



Training Materials

BEN 2.0:

A model to calculate the
economic benefit of
noncompliance

950 R02 013

BEN

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SECTION I:
OVERVIEW OF BEN

WHAT IS BEN?

- The BEN Model is a computer program that runs in the Windows™ operating environment, version 3.1 or higher (e.g., Windows 95, 98, or NT).
- BEN is easy to use, especially with its many available forms of assistance:
 - A context-sensitive “help” feature within the model — accessed through the “F1” key — means that assistance is always only a keystroke away.
 - These *Training Materials* provide a “hands-on tour” through the model.
 - The *User’s Manual* provides a more in-depth explanation of the model.
 - EPA’s enforcement economics helpline provides personalized help from 8:00 a.m. to 6:00 p.m. (Eastern time) at 888-ECONSPT or benabel@indecon.com.
 - Jonathan Libber of EPA’s Office of Enforcement and Compliance Assurance is available to answer policy and legal questions at 202-564-6102, or libber.jonathan@epa.gov.
- The *BEN User’s Manual* provides complete installation instructions; you can obtain the model from: www.epa.gov/oeca/datasys/dsm2.html or from the EPA helpline.
- BEN calculates the economic benefit of noncompliance with pollution control requirements, based on modern and generally accepted financial principles.
- BEN can also calculate the present value of “early-compliance” supplemental environmental projects (SEP’s). (For all other SEP’s, use the PROJECT model instead.)
- Related models:

PROJECT calculates the present value of supplemental environmental projects, used to mitigate a proposed civil penalty.

ABEL, **INDIPAY**, and **MUNIPAY** assess the ability to afford environmental expenditures of corporations, individuals (including owners of partnerships and sole proprietorships), and municipalities, respectively.

CIVIL PENALTY POLICY SUMMARY

- Economic benefit components:
 - Benefit from delayed pollution control costs.
 - Benefit from avoided pollution control costs.
 - Benefit from illegal competitive advantage.
- Gravity component:
 - Actual or possible harm.
 - Importance to regulatory scheme.
 - Size of violator.
- Adjustment factors:
 - Degree of willfulness and/or negligence.
 - Degree of cooperation/noncooperation.
 - History of noncompliance.
 - Ability to pay.
 - Other unique factors.
- In criminal context, BEN can enhance presentation of intent argument, and for sentencing show how violator saved money.
- Illegal competitive advantage and BEN:
 - BEN — or any computer model — cannot calculate illegal competitive advantage, leading to possible economic benefit underestimates in certain cases.
 - BEN asks questions for case attributes indicative of illegal competitive advantage, providing suggestions for further research and analysis (see Section III).
 - EPA developing strategy for cases that involve illegal competitive advantage.
 - In criminal cases, forfeiture might be more appropriate for illegal operators.
 - Illegal competitive advantage sources:
 - Gain market share from compliant competitors (e.g., win government contract via low bid made possible by avoided compliance costs).
 - Establish self in market prior to government approval, “an early mover” advantage (e.g., begin producing new chemical product without going through TSCA PMN review in order to take advantage of a new market).
 - Bring extra product to market (e.g., exceed explicit output/throughput limit).
 - Sell prohibited products (e.g., black market), as opposed to legal products produced in noncompliant process, for which BEN is appropriate.

STRATEGIC CONSIDERATIONS

- No statutes or regulations require EPA to calculate economic benefit of noncompliance (except for Clean Air Act Section 120, which mandates a specific computer model similar to BEN).
- The most EPA is required to do is consider benefit in assessing penalties.
- Try not to be drawn into the argument that BEN isn't "precise" enough.
- In court/hearing, try to persuade trier-of-fact that this is more than just reasonable, although all we need to show is reasonableness. (Clean Water Act (CWA) cases set helpful standard of "reasonable approximation" which can also be applied to Clean Air Act (CAA) cases since the same language in the Senate Report on the CWA amendments is in the Senate report on CAA amendments. I would also argue that it should be the same with all media since benefit calculation is the same across media.)
- Can never determine economic benefit as precisely as determining the money a bank robber stole:
 - Violator's financial statements have no line item for "economic benefit from pollution control noncompliance"; but,
 - For almost all cases BEN's economic benefit methodology is as accurate as an economic benefit methodology can possibly be.
- However, BEN's economic benefit result is only as accurate as your inputs: remember the GIGO mantra, "Garbage In, Garbage Out!"
- Judges generally want to recapture the benefit, and therefore may feel a greater obligation to be more precise, demanding greater precision from the enforcement agency.
- State judges may tend to give EPA greater deference than do Federal judges.

BENEFIT RECAPTURE BACKGROUND

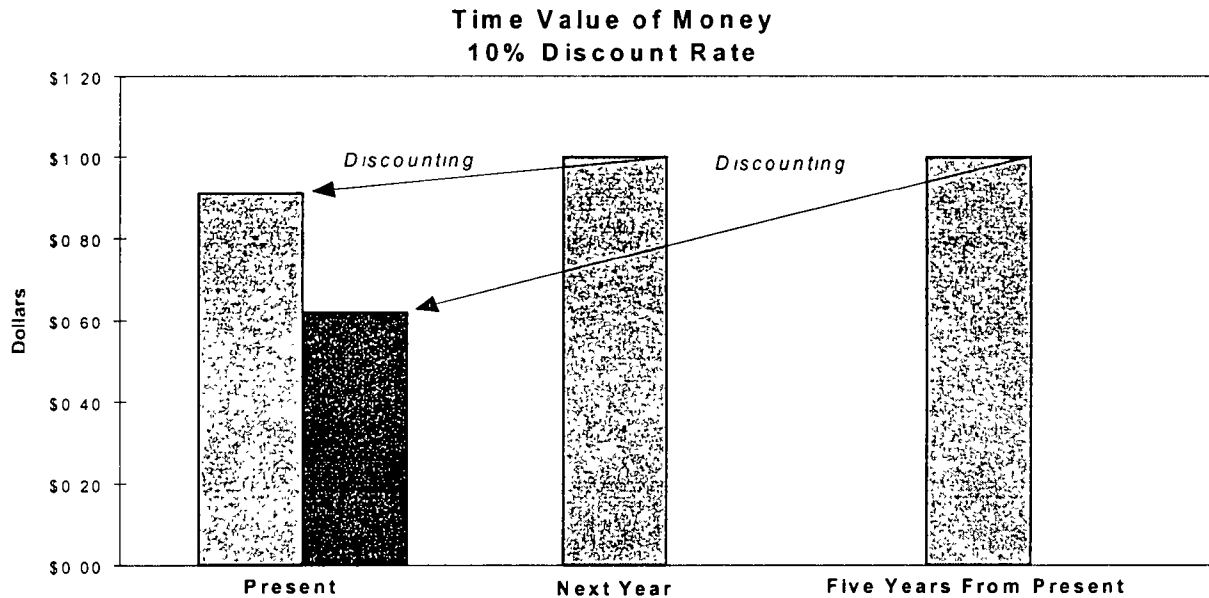
- Objective is to cancel economic gains from delayed compliance; hence, minimum penalty is amount of economic gain plus a nontrivial gravity component.
- Impact of BEN on penalty numbers:
 - 33 percent of all dollars assessed from 1975 to 1985 were assessed in 1985, the first year of BEN use.
 - 66 percent of all dollars assessed from 1975 to 1987 were assessed in 1985 to 1987, the first three years of BEN use.
 - Average total annual penalties for 1975 to 1984 were \$6 million per year; for 1985-1991, average was \$37 million per year.
 - 1994 set a new record of over \$100 million of penalties collected.
 - 1999 total was \$166.7 million in penalties (total would have been even higher but for the fact that it was mitigated to some extent by \$236.8 million in SEP's).
 - 2000 total was \$75.3 million; 2001 total was \$125.4 million.
- State use assistance available from EPA helpline (888-ECONSPT):
 - GAO pushing for the States to recapture.
 - *Laidlaw* case indicates that judges will examine how States treat benefit recapture in deciding whether State enforcement action is effective. (Both the District Court judge and Justice Ginsberg focused on benefit.)
- Under *EPA Supplemental Environmental Projects Policy* (4/10/98), violator may agree to perform SEP in return for favorable penalty consideration, but even with SEP, penalty must equal or exceed the greater of: a) economic benefit plus 10 percent of gravity, or b) 25 percent of gravity.
- PROJECT model typically used to calculate after-tax net present value (i.e., SEP's "true" cost to violator), but use BEN for an "early-compliance" SEP (i.e., compliance with other regulation earlier than is required):
 - *First*, run BEN using date of early compliance as "noncompliance date" and date of required compliance as "compliance date"
 - *Then*, BEN's economic benefit of noncompliance as of the penalty payment date will actually be the SEP value.

UNDERLYING FINANCIAL THEORY

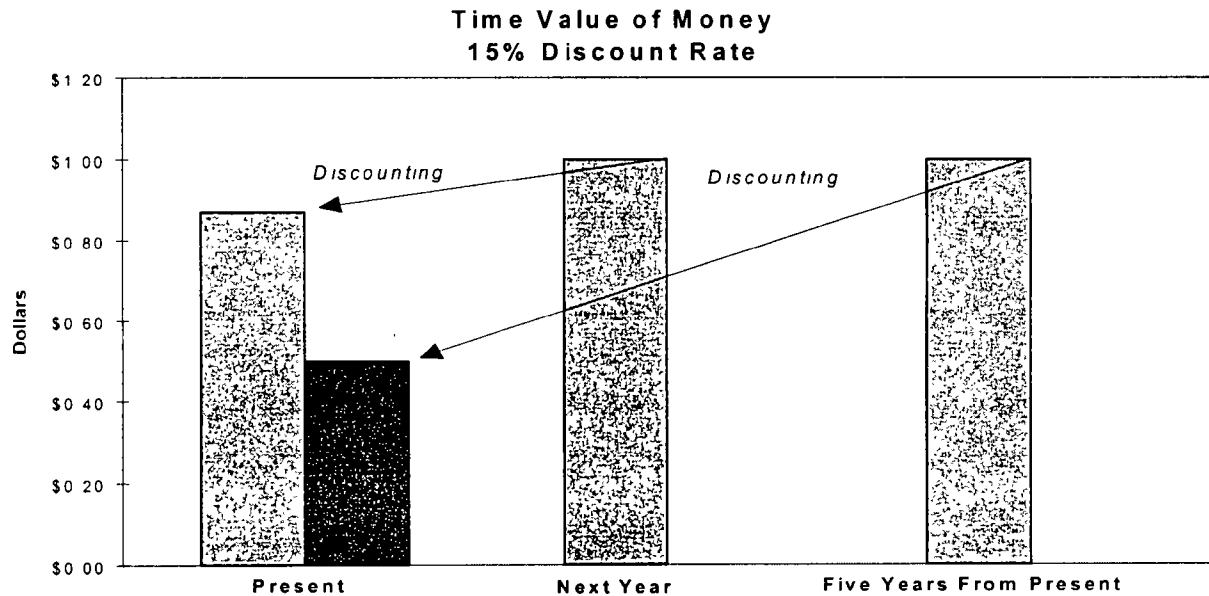
- A violator that delays installation of pollution control equipment saves money, thus gaining an economic advantage over other regulated entities (e.g., companies, municipalities) who comply on time; these savings can come from:
 - Delaying purchase of equipment;
 - Avoiding annually recurring costs of operating and maintaining equipment over period of noncompliance; and,
 - On less frequent occasions, avoiding purchase of equipment altogether.
- When violator delays spending money on pollution control, it can use the money it saves for other, revenue-producing activities and thereby gain an economic benefit.
 - If a complying firm spends \$1,000,000 to comply, the “opportunity cost” of that million dollars is based on what it could earn if it plowed that money back into the company.
 - If the complying firm’s cost of money is 10%, then the opportunity cost of that money is also 10%.
 - Personal finance example: checking account earns 0.5% rate of return, mutual fund yields an average of 9%. Opportunity cost of money not saved is based on the anticipated rate of return on mutual fund, not checking account’s 0.5%.
- Enforcement agency’s goal is to recover at least any economic benefit that violator may have accrued as a result of delayed pollution control, thus removing economic advantage that violator gained vis-a-vis competitors who complied on time.
- Key financial concept in BEN is “time value of money.”
 - A dollar today is worth more than a dollar one year from now, because of alternative investment possibilities.
 - Time value of money is quantified by “discounting” or “compounding” compliance-related after-tax “cash flows” from different years to “net present value” (NPV) as of some common date.
 - This allows comparison of cash flows from different years on same basis.

