Introduction and Overview of Federal Building Energy Efficiency Mandates

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US Department of Energy

FEMP 7-Part Webcast Series

- **Session 1**, Overview of Federal Building Energy Efficiency Mandates/An Introduction to Building Life-Cycle Costing
- **Session 2**, Overview of the Requirements of ANSI/ASHRAE/IESNA Standard 90.1-2004
- **Session 3**, Appendix G of 90.1-2004
- **Session 4**, Integrated Building Design: Bringing the Pieces Together to Unleash the Power of Teamwork
- **Session 5**, Sustainable Design
- **Session 6**, Advanced Energy Design Guides
- **Session 7**, How to Build 30% Better

For more information on webcasts

http://www.energycodes.gov/federal/webcast_federal_series.stm

Outline of Presentation

- Legislative Drivers
- Federal Rulemakings
- Executive Orders

US Congress Legislation

- Energy Policy Act of 2005 (EPACT 2005)
- Energy Independence and Security Act of 2007 (EISA 2007)
- New legislation expected in 2009

Energy Policy Act of 2005

Section 102 – Energy Management Requirements

Section 103 – Energy Use Measurement and Accountability

Section 104 – Procurement of Energy Efficient Products

Section 109 – Federal Building Performance Standards

- Mandate:
  - New Federal buildings must achieve savings of at least 30% below ASHRAE Standard 90.1-2004 or the 2004 IECC if cost-effective.
  - Buildings must also use sustainable design principles for siting, design, and construction, if cost-effective.
  - If water is used to achieve energy efficiency, water conservation technologies shall be applied, if cost-effective.

Energy Independence and Security Act of 2007

- Section 431 – Energy Reduction Goals for Federal Buildings
- Section 432 – Management of Energy and Water Efficiency in Federal Buildings
- Section 433 – Federal Building Energy Efficiency Performance Standards
  - Requires steep reduction in fossil fuel energy relative to usage in DOE's Commercial Building Energy Consumption Survey (CBECS) or Residential Energy Consumption Survey (RECS)
  - Applies only to public buildings, buildings with $2.5 million in annual costs, or buildings for which GSA must file a prospectus to Congress
  - New construction and major renovations
- Section 434 – Management of Federal Building Efficiency

Energy Independence and Security Act of 2007 (cont'd)

- Section 435 – Leasing
- Section 436 – High Performance Green Federal Buildings
- Section 437 – Federal Green Building Performance
- Section 441 – Public-Building Life Cycle Costs
  - Changes life-cycle cost period from 25 to 40 years – expands number of measures that are cost-effective
- Section 523 – Standard Relating to Solar Hot Water
  - If life cycle cost-effective, as compared to other reasonably available technologies, not less than 30 percent of the hot water demand for each new Federal building or Federal building undergoing a major renovation be met through the installation and use of solar hot water heaters.

DOE's role in Congressional Legislation

- Many items in Congressional legislation direct DOE to develop formal rules to implement mandates in legislation
- For those mandates that involve Federal buildings, FEMP develops those rules

Federal Rulemakings

- Notice of Proposed Rulemaking on procurement of energy efficient products in Section 104 of EPACT 2005 – June 2007
- Final Rule on energy efficiency requirements of Federal buildings in Section 109 of EPACT 2005 – Dec 2007
- Notice of Proposed Rulemaking on sustainable design requirements and water conservation in Section 109 of EPACT 2005 – Summer/Fall 2008
- Notice of Proposed Rulemaking on fossil fuel reduction requirements in Section 433 of EISA 2007 – Fall/winter 2008

Executive Orders

- The US President can issue executive orders that directly impact all Federal agencies.
- The latest executive order is EO 13423 - *Strengthening Federal Environmental, Energy, and Transportation Management.*

Executive Order 13423

- Reduce green house gas emissions
- Increase renewable energy usage
- Reduce water consumption
- Procure sustainable and efficient products
- Ensure new construction follows Guiding Principles
  - Employ Integrated Design Principles
  - Optimize Energy Performance
  - Protect and Conserve Water
  - Enhance Indoor Environmental Quality
  - Reduce Environmental Impact of Materials

Specific Details on Federal Energy Efficiency Design Standards

- Based on Section 109 of EPAct 2005 only at this time
- Found in 10 CFR Part 433 for commercial and high-rise multi-family residential buildings
- Currently only cover energy efficiency and not sustainable design
- Will be updated over coming months to include sustainable design and also to include fossil-fuel reductions required in Section 433 of EISA 2007

Section 109 – Federal Building Performance Standards

- Mandate –
  - New Federal buildings must achieve savings of at least 30% below ASHRAE Standard 90.1-2004 or the 2004 IECC if cost-effective.
  - Buildings must also use sustainable design principles for siting, design, and construction, if cost-effective.
  - If water is used to achieve energy efficiency, water conservation technologies shall be applied to the extent that is life-cycle cost-effective

