonable assumption might be that the cash flows under both scenarios would be identical, differing only in their timing and hence relatively insignificant inflation effects. For example, the existing market is mature and competitive (e.g., a new fast-food restaurant on an existing strip) implying that the violator's early entry has not forestalled potential competitors' entry.

actual market development may be necessary to determine whether that higher market share is a result of its first-move status.

More complicated scenarios are imaginable. Perhaps a third company had initially applied for a permit, but then withdrawn its application, implying the market can support only two competitors. A more detailed examination might reveal that the violator would not have been financially viable in this market had it waited for the permitting process, leading to a hypothetical market share of zero percent in a compliant state of the world.

Furthermore, the cash flows should reflect any permit provisions that would have altered the company's operations, e.g., lower cable capacity and hence reduced bandwidth. Such provisions, if avoided not just temporarily but instead permanently, could bolster an argument for the violator's having gained permanent increased market share as a result of its noncompliance.

4. Violator Operates at Higher Capacity Than It Should Have

A firm may be able to (or may be required to) comply with applicable environmental regulations by maintaining its output or throughput below a given threshold level. A violator might produce above this threshold level in order to take advantage of high product prices. Alternatively, a violator might realize its lowest unit production costs at an output level that exceeds the level at which it can maintain environmental compliance. In these cases, the total economic benefit comprises the following:

\+ *Avoided compliance costs (calculated by BEN)*
\+ *Value of incremental cash flows from additional production*

This approach is appropriate for examples like the rockcrusher, subject to regulations explicitly restricting process throughput and/or product output (instead of — or in addition to — restricting emissions levels or requiring control equipment). Otherwise the violator might have compliance options that would allow it to legally produce some or even all of the "excess" output. If the firm has a technologically and economically feasible compliance option that allows it to produce its violation-level output legally, then the economic benefit of the violation is limited to the avoided and/or delayed cost of compliance, which BEN captures.[15]

---

[15] If that option involves a lengthy implementation schedule (which could not have started before a certain date) then a hybrid approach may be necessary, entailing an initial cutback in production (hence entailing economic benefit over a relatively short period), but then ramping back up once the pollution control equipment is installed (whose actual delay is captured by BEN).

Under an extreme counterexample, the terms of a new permit place a company's existing production levels in noncompliance. It can comply either by slashing production 50 percent, or by purchasing a replacement part at the local hardware store for a dollar. In this case a company continuing at full production rates has an economic benefit based only on the avoided cost of one dollar.[16] The company has also produced 100 percent more than it would have had it attempted to comply without the one-dollar part, but this is irrelevant, since if the company had purchased the part it still would have been able to continue at the higher production level in a compliant manner.[17]

[16] This assumes that the technology would have been both *feasible and sufficient* at the time to bring the violator into compliance. If no feasible technology is available at the time of the violation, then reduced production is the only option for compliance.

[17] Just as with a more routine BEN analysis, even if the economic benefit is negligible, a significant penalty may still be merited for gravity reasons.