"TIME VALUE OF MONEY" EXAMPLE

- Assuming a discount rate of 10 percent, \$1.00 one year from now has a net present value (NPV) of \$0.91; \$1.00 five years from now has a NPV of \$0.62:

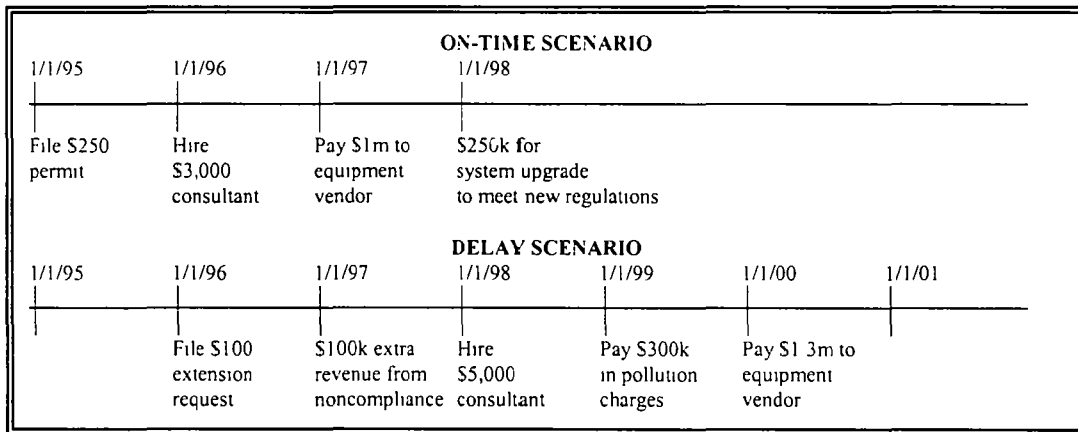


- With a discount rate of 15 percent, respective results are \$0.87 and \$0.50:



“ON-TIME” AND “DELAY” SCENARIOS

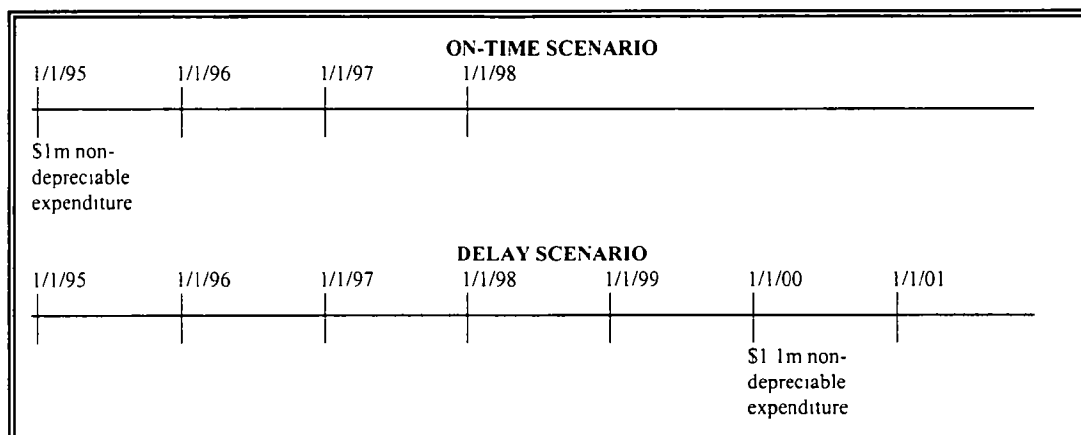
- Before we can discount or compound any cash flows, we must determine “on-time” and “delay” scenarios, i.e., what actions and associated costs were necessary for on-time compliance, and for delayed compliance.
- Economic benefit is difference between net present values (NPVs) of the two scenarios.
- Fundamental definition of economic benefit — difference between NPVs of on-time and delay scenarios — is same regardless of whether economic benefit is from delayed/avoided pollution control expenditures (i.e., BEN’s calculations) or from illegal competitive advantage (i.e., expert using even more complex calculations).
- Compliance scenarios can sometimes be complex and require many customized calculations:



- Here the violator should have started taking actions for compliance in 1995, but did not start taking any actions (and hence incurring any costs) until a year later, in 1996.
- But because of the violator’s delay, required actions for delay scenario are very different (perhaps because of new regulations) than for on-time scenario (as opposed to differing merely by inflation).
- Therefore, such scenarios are probably not amendable to a BEN analysis. More customized calculations are necessary.
- Fortunately, although you should be aware that such complex situations exist — and require expert assistance — most scenarios are far more simple and hence amenable to BEN . . .

“ON-TIME” AND “DELAY” SCENARIOS (continued)

- Here is one such simple example:

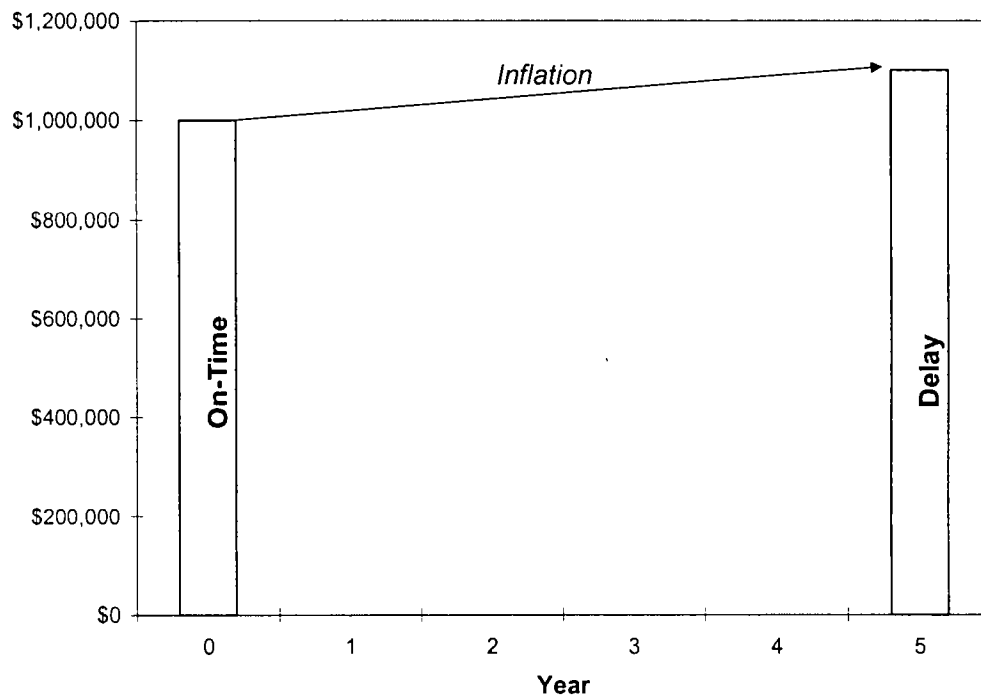


- Violator should have spent \$1 million in 1995, but did not comply until 2000 (when inflation increased the cost of compliance slightly to \$1.1 million).
- Such simple scenarios are amenable to BEN.
- The following pages provide a graphical illustration of the calculations BEN performs to calculate the economic benefit of noncompliance in such a case.

ECONOMIC BENEFIT EXAMPLE

- ABC company should have made a one-time, nondepreciable expenditure of \$1.0 million (after-tax) in January of Year “0,” but did not actually incur the expenditure until January of Year “5,” and will not pay a penalty until January of Year “7.” What is the economic benefit that ABC gained?
- To answer this, we need to compare what should have happened for on-time compliance with what actually happened for delayed compliance.
- First step is to adjust for inflation:
 - Cost of complying on-time (in January of Year 0) is \$1 million (assuming cost estimate is already expressed in Year 0 dollars).
 - Cost of complying late (in January of Year 5) is approximately \$1.1 million.
 - Increase is calculated from an assumed inflation rate of 2%, or alternatively from cost index values (i.e., \$1 million divided by January of Year 0 cost index value, then multiplied by January of Year 5 value).
- The calculation is therefore:

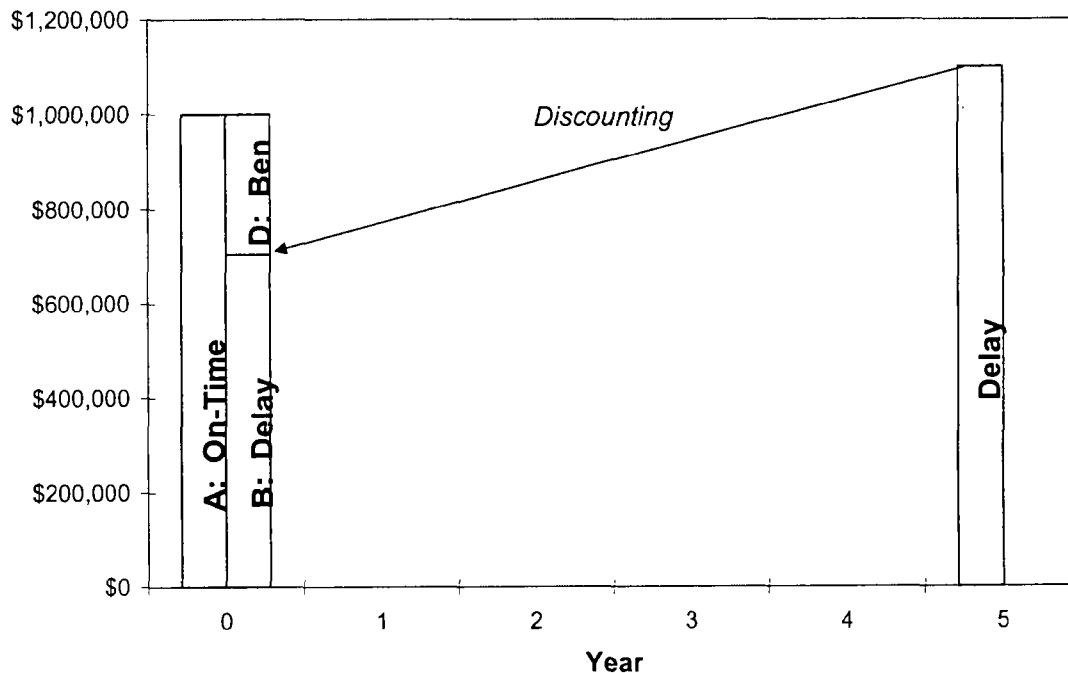
$SX \times (1 + \text{InflRate})^{\text{\#ofYrs}}$	$SX / \text{CostEstimateDateIndex} \times \text{TargetDateIndex}$
$\$1,000,000 \times (1.02)^5$	$\$1,000,000 / 230 \times 253$ (Year 0 & Year 5 values, resp.)
$\$1,000,000 \times 1.10$	$\$1,000,000 \times 1.10$
$\$1,100,000$	$\$1,100,000$