DOE Rulemakings

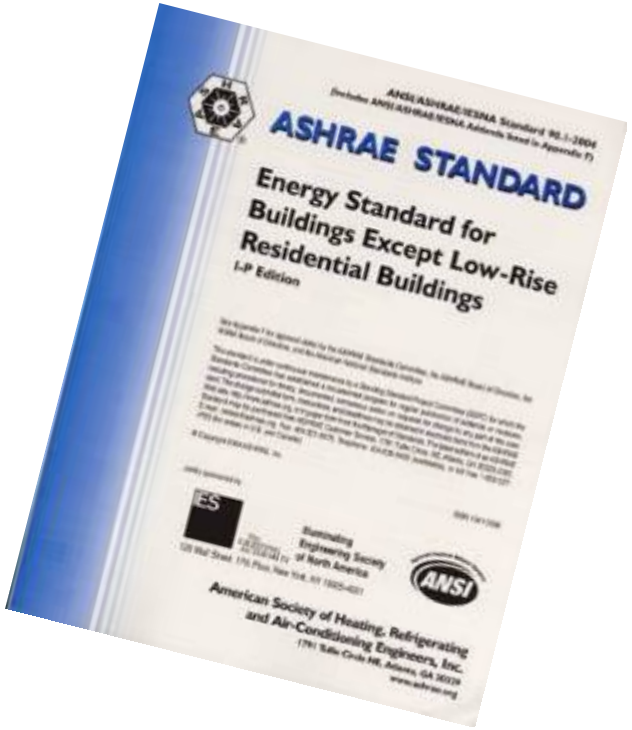
- Found in
  - 10 Code of Federal Regulations (CFR) Part 433
    - new commercial and high-rise multi-family residential buildings started after January 3, 2007
  - 10 CFR Part 435 Subpart A
    - new residential buildings started after January 3, 2007

Baseline Standards

- Called out in Section 109 of the Energy Policy Act of 2005
- Set the baseline for “at least 30% savings”
- Must be met as absolute minimum if no other improvements are cost effective

Baseline Standards

- ANSI/ASHRAE/ IESNA Standard 90.1-2004
  - Prevailing private sector standard for commercial and high-rise multi-family residential buildings



Baseline Standards

- Section 109 requires DOE to update the baseline standards as new versions of the prevailing private sector standards are released and are deemed cost-effective
- DOE will be evaluating the 2006 IECC and ASHRAE Standard 90.1-2007 for the next version of the rule

Energy Saving and Cost-Effectiveness Goal

- Federal building designs must be at least 30% more energy efficient than buildings built to the prevailing private sector standards, if cost-effective
- This is a “soft” goal, as the energy savings must be “at least 30%” but also “cost-effective”

Energy Saving and Cost-Effectiveness Goal

- If 30% savings cannot be achieved, you must try backing off to lesser savings, until cost-effectiveness is achieved

Energy Saving Metrics

- For commercial and high-rise multi-family residential buildings
  - Performance Rating Method in Appendix G of ASHRAE Standard 90.1-2004

Energy Saving Metrics

- Appendix G is performance-based
  - it requires the use of building simulation software to determine if the proposed design achieves the desired energy savings
- Appendix G requires simulation of a baseline building (that just meets the baseline standard) and a proposed building (that exceeds the baseline standard)

Energy Saving Metrics

- Appendix G relies on *energy cost* as the comparison, as opposed to site or source energy
- *Energy cost* is the metric used in the prevailing private sector standards
- *Energy cost* is also the metric underlying EO 13423

Cost-Effectiveness Metrics

- Life-cycle costing must be performed in accordance with 10 CFR Part 436
- Building Life Cycle-Cost (BLCC) software is available from National Institute of Standard and Technology (NIST)

Allowable Cost-Effectiveness Metrics

- Lower life-cycle cost
- Positive estimated net savings
- Savings-to-investment ratio greater than 1
- Adjusted internal rate of return estimated to be greater than Federal discount rate in OMB Circular A-94

Thank-You

An Introduction to Building Life-Cycle Costing

Barbara C. Lippiatt

Building and Fire Research Laboratory

National Institute of Standards and Technology (NIST)

U.S. Department of Commerce

Jennifer F. Helgeson

FEMP Webcast Series on Federal Commercial Buildings

Session 1

August 19, 2008

Objectives

- Rationale for Life-Cycle Cost (LCC) Analysis
- Basic LCC Methodology
- Requirements of a LCC Analysis
- BLCC5.3 computer program

LCC Legislation

- Nat'l Energy Conservation Policy Act, 1978
- Energy Policy Act 1992, 2005
- Energy Independence and Security Act, 2007
- Executive Order 13423, 2007
- 10 CFR 436A, 1990
- OMB Circular A-94, 1992

Life-Cycle Cost Analysis

- a method of economic analysis that sums all **relevant** project costs over a given **study period** in **present-value** terms.

- most relevant when selecting among **mutually exclusive project alternatives** that meet minimum functional performance requirements but have different initial costs, OM&R costs, and/or expected lives.