ECONOMIC BENEFIT EXAMPLE (continued)

- Inflation hence increases nominal cost of complying late. If inflation were the only factor, complying on-time would make more sense for violator, since it would be less expensive than complying late. Instead, we also need to account for violator's time value of money, and therefore adjust the separate costs from on-time and delay scenarios to a common present value, as of a common date (i.e., January of Year 0 noncompliance date).
- On-time scenario cost of \$1 million is already expressed at January of Year 0 but we need to discount delay scenario cost of \$1.1 million back to January of Year 0 (from January of Year 5). With a 9.5% rate, the present value of delay scenario is only \$700,000.
- The calculation is therefore:
$$\text{\$X} / (1 + \text{DiscountRate})^{\text{NumberOfYears}}$$
$$\text{\$1,100,000} / 1.095^5$$
$$\text{\$1,100,000} / 1.57 = \$700,000$$
- Thus in order to pay for \$1.1 million in compliance costs in Year 5, the violator need set aside only \$700,000 in Year 0.
- Economic benefit at January of Year 0 is the difference between on-time and delay scenario present values: \$1,000,000 minus \$700,000, which equals \$300,000.

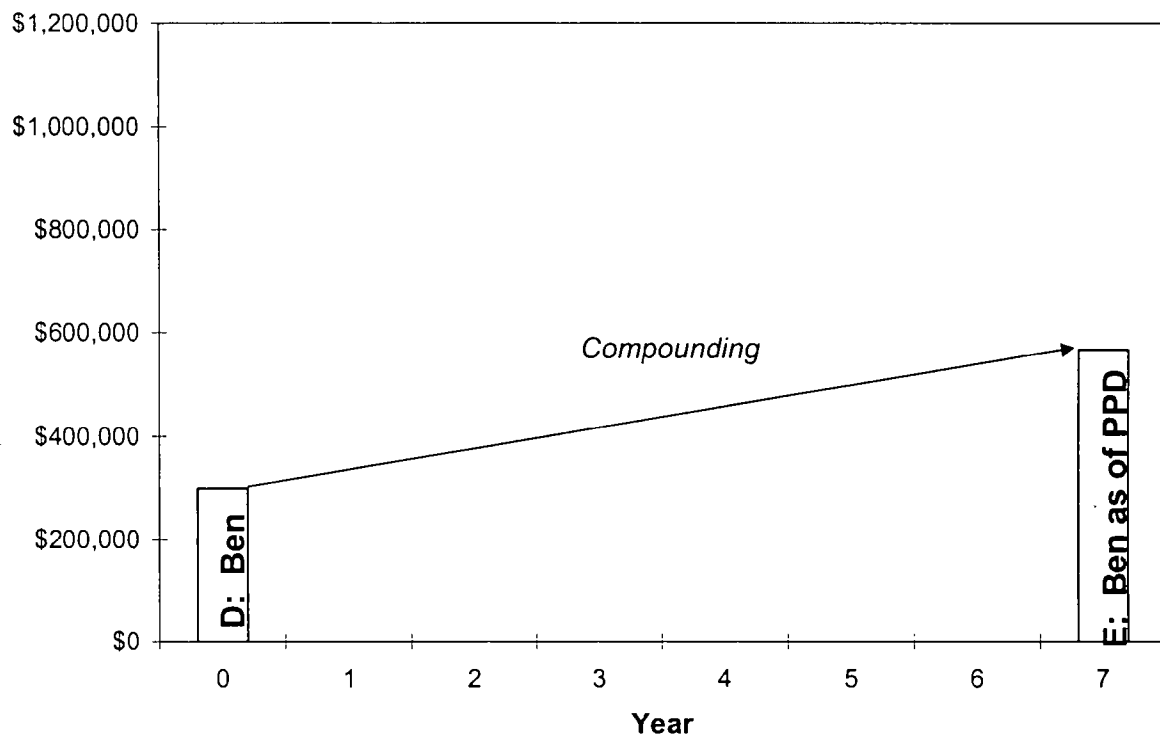
(letter designations correspond to BEN output labels)



ECONOMIC BENEFIT EXAMPLE (continued)

- However, we need to calculate economic benefit as of when violator will pay a penalty, which is January of Year 7 (not Year 0).
- Using the same 9.5% rate, we compound the initial economic benefit of \$300,000 forward from Year 0 to Year 7, to arrive at a final economic benefit of \$567,000.
- The calculation is therefore:
$$\$X \times (1 + \text{DiscountRate})^{\text{NumberOfYears}}$$
$$\$300,000 \times 1.095^7$$
$$\$300,000 \times 1.89 = \$567,000$$

(letter designations correspond to BEN output labels)



SECTION II:
USING THE BEN MODEL

MAIN SCREEN/CREATING A CASE

- When you first open BEN the main screen appears, which is where you create cases and runs. Tab and enter keys will move you sequentially through the input areas, but you can also use your mouse to input data in any order.
- From here you can also access file, window, and help pull-down menus, which allow you to open, close, create, save, or exit files (which are saved as “*.ben”), as well as modify your printer setup (just as in most Windows™ applications). The window menu allows you to shift between multiple open BEN cases. For help use the help menu, or press F1 anytime.
- The first three inputs on the case screen are case name, analyst name, and office/agency. These appear on the bottom of result printouts but do not affect the economic benefit calculation. Case name and analyst name can be any length and include any characters.
 - Case name can be name of violator or anything else relevant to case.
 - Choose office/agency (formerly EPA region) from pull-down menu that lists all ten regions, EPA headquarters and “other,” or type in own entry.
 - Analyst name is usually person performing the analysis or enter “**For Settlement Purposes Only**”.
- Tax-related inputs are violator’s entity, state, and possibly customized tax rates, which together determine tax rates BEN applies to violator’s cash flows.
 - Select “Not-For-Profit” for governmental jurisdiction or charity, “C-Corporation” for company that files tax form 1120 or 1120-A (which includes virtually all publicly traded companies), or “For-Profit Other than C-Corporation” for all other types of companies (i.e., S-Corporations, partnerships, sole proprietorships).
 - From pull-down menu select state in which violator conducts its business (which is not necessarily its state of incorporation), or AVG (for an average of all states), or BEN (to replicate the DOS version of BEN’s standard values, similar to AVG).
 - If you have a compelling reason, customize the tax rate by pressing [**Customize Taxes**] button. BEN will then automatically check the “Taxes Have Been Customized” box.
- [**Competitive Advantage**] button opens a window with several questions. Checking boxes will not affect economic benefit result, but BEN will alert you to possible additional gain from illegal competitive advantage. (Once you finish this screen, click [**OK**], not [**Cancel**].)
- Penalty payment date is when penalty will be paid. (See Section III for guidance.)
- Only once you have entered all required case inputs (including competitive advantage questions) can you create runs.

BEN

File Window Help

EXAMPLE BEN

Case

Case Name:
Example Case

Region
Region 1

Analyst:
J Analyst

Taxes

Entity

☐ Not-For-Profit

☒ C-Corporation

☐ For-Profit Other than C-Corporation

State:
MA

Customize Taxes

☐ Taxes Have Been Customized

Competitive Advantage

Penalty Payment Date: 01-Jan-1999

Runs

New Run:
Add

Existing Runs:

Test Run

Test Run 2-CD 1/1/98

Enter/Edit

Calculate

Copy

Remove

Questions on Illegal Competitive Advantage

☐ Did violator's noncompliance allow it to begin production or sales sooner than it should?

☐ Did violator sell prohibited products?

☐ Are compliance costs a significant percentage of total production costs?

☐ Does violator sell products that can develop "brand loyalty" or high switching costs?

☐ Has violator developed or sold new products or services while in noncompliance?

☐ Could violator have complied cost-effectively by reducing output/throughput?

OK Cancel

CREATING A RUN

- You can add, copy, calculate, and remove runs on the right-hand side of screen.
 - Each case can contain multiple runs.
 - Run names can be in any format and do not affect results.
 - To add a run, enter run name under “New Run:” and press **[Add]**.
 - To enter or edit data for a run, select its name and press **[Enter/Edit]**.
 - To calculate a run, select its name and press **[Calculate]**.
 - To copy a run, select its name and press **[Copy]**.
 - To remove a run (permanently!), select its name and press **[Remove]**.
- Cost estimates can include — but do not require — dollar signs and commas. Decimals are acceptable but BEN will round amount to nearest dollar.
- Each cost estimate needs an estimate date that includes year, month, and day. BEN will accept most date formats. If you do not have an exact date, enter a reasonable estimate.
- Capital investments include all depreciable outlays (i.e., assets that wear out over time).
 - Examples include stack scrubbers, monitoring wells, wastewater treatment systems.
 - Include all installation and design costs.
- One-time nondepreciable expenditures occur once and do not depreciate.
 - Examples include land purchases, designing training program, consulting studies.
 - BEN assumes these expenditures are tax deductible. For land purchases, be sure to change this assumption on the Options screen.
- Annually recurring costs are periodic actions necessary for compliance, typically for operation and maintenance of capital equipment.
 - Examples include labor, utilities, materials, rent, annual property taxes on equipment.
 - Can be negative when compliance saves violator money (e.g., new system is more efficient than old and decreases expenditures on energy or labor).
 - Exclude expenses like capital recovery, interest payments, or depreciation.
 - Include only incremental costs necessary for compliance.
- Noncompliance date is when violator first failed to comply with regulations. Compliance date is when violator reached compliance, or whenever you expect violator to reach compliance in future. (See Section III for guidance.) If you later specify that all compliance costs are avoided (as opposed to merely delayed), you still must enter a compliance date (even though it then has no impact upon result).

EXAMPLE BEN

Example Case Test Run

Compliance Components

	Cost Estimate	Estimate Date
Capital Investment:	\$1,000,000	01-Jan-1992
One-Time, Nondepreciable Expenditure:	\$100,000	01-Jan-1992
Annually Recurring:	\$10,000	01-Jan-1992

Dates

Noncompliance: 01-Jan-1992
Compliance: 01-Jan-1997

OK

Options

Cancel

Enter/Edit

Calculate

Copy

Remove

MA

Customize Taxes

☐ Taxes Have Been Customized

Competitive Advantage

Penalty Payment Date: 01-Jan-1999

CALCULATING AND PRINTING RUNS

- Enter all inputs before attempting to calculate results.
- To perform calculation, select existing run from list on main screen and press **[Calculate]**. BEN will perform calculation and present its results on new screen.
- You can also calculate multiple runs simultaneously: select any combination of runs (using the control-click or shift-click actions with keyboard and mouse), then press **[Calculate]**.
- BEN will summarize your inputs and also note if you customized tax rates or discount/compound rate.
- If you checked off any questions about competitive advantage, a message will appear in the results that violator may have received additional economic benefit from illegal competitive advantage.
- Use scroll bar to view inputs that do not fit on the screen.
- **[Done]** button returns you to main screen.
- You can also print your results from this screen.
 - **[Summary]** button prints information from results screen (i.e., economic benefit result and summary of your inputs).
 - **[Detail]** button prints summary plus additional information that does not appear on screen: possible sources of illegal competitive advantage (if relevant), discount/compound rate calculation (unless you customized the rate), specific cost estimate (unless you overrode BEN's calculation), and up to four pages of detailed cash flow calculations.
 - In case you have trouble printing your results (e.g., page orientation or paper type), try modifying printer setup, accessible under file pull-down menu on main screen.

Example Case: Economic Benefit Results

Run Name =	Test Run	
Present Values as of Noncompliance Date (NCD)	01-Jan-1992	
A) On-Time Capital & One-Time Costs	\$946,734	
B) Delay Capital & One-Time Costs	\$619,159	
C) Avoided Annually Recurring Costs	\$23,889	
D) Initial Economic Benefit (A-B+C)	\$351,463	
E) Final Econ. Ben. at Penalty Payment Date,		
01-Jan-1999	\$698,461	
<i>C-Corporation w/ MA tax rates</i>		
Discount/Compound Rate	10.3%	
Discount/Compound Rate Calculated By	BEN	
Compliance Date	01-Jan-1997	
Capital Investment:		
Cost Estimate	\$1,000,000	
Cost Estimate Date	01-Jan-1992	
Cost Index for Inflation	PCI	
# of Replacement Cycles, Useful Life	1, 15	
Projected Rate for Future Inflation	N/A	
One-Time, Nondepreciable Expenditure		

Print

Summary

Detail

Done

ADVANCED FEATURES: CUSTOMIZING TAXES

- Do not customize taxes unless you have a compelling reason to do so. To customize tax rates press [**Customize Taxes**] button on main screen.
- BEN uses marginal tax rates (i.e., tax rates on last dollar of income) rather than average tax rates, since the economic benefit calculation is analyzing incremental cash flows necessary for compliance. BEN assumes violator is subject to highest income tax rate.
- For example, assume first \$100 of income taxed at 10% rate, and next \$100 at 20%. Average tax rate may be 15%, but for economic benefit the relevant factor is 20% marginal tax rate.
- Not-for-profits have a zero-percent tax rate.
- BEN uses state-specific tax rates together with federal tax rates to calculate a combined tax rate. State taxes must be adjusted to reflect their deductibility from federal taxes, using the following formula:
$$\text{Combined} = \text{Federal} + (\text{State} \times (1 - \text{Federal}))$$
- You can customize only the combined tax rate result, not the preliminary inputs (i.e., federal or state tax rate).
- Enter tax rates as decimals, not as percentages. BEN will then automatically display them as percentages.
- If you customize the tax rate BEN will automatically check the “Taxes Have Been Customized” box on the case screen. It will also note the customization in result printouts.
- If you later change a violator’s tax status or state, you will lose any tax customization.

EXAMPLE BEN

Tax

Combined = Federal + (State * (1 - Federal))

	Federal	MA	Combined
1987	34.0%	9.5%	40.30%
1988	34.0%	9.5%	40.30%
1989	34.0%	9.5%	40.30%
1990	34.0%	9.5%	40.30%
1991	34.0%	9.5%	40.30%
1992	34.0%	9.5%	40.30%
1993	35.0%	9.5%	41.20%
1994	35.0%	9.5%	41.20%
1995	35.0%	9.5%	41.20%
1996	35.0%	9.5%	41.20%

Note: Changing entity or state on the previous screen will result in loss of tax customization.

OK

Cancel

Runs

New Run:

Add

Existing Runs:

Test Run

Test Run 2--CD 1/1/98

Enter/Edit

Calculate

Copy

Remove

☐ Taxes Have Been Customized

Competitive Advantage

Penalty Payment Date: 01-Jan-1999

Contains Enforcement-Sensitive Material

II-8

BEN Training Materials; Updated July 2002

ADVANCED FEATURES: OPTIONAL RUN INPUTS

- Although you must input compliance cost data and certain dates, BEN provides certain economic variables and data. You can accept BEN's standard values, or override them with your own data — if you have a reasonable basis for such a decision.

Discount/ Compound Rate (see section V for example of Discount/ Compound Rate calculation)	BEN discounts and compounds all cash flows at the cost of capital, averaged over the time period from noncompliance date to compliance or penalty payment date, whichever is later. For a company, BEN calculates a typical weighted-average cost of capital (WACC), which represents the cost of a company's debt and equity weighted by the value of financing source. A company must on average earn a return necessary to repay its debt holders (e.g., banks, bondholders) and satisfy its equity owners (e.g., partners, stock holders). While companies often earn in excess of WACC, companies that do not on average earn at least their WACC will not survive (i.e., lenders will not receive principal and/or interest payments; owners will be dissatisfied with their returns). The WACC represents the return a company can earn on monies not invested in pollution control, or, viewed alternatively, represents the avoided costs of financing pollution control investments. For a not-for-profit, BEN uses the average municipality's cost of debt, based on interest rates for general obligation bonds.
Cost Index for Inflation	To adjust cash flows for inflation, BEN applies the <i>Chemical Engineering</i> magazine Plant Cost Index (PCI) month-by-month historical values (which measure cost changes for plant equipment), but also provides optional alternative cost indices (with descriptions in the help system).
Number of Replacement Cycles	In addition to the economic benefit from initially delaying pollution control equipment, BEN calculates additional economic benefit from delaying future replacement cycles, assuming one cycle. (You can specify as many as five, but additional cycles usually have little to almost no impact.)
Useful Life of Capital Equipment	BEN assumes the violator will have to replace pollution control equipment every 15 years — different types of equipment may merit other useful lives.
Projected Rate for Future Inflation	BEN adjusts any future replacement cycles beyond the first one with a forecast for the PCI.
Delayed vs. Avoided	BEN assumes that the capital investment and one-time nondepreciable exp. are delayed not avoided — uncheck this box to change that assumption
Nondepreciable Exp. Tax-Deductibility	BEN assumes that one-time nondepreciable expenditures are tax deductible, but you should override this assumption for land purchases.

Test Run: Optional Inputs [X]

Discount/Compound Rate: 10.3%

Capital Investment

Cost Index for Inflation: PCI

Number of Replacement Cycles: 1

Useful Life of Capital Equipment: 15

Projected Rate for Future Inflation: 1.7%

☒ Delayed, Not Avoided

One-Time, Nondepreciable Expenditure

Cost Index for Inflation: PCI

☒ Tax Deductible

☒ Delayed, Not Avoided

Annual Costs

Cost Index for Inflation: PCI

OK

Specific Cost Estimates

Cancel

ADVANCED FEATURES: SPECIFIC COST ESTIMATES

- This screen allows you to view BEN's inflation adjustments, which calculate specific cost estimates for certain dates, extrapolating from the original single cost estimate that BEN requires for each compliance component. The screen also allows you to override BEN's calculations for the specific cost estimates, but do so only for compelling reasons.
- All data except for specific cost estimates are "grayed out", since BEN allows to you override only final estimates, not intermediate calculations. Changing your inputs on prior screens, however, will have an impact on "grayed-out" data — unless you click **[OK]** on this screen, which will lock in your inputs on prior screens. Clicking **[OK]** on this screen will also visually erase all other data when you return to this screen in the future (since BEN does not know whether your final estimate still matches up with its intermediate calculations).
- Reasons for modifying BEN's calculations can include the following, but be prepared to document your actions and rationale.
 - You have separate cost estimates for the noncompliance and compliance dates. This could reflect several scenarios:
 - violator obtained cost estimate at noncompliance date, even though it did not comply until later;
 - technological change between non-compliance and compliance dates implies that different compliance measures were available at the two dates; or,
 - regulatory change over time mandated different compliance measures at the noncompliance vs. compliance dates.
- Under such scenarios, use most recent data for original capital cost estimate so that it reflects delay compliance scenario (ensuring that any future capital equipment replacement cycles are calculated correctly). Then, override the specific cost estimate in the first column (i.e., on-time scenario compliance start) with the correct estimate.
- You have inflation data that is more appropriate than BEN's. Although BEN offers many other alternative cost indices in addition to its default Plant Cost Index, occasionally some other inflation adjustment may be necessary. If so, override whichever specific cost estimates you believe are inaccurate.

EXAMPLE BEN

Example Case Test Run

Test Run Optional Inputs

Test Run Specific Cost Estimates

	Compliance Start		Replacement Cycle Start	
	On-Time	Delay	On-Time	Delay
	01-Jan-1992	01-Jan-1997	01-Jan-2007	01-Jan-2012
Capital Investment				
Original Cost Estimate:	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000
	÷	÷	÷	÷
Cost Index Value as of (A):	359.500	359.500	359.500	359.500
	×	×	×	×
Cost Index Value as of (B):	359.500	383.300	442.833	481.776
	=	=	=	=
Specific Cost Estimate:	\$1,000,000	\$1,066,203	\$1,231,803	\$1,340,127
One-Time, Nondepreciable Expenditure				
Original Cost Estimate:	\$100,000	\$100,000		
	÷	÷		
Cost Index Value as of (A):	359.500	359.500		
	×	×		
Cost Index Value as of (B):	359.500	383.300		
	=	=		
Specific Cost Estimate:	\$100,000	\$106,620		

(A) -- Original Cost Estimate Date
(B) -- Specific Cost Estimate Date

OK

Cancel

Confirm



Warning: Saving this screen will prevent any further changes to this run on prior screens. Continue?

Yes

No

Cancel

IMPACT OF INPUT CHANGES UPON ECONOMIC BENEFIT

Input Item	Direction of Change	Impact on Economic Benefit
Marginal Tax Rate	increase	decrease
Penalty Payment Date	later	increase
Cost Estimates	increase	increase
Noncompliance Date	later	decrease
Compliance Date	later	increase
Discount/Compound Rate	increase	increase
Number of Replacement Cycles	increase	increase
Useful Life of Capital Equipment	increase	decrease
Project Rate for Future Inflation	increase	varies
Cost Index for Inflation	PCI to other index	varies
Tax-Deductibility of One-Time, Nondepreciable Expenditure	tax deductible to not tax deductible	increase

SECTION III:
ISSUES THAT ARISE WHILE USING BEN

CIVIL PENALTY CALCULATIONS

- Two components for most penalties; see *Policy on Civil Penalties* (2/16/84, General Enforcement Policy Compendium P.T. 1-1 and P.T. 1-2).
 - Economic benefit of noncompliance: apply BEN model (as per *Guidance for Calculating the Economic Benefit of Noncompliance for a Civil Penalty Assessment*, 11/05/84, PT. 1-5.)
 - Gravity, reflecting seriousness of the violation (consult applicable medium-specific penalty policy).
 - Gravity adjusted for: history of violation, cooperation/noncooperation, negligence/willfulness, and ability to pay. (Ability to pay analysis may also apply to economic benefit portion; see *Guidance on Determining a Violator's Ability to Pay a Civil Penalty*, 12/16/86, PT. 2-1.)
- Add economic benefit and adjusted gravity to yield initial penalty target figure.
- Absolute bottom line is economic benefit component plus some nontrivial gravity component, unless reasons to settle below this amount are compelling (*Policy on Civil Penalties*, supra).

SETTLEMENT NEGOTIATIONS

- General Strategy for Settlement Negotiations (may not apply to unilateral orders): develop several penalty calculations — not arbitrary ones, but instead each with its own rationale. (But for federal facilities, may want to file before negotiating.)
- But first and foremost, never apologize for your penalty figures:
A request made with diffidence and timidity is easily denied because the petitioner himself seems to doubt its fitness. — Samuel Johnson
- Statutory Maximum (e.g., \$250,000) and Adjusted Penalty (e.g., \$245,000)
 - Include statutory maximum in judicial complaint (e.g., 10 days x \$25,000).
 - For EPA administrative cases, complaint should contain already-adjusted penalty figure (e.g, \$245,000), but you still need to calculate statutory maximum to ensure your penalty calculation does not exceed this amount.
 - Tactic for administrative cases: calculate penalty number for complaint using very aggressive assumptions, resolving all doubts against violator. (*Katzen Brothers* requires that all penalty factors be addressed.)
- Counter Offer #1 (e.g., \$182,000): Applies penalty policy very aggressively against violator, but falls well short of statutory maximum; should contain maximum BEN figure.
- Counter Offer # 2 (e.g., \$163,000): Applies penalty policy less aggressively against violator; may have a lower BEN figure (e.g., based on a shorter period of violation).
- Negotiation Bottom Line (e.g., \$122,000)
Represents what the litigation team feels the case is worth; unless the team is convinced its numbers are wrong, the government will not settle below this number.
- Penalty Policy Bottom Line (e.g., \$111,000)
Agency's penalty policy is never to settle below economic benefit of noncompliance; litigation team in some cases can reduce penalty below Negotiation Bottom Line, but they cannot reduce it below economic benefit unless highly compelling reasons are present.
- Flow of Negotiations: As you move from aggressive assumptions to less aggressive posture on each penalty issue, obtain something in return, unless other side convinces you that your assumptions are incorrect (e.g., compromise on penalty in return for better compliance schedule or agreements to institute environmental auditing program).
- Common misconception is that BEN is totally objective and not a subject for negotiation: financial theory behind the model's methodology is not negotiable, but sometimes certain data inputs may be negotiable. (See following page.)

DATES, RATES, AND DATA

- Period of violation (i.e., time between noncompliance and compliance dates) is major issue: as interval increases, economic benefit increases.
 - In practice, period of violation often not clear; if evidentiary problems, use sensitivity analysis (i.e., multiple runs) to see impact of different assumptions.
- When violator not yet in compliance, must estimate a future date; tell violator your assumption and avoid “unpleasant surprises.”
 - Be pessimistic: *Things always take longer than they take.* — Yogi Bera; far easier to lower penalty for violator who beats schedule than increase it for one that fails to meet schedule (i.e., don’t get caught in “close and bump” situation).
 - Might want to use date from proposed consent decree.
 - Further compliance delays will increase BEN; faster schedules reduce BEN.
- Similarly, as penalty payment date extends further into future, economic benefit increases.
 - Tell violator BEN’s penalty payment date, and that if date actually later, BEN will be higher (and vice versa).
 - For trial/hearing, make sure judge understands that benefit keeps increasing until penalty is paid: since decision usually made many months after trial/hearing, might want to run BEN with various future penalty payment dates to illustrate this.
- Again, far easier to reduce a penalty for violator that agrees to pay earlier than to raise it for one that pays later than you assumed. Also, inform violator that economic benefit will no longer continue to be compounded forward if penalty amount is escrowed.
- BEN’s discount/compound rate based upon a typical violator’s cost of capital (WACC for companies; municipal bond interest rate for not-for-profits); basis not open to negotiation, but violator may argue for rate tailored to itself, industry, or specific division.
 - Involve a financial analyst or contact EPA helpline (888-ECONSPT) if violator raises an issue about calculation for discount/ compound rate (i.e., cost of capital).
 - Might want to warn violator that case-specific cost of capital could result in higher discount/compound rate, which will increase economic benefit.
- For cost estimates, aim high as negotiation ploy; common data sources include:
 - Discovery for evidence of violator’s actions: daily logs, consultant’s reports, discharge monitoring reports (DMRs), model interrogatories, request for production.
 - Administrative subpoena.
 - Ask engineering experts, both in-house, and contractors, or even similar regulatee.
 - Clean Air manual at <http://www.epa.gov/ttn/catc/products.html>.
 - Some standardized UST costs available on EPA website.
 - RCRA compliance costs at <http://es.epa.gov/oeca/ore/rcra/cmp/120097.pdf>.

COMMON VIOLATOR ARGUMENTS

1. *Cost of roof on new treatment building should be excluded since roof is not needed to operate treatment system.*
 - In virtually all cases, BEN should include the cost of the roof unless the violator can conclusively prove that the treatment system would operate just as effectively and efficiently without the roof (all else being equal) and that the roof is not a customary part of such treatment systems. A violator can almost never support this claim, since it must essentially argue that installing a roof was a waste of money (serving no sensible business purpose).
2. *Cost of painting walls and landscaping treatment building should be excluded since they are unnecessary for compliance.*
 - While such items may not be directly necessary to achieve compliance, if these items are normally part of such projects, then BEN should include their costs. Such expenditures often provide intangible and tangible benefits, such as improving the appearance of the facility, reducing erosion and dust, preserving the building, and creating a more attractive environment for employees, visitors, and customers. Presumably these expenditures would have been necessary for on-time compliance, and hence the violator benefitted by delaying them.
3. *Cost of an extra (backup) pump should be excluded, since it is unlikely ever to be used.*
 - While the pump may never be used, if reasonable engineering practice would include an extra pump (or any other backup systems), then BEN should include its cost. Given that the violator did (or will) purchase the extra pump, the burden is on the violator to show that it is unnecessary to achieve and consistently maintain compliance. Further, even if the cost of the extra pump were subtracted from the capital investment, annual operation and maintenance costs might need to be increased to reflect the greater importance of maintaining the existing pumps.
4. *Cost of building second floor above treatment plant should be excluded since it is used exclusively for purposes unrelated to compliance.*
 - If the second floor does not support the pollution control system, then the incremental cost of building the second floor may be subtracted from the capital investment.

COMMON VIOLATOR ARGUMENTS (continued)

5. *Cost of building tertiary treatment system should be excluded since only primary and secondary treatment systems were necessary to remedy violations.*
 - If the tertiary treatment system really was unnecessary to prevent the violations alleged in the complaint, but rather is necessary for achieving compliance with future standards, then subtract its cost from the capital investment. Recall that the capital investment should reflect the pollution control system that was necessary to remedy the violations at the time and under the conditions alleged in the complaint. The violator, however, must convince EPA that the additional cost is truly unrelated to remedying the violations alleged in the complaint.
6. *No additional labor is necessary to operate new pollution control system, since existing employees operating old system will operate it.*
 - If the existing employees were operating an old pollution control system replaced by the new system, then this claim may be correct. Presumably the total labor costs associated with the old pollution control system (replaced by the new system) are less than or equal to the labor costs for the new system. If the new system is more efficient to operate, even less labor may be required. Your entry for annually recurring costs should reflect this and can even be negative.
7. *Labor costs for new system are really zero because we are reassigning workers from another part of plant; thus, since we are not hiring additional workers to run system, we have no incremental labor costs.*
 - This claim is not correct since the employees who will operate the new system are not coming from the old pollution control system that is being replaced. Rather, they are coming from another part of the facility and the facility will be deprived of the productive work these employees were doing. If the violator had complied on-time, it would have had to shift these employees to pollution control and given up the work these employees otherwise would have done somewhere else (e.g., the production line) during the period of noncompliance. This is the concept of opportunity cost: the cost of resources for a particular use is measured by the benefit lost in forfeiting their best alternative use.

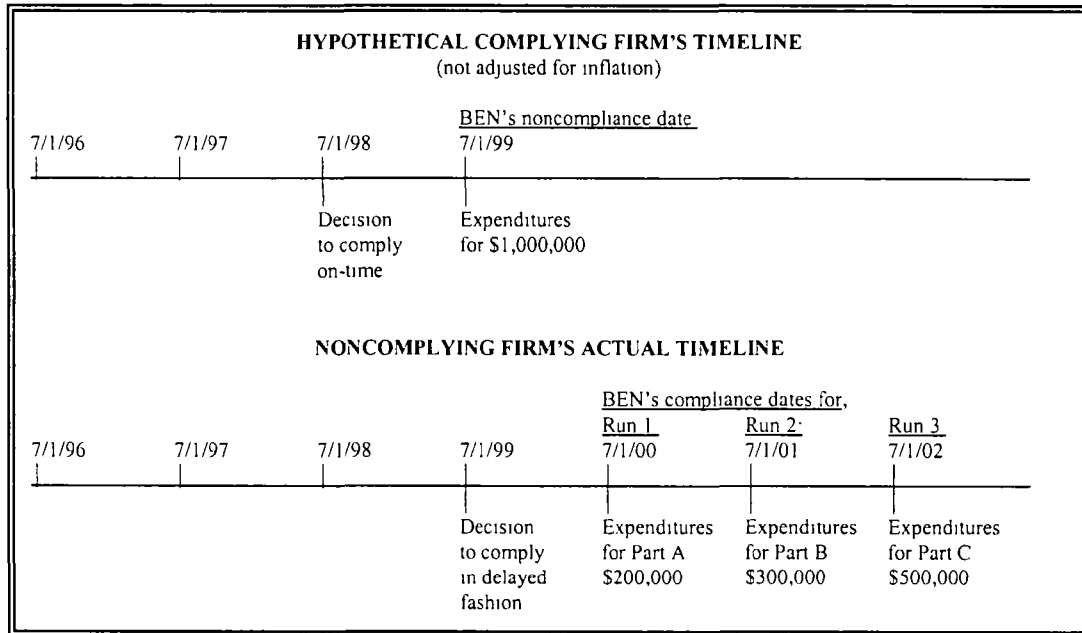
CHARACTERIZING COMPLIANCE SCENARIOS

- Under all of the following compliance scenarios, \$1 million in capital equipment is required, but the BEN inputs may vary significantly.
1. ***Starting Over: Violator Spends \$100,000 on System that Does Not Work.***
 - The violator should have spent \$1,000,000 to install a satisfactory system, but instead spent \$100,000 on-time for a system that did not work. If the system did not result in compliance, it is questionable that the system's expenditures were in fact intended for genuine compliance. Unless some other factor is present, the correct entry for the capital investment should be \$1,000,000.
 - The enforcement team might find that the violator had some reasonable basis or justification for selecting the inexpensive technology. If the violator went to a reputable firm, the firm recommended the system that failed, and the violator's reliance on the recommendation was reasonable, then you should offset the economic benefit by the after-tax present value of the unsuccessful expenditure. You could use BEN to calculate this offset, although remember that this is a case-specific judgement for the litigation team.
 2. ***The Little System that Couldn't: System "Works," But Is Too Small.***
 - The violator spent \$100,000 on-time for a system that was too small to solve the pollution problem, but the existing system can be incorporated into the final, fully sized system. The Agency should subtract from the total required investment the \$100,000 already spent; the BEN capital investment input would be \$900,000. The reason for this treatment is that the violator gained a benefit on only the \$900,000 that it did not spend, not the \$100,000 it did spend.
 3. ***Letter Makes Better?: Same as Scenario 2, But Violator Has Letter from Government Official Approving System.***
 - While the violator has a reason for being out of compliance, it still had the benefit of using the \$900,000 for other purposes while it was in violation. Thus, BEN's capital investment is still \$900,000. BEN is "no-fault" in nature. Regardless of how good the violator's excuse is, it still had the use of the \$900,000 over the period of the violation. The only difference between this and scenario 2 is the existence of an arguable approval by the regulatory agency, but this is a legal distinction, not an economic one, possibly affecting the gravity component of the penalty, but not the economic benefit component.

CHARACTERIZING COMPLIANCE SCENARIOS (continued)

4. *Three Easy Pieces: Violator Complies in Stages.*

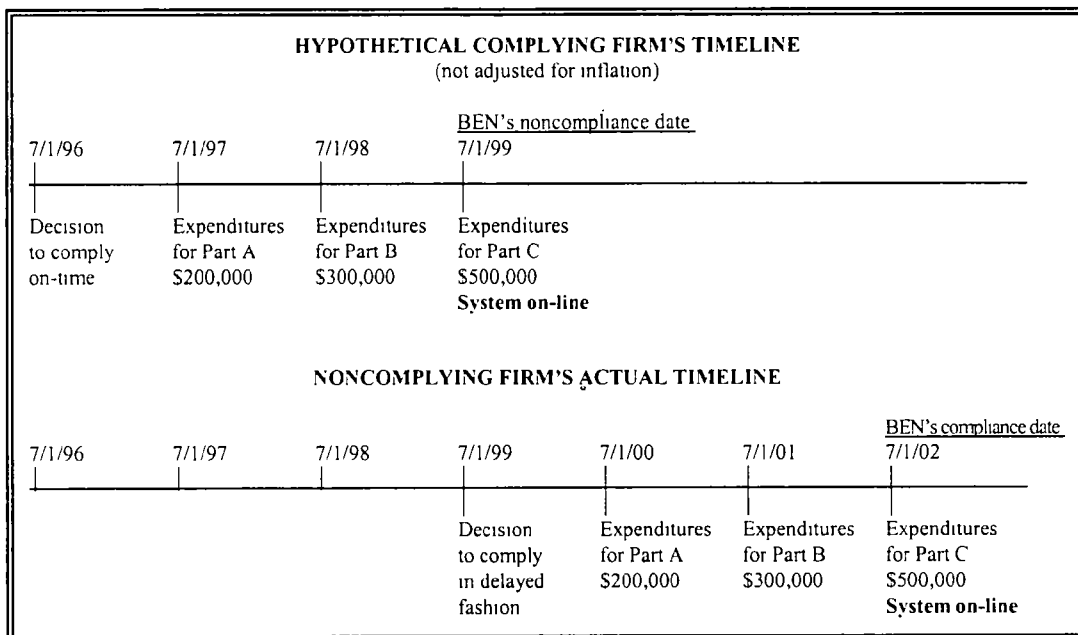
- The violator put part of the pollution system into operation (with actual — though partial — pollution reduction) one year after the noncompliance date at a cost of \$200,000. One year later (and two years after the noncompliance date), the violator will put a second piece of the system costing \$300,000 into operation (which will result in additional pollution reduction). Three years later the entire system will be in operation, and the final piece will cost \$500,000.
- If on-time compliance could have been achieved in one stage instead of three, create three separate BEN runs, each with the same noncompliance date:
 - \$200,000 capital investment, and a one-year period of noncompliance;
 - \$300,000 capital investment, and a two-year period of noncompliance;
 - \$500,000 capital investment, and a three-year period of noncompliance.
- As the violator paid for each component, it was no longer delaying the purchase of that equipment. Add the results from the three runs to determine the total economic benefit.



CHARACTERIZING COMPLIANCE SCENARIOS (continued)

5. ***It Ain't Over Till the Last Component Sings:***
System is Operational at Conclusion of Series of Expenditures.

- This is similar to scenario 4 (where the violator purchased and installed the various system components over three years), except that here the system is put into operation only after all of its components are installed, instead of sequentially.
- If on-time compliance would have been accomplished the same way as delayed compliance, in three separate stages (see timeline below), create one BEN run with a capital investment of \$1,000,000 and a three-year noncompliance period. For both on-time and delayed compliance, three years are necessary to comply, and therefore if the violator had complied on time it would have needed to start three years before the compliance date.



- Note that BEN's calculation here is based on the simplifying assumption that all the money was spent on a single date, i.e., the day compliance was achieved. Instead, you could create three separate BEN runs, with different noncompliance and compliance dates (yet hence the same-length noncompliance period). This approach will yield a slightly higher BEN result, although the additional complexity may not be worth the additional accuracy (especially if the noncompliance period is long relative to the period over which the actual expenditures were incurred).

CHARACTERIZING COMPLIANCE SCENARIOS (continued)

6. *The “Lessor” of Two Evils: Pollution Control Equipment Will Be Leased, Not Purchased.*

- The violator is actually leasing the equipment it needs to comply for \$125,000 per year. Rather than entering the \$1,000,000 as a capital cost, you should enter a zero for capital investment and \$125,000 as an annually recurring cost.

7. *“True” Confessions: Compliance is “Cheaper” than Noncompliance.*

- The violator comes into compliance late and finds that it has been saving money since it installed the new technology. This may occur because the compliant technology allows the violator to recover materials and/or reduce operation and maintenance costs. BEN produces a negative result, seemingly confirming that the violator would have been better off had it complied on-time.
- Other factors may have caused the violator to delay compliance, or perhaps the violator was unaware not only of the potential cost savings from compliance but also the status of its noncompliance.
- Be wary of such negative economic benefit results! For example, the violator might have felt that the new processes and technology needed to comply would have adversely affected its product quality. In that case, the violator probably realized an economic benefit from not having its product quality adversely affected by the compliant technology. This constitutes illegal competitive advantage, and typically requires additional research into the alternative compliance scenarios and their financial impacts.
- Even if the economic benefit really is negative, the enforcement team should carefully consider the appropriate gravity component of the penalty, since the violations might still be serious, despite the lack of economic gain to the violator.

ILLEGAL COMPETITIVE ADVANTAGE

- Although BEN does not calculate the economic benefit from illegal competitive advantage, it does ask certain questions concerning its possible presence.
- Below are the questions that BEN asks, along with the responses that appear in BEN's results if you answer affirmatively.
 1. *Did noncompliance create a cost advantage that allowed market share gain?*
Detailed examination is necessary, first of supposed cost advantage and causation, and then of actual financial impact.
 2. *Did violator sell prohibited products/services that no additional costs could have made legal?*
Determine after-tax profit from illegal sales.
 3. *Did noncompliance allow start of production/sales earlier than under hypothetical compliance?*
Examine net after-tax cash flows realized from earlier-than-permissible production/sales.
 4. *Would permit have affected operations so significantly as to alter gross revenues?*
Examine net after-tax cash flow impact from modifications to operations.
 5. *Did compliance *require* a reduction in throughput/output?*
Determine after-tax profit from incremental production.
- If you answer affirmatively to any of these questions, further research and analysis is necessary to determine the full extent of the violator's economic benefit.
- You might wish to consult U.S. EPA's guidance on illegal competitive advantage, or contact EPA's enforcement economics support helpline, at 888-ECONSPT (326-6778).

TRIAL PREPARATION

- Expert Witness — whether in-house employee or outside consultant — presents analysis of benefit, with calculations using whatever analytical tool expert thinks is appropriate (e.g., BEN, computer spreadsheets, calculator).
 - Many cases may involve complex compliance scenarios for which customized computer spreadsheets more flexible than BEN are necessary, other cases may involve very simple calculations that can be presented in an even more streamlined format than BEN, while some cases may be perfectly amenable to BEN.
 - If BEN model is used to calculate economic benefit, person who ran BEN should be the testifying expert if and only if that person can explain it to judge and handle cross-examination.
 - Focus trial preparation on key differences between defendant's analysis and enforcement agency's.
 - While you are still in negotiation, obtain necessary documents to support benefit analysis at trial — if you wait until after settlement fails to begin discovery, then you will probably not have enough time to obtain documents you need.
 - Attorney who is handling the expert witness must understand the underlying financial theory:
 - Judges need to see that you truly understand the finance issues, and can tell when all you are doing is merely asking scripted questions and receiving scripted answers.
 - You need to be able to rehabilitate your expert if defendant's counsel shakes his or her testimony.
 - You need to effectively cross examine the opposing expert witness, many of whom are vulnerable.
 - Consider using the rule of thumb approach, presented at the end of this section, if the benefit component is very small (under \$10,000) and the other side does not have an expert witness.

RULE OF THUMB BENEFIT CALCULATION MODEL

- Only use this when the following criteria are met:
 - Violator is not using an expert witness.
 - The benefit is relatively small (probably under \$10,000 or if the benefit represents only 10% of the entire penalty).
- Advantages
 - You can have anyone present the calculation as long as they can explain it clearly.
 - Remember that reasonable “approximations will suffice” in Clean Water Act cases, and perhaps others.
 - Presents the trier of fact with a fairly simple calculation, and should conserve trial time and enforcement resources.
 - Presents a conservative calculation of benefit as it understates benefit (in comparison with BEN) in almost all typical cases.
 - Rule of Thumb has actually been around since 1984 (contained in Framework document).

Explanation of Rule of Thumb Calculation

EPA established the economic benefit recapture requirement in its Policy on Civil Penalties and the accompanying document, A Framework for Statute-Specific Approaches to Penalty Assessments. These 1984 policies were codified in the General Enforcement Policy Compendium as P.T. 1-1 and P.T. 1-2, respectively. On pages 7-8, the Framework document presents a simple formula for calculating the economic benefit from delayed expenditures, and on page 9, the Framework document presents a simple formula for calculating the benefit from avoided expenditures. Both of these formulae are contained in the Rule of Thumb Economic Benefit Spreadsheet. A sample analysis using that Spreadsheet is attached. The following presents some guidance in using the Spreadsheet.

Operation of the Rule of Thumb Spreadsheet

All you will need to use this Spreadsheet are the costs avoided and/or delayed, the amount of time the entity was in violation, and the combined Federal and State tax rate from the State where the violating facility is located. This information is available from the BEN model, but if for some reason that information is unavailable, the user can use 39.5% as the tax rate as it is an average of all combined Federal and State tax rates. The tax rate needs to be entered as a decimal (e.g. 39.5% would be entered as 0.395).

Advantages of the Rule of Thumb Spreadsheet

The Spreadsheet approach has several advantages over using the BEN model. First its simplicity allows our enforcement personnel without finance backgrounds to present a benefit calculation in a hearing. The BEN model is somewhat complex and beyond the expertise of most enforcement professionals to explain from the witness stand. The Spreadsheet, in contrast, could be explained by almost all of our enforcement professionals. While this approach is not nearly as accurate as the BEN model or the approaches we normally use at trial or hearing, it is adequate as the standard for Clean Water Act cases for the calculation of economic benefit is a "reasonable approximation". That standard should eventually be adopted in other media as there is no difference between the calculation of benefit in a Clean Water Act case and a case involving TSCA, RCRA, CAA, etc. The Rule of Thumb Spreadsheet also presents the trier of fact with a simple calculation and should reduce hearing time and conserve litigation resources.

Limitations

The Spreadsheet has some limitations. The first is, as mentioned above, it is not nearly as accurate as the BEN model or the other approaches we normally use at trial or hearing. Because of that, you should not use it if the respondent is using an expert witness to oppose the benefit calculation. Although we only have to come forward with a reasonable approximation of benefit, the Spreadsheet will probably not compare favorably with a sophisticated analysis. As a practical matter, you should also not use the Spreadsheet if the benefit component is significant (i.e. over \$10,000). For a small benefit calculation, the inaccuracies are de minimis, but as the size of the benefit increases, the inaccuracies become more significant and will substantially understate the economic savings from noncompliance.

Comparison with BEN

The Rule of Thumb Spreadsheet will yield more conservative calculation of economic benefit in the vast majority of cases because of the following factors:

- The delayed cost calculation assumes a 5% time value of money (i.e., the discount rate). This is nearly half of the typical discount rate in the BEN model.
- The avoided cost calculation makes no adjustment for the time value of money. This is just a straight calculation of the after-tax value of the avoided expenditures. No attempt is made to include the benefit the violator derived from internally reinvesting that money even at the delayed-expenditure calculation's meager 5% rate.

Some aspects of the Spreadsheet that are less conservative than the BEN model, but their combined impact does not fully mitigate the impact of the conservative assumptions discussed above. Just for the record those aspects are:

- No adjustment is made for inflation. Inflation usually reduces economic benefit because it makes complying late more expensive than complying on time. (I.e., the equipment in 2001 costs more than if it had been purchased on time in 1996.)
- No adjustment is made in the delayed cost calculation for taxes. Since the equipment is depreciable, and the one-time nondepreciable expenditures are usually tax deductible, the Spreadsheet's cost figures are higher than BEN would use. If a firm can depreciate and/or deduct its pollution control expenditures, it can reduce the cost of compliance, and the economic benefit from delaying compliance will be consequently lower. The higher the firm's tax rate, the lower the economic benefit.

But for the typical delayed cost calculation, the Spreadsheet will usually be 40-50% less than BEN. For the typical avoided cost calculation, the Spreadsheet will usually be about 15-25% less.

Rule of Thumb Economic Benefit Spreadsheet

Benefit from Delayed Expenditures

Cost	5% Gain	Years of NC	Total
10000	500	5	2500

Benefit from Avoided Expenditures

Cost	Tax Rate	After Tax Cost	Years of N/C	Total
1000	0.405	595	5	2975

Grand Total
5475

SECTION IV:
SAMPLE PROBLEMS

OVERVIEW OF SAMPLE PROBLEMS

- This section contains three sample problems (labeled A, B, and C).
- For each sample problem, the first page provides you with a scenario and several assignments.
- The second page (on the backside of each first page) shows you the results in the form of BEN's summary printouts for the different runs corresponding to all of that scenario's assignments.
- The third page then provides a brief explanation of the results, as well as helpful notes.
- When you start a sample problem, you should first create a new file for the case (i.e., using the "Control-N" keystroke, or choosing "New" from the file pull-down menu, just as in any standard Windows application).
- Then, for each new assignment, create a new run. You can either start a run from scratch by typing in its name in the space under the "New Run" heading on the main screen, or by selecting a run for a prior assignment and clicking **[Copy]**.
- If your results are off by only a small amount, some of your dates may differ slightly from the solutions. (If you entered your dates using a nontraditional format, be sure that BEN has interpreted your dates in the manner you intended.) The sample problems require you to make reasonable assumptions about dates, because you may have to make similar decisions in real cases. Be sure the violator understands the assumptions you make, and that any changes may alter the economic benefit.

BEN SAMPLE PROBLEM A: Delora's Unbelievable Dry-Cleaning Establishment

Scenario

Upon Delora Downey's birth, her father Dudley founded Delora's Unbelievable Dry-Cleaning Establishment (DUDE), an S-Corporation, in her honor. When Dudley built DUDE, dry cleaners did not have to meet any air emission requirements, but the VOC emissions from the dry cleaning process became a problem as the metropolis of Vapid Valley CA continued its exponential growth. Vapid Valley was subject to weather inversions, particularly in the winter, which intensified air pollution problems. Unfortunately, as a result of a tragic martinizing accident in 1999, Dudley died, leaving the business in the hands of his daughter Delora.

DUDE needed to come into compliance with EPA's new air emission standards by January 1, 2000, and by then Delora — a shrewd yet corrupt businessperson — had installed \$50,000 worth of equipment ostensibly for this purpose. Later that month, EPA's inspection of DUDE revealed Clean Air Act violations. The \$50,000 equipment that Delora said she had installed for compliance seemed to have no impact upon emissions, and appeared to have been installed for other reasons. In the ensuing negotiations, Delora agreed to comply by May 31, 2000.

Believing that EPA investigators were out of her hair, instead of investing in pollution control equipment Delora daringly purchased state-of-the-art dry-cleaning equipment and spot-removing devices, which more than doubled her business. During a 2001 inspection, EPA discovered Delora's dastardly deed, and immediately began an enforcement action.

Succumbing to EPA pressure, Delora finally installed and had the required equipment operating on August 8, 2001, spending three quarters of a million dollars on the equipment. Starting at the same time, she also began to incur approximately \$60,000 per year in operating and maintenance expenses. The final compliance design incorporated none of Delora's older, original "emission control" equipment. Because of Delora's negligent and defiant actions, EPA has decided that Delora must pay a penalty. An administrative hearing was held on January 28, 2003.

Assignments

1. Calculate the economic benefit that DUDE gained as a result of noncompliance. (Assume a penalty payment date six months after the scheduled hearing.)
2. Delora's dorky brother Darren, her accountant and lawyer, cites a document on the equipment's associated expenses and expected life to argue that the useful life entry should be 20 years, not BEN's 15-year standard value. Calculate the revised economic benefit.
3. Did DUDE gain any additional economic benefit through illegal competitive advantage?

Run Name =	Run 1	Run 2: 20yr
Present Values as of Noncompliance Date (NCD),	01-Jan-2000	01-Jan-2000
A) On-Time Capital & One-Time Costs	\$619,413	\$572,673
B) Delay Capital & One-Time Costs	\$539,908	\$499,165
C) Avoided Annually Recurring Costs	\$47,998	\$47,998
D) Initial Economic Benefit (A-B+C)	\$127,503	\$121,505
E) Final Econ. Ben. at Penalty Payment Date,		
28-Jul-2003	\$183,926	\$175,274
<i>Ec. ben. from illegal competitive advantage</i>		
<i>may also be present: see detailed printouts.</i>		
<i>For-Profit (not C-Corp) w/ CA tax rates</i>		
Discount/Compound Rate	10.8%	10.8%
Discount/Compound Rate Calculated By.	BEN	BEN
Compliance Date	08-Aug-2001	08-Aug-2001
Capital Investment:		
Cost Estimate	\$750,000	\$750,000
Cost Estimate Date	08-Aug-2001	08-Aug-2001
Cost Index for Inflation	PCI	PCI
# of Replacement Cycles; Useful Life	1; 15	1; 20
Projected Rate for Future Inflation	N/A	N/A
One-Time, Nondepreciable Expenditure.		
Cost Estimate	\$0	\$0
Cost Estimate Date	N/A	N/A
Cost Index for Inflation	N/A	N/A
Tax Deductible?	N/A	N/A
Annually Recurring Costs:		
Cost Estimate	\$60,000	\$60,000
Cost Estimate Date	08-Aug-2001	08-Aug-2001
Cost Index for Inflation	PCI	PCI
User-Customized Specific Cost Estimates	N/A	N/A
On-Time Compliance Capital Investment		
Delay Compliance Capital Investment		
On-Time Compliance Replacement Capital		
Delay Compliance Replacement Capital		
On-Time Compliance Nondepreciable		
Delay Compliance Nondepreciable		

BEN SAMPLE PROBLEM A: Delora's Unbelievable Dry-Cleaning Establishment

Solutions

1. *DUDE's calculated economic benefit of noncompliance with the Clean Air Act requirements is \$183,926. You should not give Delora credit for her initial "pollution control" expenditure of \$50,000, because it appears unrelated to compliance.*
2. *The new economic benefit is \$175,274 assuming a useful life of the pollution control equipment equal to 20 years. A longer useful life reduces the economic benefit, all other assumptions held constant.*
3. *Conditions for illegal competitive advantage might conceivably exist, since Delora managed to double her business while in noncompliance. Then again, even had Delora complied, she probably could have purchased the state-of-the-art devices anyway, and still doubled her business. All Delora need demonstrate is that state-of-the-art devices do not interfere with pollution control compliance. The doubling of her business does illustrate the handsome rate of return on alternatives to investing in pollution control equipment and thus underscores the need to apply a company's WACC to its cash flows in economic benefit calculations, reflecting the opportunity cost of alternative investments.*

Notes

For the case inputs, change the default "C-Corporation" to "For-Profit Other than C-Corporation." The penalty payment date is normally subject to your judgment (see Section III), but this assignment has you assume six months after the scheduled hearing.

The \$750,000 is for equipment, and any such equipment that wears out over time is a capital investment. (You would want to follow up with Delora to verify that the \$750,000 estimate includes all installation and design costs.) We can accept BEN's default assumption of a future replacement cycle, because we can anticipate that when it wears out, Delora will have to replace it. The \$60,000 for operation and maintenance of the equipment is an annually recurring cost.

The noncompliance date is January 1, 2000, since the new air emission standards took effect then, and an EPA inspection later that same month discovered the noncompliance. In many cases, however, actual inspections might not have found the violations until even years after the regulations first took effect. If so, an aggressive initial assumption for the noncompliance date might be when the regulations first took effect, but be aware of evidentiary concerns.

The correct compliance date is August 8, 2001. If you thought May 31, 2000, was the correct date, the scenario states that Delora only "agreed" to comply by that date. She did not actually comply until August of the following year. (Although this "missed" compliance date is not relevant to economic benefit, it may have an impact on gravity.)

BEN SAMPLE PROBLEM B: Kryptonite Chemical, Inc.

Scenario

Kryptonite Chemical, Inc., a publicly traded company and producer of chemical deterrents located in Metropolis NY, dumped 300 barrels of hazardous waste in the forest behind the plant. Majority shareholder and manager, Lex Luthor, thus avoided the huge expense charged by licensed waste disposal firms. In turn, Luthor planned to invest this savings in research and development for his new “Legion of Doom” product line.

Clark Kent, a member of the local environmental society called “Unknown Writers Insulted by Messy Pollution” (U-WIMP), uncovered Luthor’s offense. U-WIMP reported Luthor’s violation to EPA. Upon inspection, EPA determined that Kryptonite violated the Resource Conservation and Recovery Act because it improperly disposed of the barrels.

After meeting with Luthor’s lawyer, Snidely Whiplash, you determine that the improper disposal occurred in the middle of January of 2001. Your waste disposal consultant, Dr. David Banner, estimates that it would have cost Kryptonite \$1,000 per barrel to transport and dispose of the waste properly back in January 2001. (Fortunately, no hazardous waste has leaked from the barrels.) Luthor agrees to comply by the beginning of December 2002, and to make the penalty payment one month later.

Assignments

1. Calculate the economic benefit that Kryptonite Chemical, Inc. gained as a result of delaying proper disposal of the barrels.
2. The Kryptonite employee who dumped the waste in the forest, Joe Lackey, informs you that he dumped only half of the hazardous waste barrels in January of 2002, and the other half a year earlier. Once you have arranged with the FBI for Joe to enter the Witness Protection Program, calculate the revised economic benefit.
3. During another round of settlement negotiations, Luthor’s consultant, Bill Owerly, informs you that Kryptonite has recently filed for Chapter 11 bankruptcy protection. Mr. Owerly argues that Kryptonite therefore no longer has gained any economic benefit. Do you agree?
4. Luthor is so upset at your response to Owerly’s argument that he not only terminates his contract with Owerly, but also vows never to comply. Calculate the revised economic benefit.

Run Name =	Run 1	Run 2a: 2000	Run 2b: 2001	Run 4a: 2000	Run 4b: 2001
Present Values as of Noncompliance Date (NCD),	15-Jan-2001	15-Jan-2000	15-Jan-2001	15-Jan-2000	15-Jan-2001
A) On-Time Capital & One-Time Costs	\$177,300	\$87,168	\$88,650	\$87,168	\$88,650
B) Delay Capital & One-Time Costs	\$150,805	\$67,973	\$75,403	\$0	\$0
C) Avoided Annually Recurring Costs	\$0	\$0	\$0	\$0	\$0
D) Initial Economic Benefit (A-B+C)	\$26,495	\$19,196	\$13,247	\$87,168	\$88,650
E) Final Econ. Ben. at Penalty Payment Date,					
01-Jan-2003	\$32,456	\$26,086	\$16,228	\$118,455	\$108,597
<i>C-Corporation w/ NY tax rates</i>					
Discount/Compound Rate	10.9%	10.9%	10.9%	10.9%	10.9%
Discount/Compound Rate Calculated By:	BEN	BEN	BEN	BEN	BEN
Compliance Date	01-Dec-2002	01-Dec-2002	01-Dec-2002	01-Dec-2002	01-Dec-2002
Capital Investment					
Cost Estimate	\$0	\$0	\$0	\$0	\$0
Cost Estimate Date	N/A	N/A	N/A	N/A	N/A
Cost Index for Inflation	N/A	N/A	N/A	N/A	N/A
# of Replacement Cycles, Useful Life	N/A; N/A	N/A; N/A	N/A, N/A	N/A; N/A	N/A; N/A
Projected Rate for Future Inflation	N/A	N/A	N/A	N/A	N/A
One-Time, Nondepreciable Expenditure:				avoided	avoided
Cost Estimate	\$300,000	\$150,000	\$150,000	\$150,000	\$150,000
Cost Estimate Date	15-Jan-2001	15-Jan-2001	15-Jan-2001	15-Jan-2001	15-Jan-2001
Cost Index for Inflation	PCI	PCI	PCI	PCI	PCI
Tax Deductible?	Y	Y	Y	Y	Y
Annually Recurring Costs:					
Cost Estimate	\$0	\$0	\$0	\$0	\$0
Cost Estimate Date	N/A	N/A	N/A	N/A	N/A
Cost Index for Inflation	N/A	N/A	N/A	N/A	N/A
User-Customized Specific Cost Estimates:	N/A	N/A	N/A	N/A	N/A
On-Time Compliance Capital Investment					
Delay Compliance Capital Investment					
On-Time Compliance Replacement Capital					
Delay Compliance Replacement Capital					
On-Time Compliance Nondepreciable					
Delay Compliance Nondepreciable					

BEN SAMPLE PROBLEM B: Kryptonite Chemical, Inc.

Solutions

1. *Kryptonite Chemical, Inc.'s economic benefit is \$32,456.*
2. *The new economic benefit result is \$42,314, representing the sum of two separate BEN runs for the two separate waste dumping violations: the economic benefit from the waste dumped in January 2000 is \$26,086 and for January 2001 is \$16,228.*
3. *The proceedings have no effect on economic benefit, but do raise an ability-to-pay issue.*
4. *The economic benefit is now a significantly higher \$227,052 (\$118,455 + \$108,597), since the disposal costs would be avoided, instead of merely delayed.*

Notes

Although the actual noncompliant actions lasted at most only two months — January 2000 and January 2001 — we tell BEN that the noncompliant condition lasted until the proper disposal, since the compliance costs were delayed until December 2002. While BEN's use of "noncompliance date" and "compliance date" is usually in sync with legal dates, in this case it is not. Remember, the key is to determine what the violator saved, which in this case is based on delaying the cleanup.

All the costs are one-time nondepreciable expenditures. The violator is not buying any equipment. Nor are these costs annually recurring: if the violator performs the disposal correctly, the violator will never have to incur the expenditures again. They are tax deductible (typically only land is not deductible), regardless of the violator's reprehensible delay in spending them. Remember that the BEN model seeks only to measure the gain to the violator, hence the calculations are no-fault in nature and amoral. If a cost is legally tax deductible according to the IRS, then we must consider it so (e.g., the Exxon Valdez oil spill cleanup was 100-percent deductible).

In situations with significant differences in violation periods, such as the second assignment, you must separate the costs into different runs. Here half the barrels were dumped in January 2000 and half in January 2001. The other dates remain the same. The total economic benefit is the sum of the two runs. The second run is less than the first because the violator had the use of the money one year less than in the first set of barrels.

The fourth assignment also requires two runs, but on the options screen you need to uncheck the "Delayed, Not Avoided" box for the one-time nondepreciable expenditure. This reflects the fact that Kryptonite is now avoiding the costs of disposal entirely, rather than delaying them. Although BEN still requires a compliance date, it has no impact upon the result.

BEN SAMPLE PROBLEM C: Town of Colaville

Scenario

Colaville is a small town whose primary employer is a local soft drink producer, Crazy Cola, Inc. Colaville's only water source is the Caffeine River. In February of 2001, Howard Cunningham and his family moved to Colaville to open a new hardware store. Howard, one of the very few Colaville residents not employed by the cola plant, did not receive the benefits of free cola that his undercompensated peers did. Thus, the Cunninghams drank tap water.

They quickly discovered that the tap water was discolored and tasted unusual. Colaville's small population had become so reliant on Crazy Cola for their drinking needs that they neglected to notice any defects in the town's drinking water. Upon investigation, EPA officials found that Colaville was in violation of Safe Drinking Water Act requirements dating back to at least March 1, 2000.

An engineering firm, Potsie Technologies, estimated in an August 8, 2001 report that the necessary water treatment plant will cost \$2 million. Additionally, it reports that annual costs to maintain the equipment will be \$185,000.

After many long, drawn-out meetings with the Colaville Town Council (and a case of the "shakes" from drinking too much Crazy Cola), you agree that Colaville can comply by the beginning of March 2004, with the penalty due a year earlier.

Assignments

1. Calculate the economic benefit that Colaville gained from its noncompliance.
2. After reviewing your preliminary analysis, Potsie points out that BEN's default Plant Cost Index (PCI) might not be an accurate measure of inflationary trends for the large structures necessary for the treatment plant. Instead he suggests the Building Cost Index (BCI), although for the annually recurring costs he concedes the PCI still might be the most appropriate index. Calculate the revised economic benefit.
3. The Colaville Town Council, upon consultation with a productivity consultant, Dr. Arthur Fonzarelli, learns that the residents of Colaville have become inefficient workers as a result of widespread insomnia. He reasons that this problem has resulted from the Colaville residents' massive intakes of caffeine associated with Crazy Cola. Dr. Fonzarelli notes that upon the availability of safe drinking water, the workforce will consume much less caffeine and provide more efficient labor. This increase in productivity will reduce the treatment plant's projected annual O&M costs by \$25,000 (relative to the Potsie Technologies report). Calculate the revised economic benefit.

Run Name =	Run 1	Run 2: BCI	Run 2: O&M;
Present Values as of Noncompliance Date (NCD),	01-Mar-2000	01-Mar-2000	01-Mar-2000
A) On-Time Capital & One-Time Costs	\$3,144,745	\$3,199,195	\$3,199,195
B) Delay Capital & One-Time Costs	\$2,756,761	\$2,848,876	\$2,848,876
C) Avoided Annually Recurring Costs	\$677,622	\$677,622	\$586,051
D) Initial Economic Benefit (A-B+C)	\$1,065,605	\$1,027,940	\$936,370
E) Final Econ. Ben. at Penalty Payment Date,			
01-Mar-2003	\$1,237,099	\$1,193,373	\$1,087,065
<i>Not-For-Profit, which pays no taxes</i>			
Discount/Compound Rate	5.3%	5.3%	5.3%
Discount/Compound Rate Calculated By.	BEN	BEN	BEN
Compliance Date	01-Mar-2004	01-Mar-2004	01-Mar-2004
Capital Investment:			
Cost Estimate	\$2,000,000	\$2,000,000	\$2,000,000
Cost Estimate Date	08-Aug-2000	08-Aug-2001	08-Aug-2001
Cost Index for Inflation	PCI	BCI	BCI
# of Replacement Cycles, Useful Life	1, 15	1; 15	1; 15
Projected Rate for Future Inflation	N/A	N/A	N/A
One-Time, Nondepreciable Expenditure.			
Cost Estimate	\$0	\$0	\$0
Cost Estimate Date	N/A	N/A	N/A
Cost Index for Inflation	N/A	N/A	N/A
Tax Deductible?	N/A	N/A	N/A
Annually Recurring Costs			
Cost Estimate	\$185,000	\$185,000	\$160,000
Cost Estimate Date	08-Aug-2001	08-Aug-2001	08-Aug-2001
Cost Index for Inflation	PCI	PCI	PCI
User-Customized Specific Cost Estimates:	N/A	N/A	N/A
On-Time Compliance Capital Investment			
Delay Compliance Capital Investment			
On-Time Compliance Replacement Capital			
Delay Compliance Replacement Capital			
On-Time Compliance Nondepreciable			
Delay Compliance Nondepreciable			

BEN SAMPLE PROBLEM C: Town of Colaville

Solutions

1. *Colaville gained an economic benefit of \$1,237,099 from noncompliance.*
2. *Using the Building Cost Index (instead of the default Plant Cost Index) for the capital investment, Colaville's economic benefit is \$1,193,373.*
3. *Taking into account the reduction of annually recurring costs by \$25,000 (and keeping the Building Cost Index for the capital investment), Colaville's economic benefit is \$1,087,065.*

Notes

Make sure you have specified the “not-for-profit” status, although the state does not matter (since the tax rate will be zero regardless of the state location).

The \$2 million is a capital investment as it will eventually wear out. And since it will be replaced, you can accept BEN's default of a future replacement cycle.

The operation and maintenance cost is annually recurring.

For the third assignment, be sure to subtract the incremental savings in annually recurring costs from the original entry in the first assignment (i.e., subtract \$25,000 from \$185,000). You could even enter a negative number if the new equipment allowed the violator to spend less on annually recurring costs than before.