Types of Decisions

- Accept/Reject Projects/Alternatives
- Optimal System Size
- Optimal Combination of Interdependent Systems
- Ranking Independent Projects

LCC Analysis Method

- evaluates costs of acquisition, ownership & disposal
- compares initial investment with future savings
- includes financing costs
- includes FEMP, OMB, MILCON criteria
- consistent with ASTM Standards

Relevant Project Costs

- **Investment-related**
  - First costs
  - Replacement costs
  - Salvage value (resale or disposal cost)
- **Operation-related**
  - Operation, maintenance, and repair costs
  - Energy and water costs
  - Contract-related costs (for financed projects)

Project Costs

LCC Analysis requires

- dollar amounts as of today
- no sunk costs
- non-tangibles in narrative form

Generally, only amounts that are different need to be considered when comparing mutually exclusive alternatives

Study Period

- Length of time over which an investment is analyzed
- Study period must be equal for all alternatives, depending on
  - the expected life of the project and/or
  - the investor's time horizon
- Base Year: analysis date to which all cash flows are discounted
- Base Case: alternative with lowest first cost

Study Period

- **Key dates**
  - Base Date: beginning of study period
  - Service Date: beginning of operational period
  - End Date: end of study period
- **Planning/Construction/Implementation Period**
- **Contract Period**

Present Value & Discounting

Present-Value amount

is the equivalent value to an investor, as of the Base Year, of a cash amount paid (received) at a future date

Present-Value of a Future amount

is found by discounting

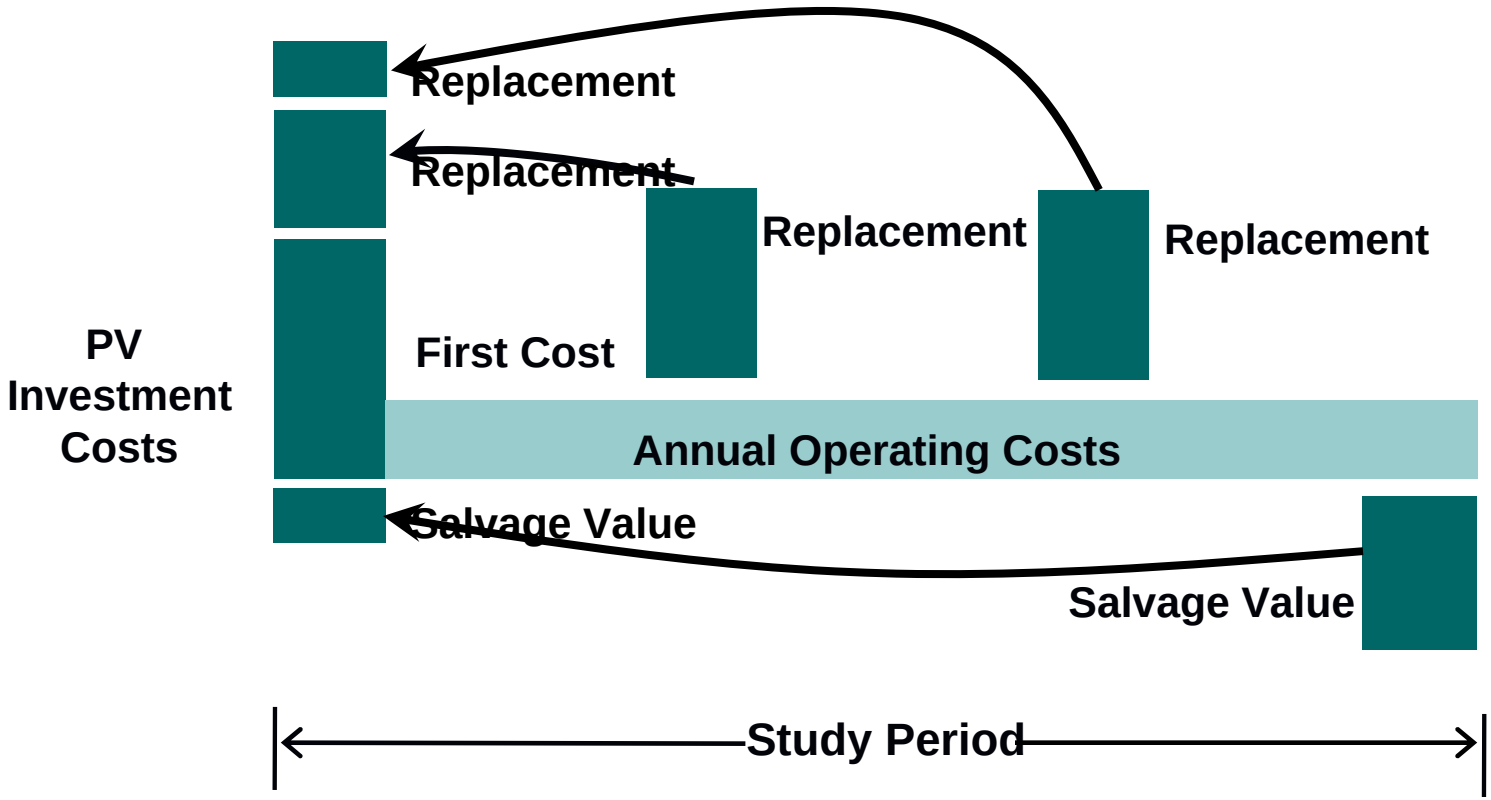
Discounting

adjusts for the investor's time-value of money

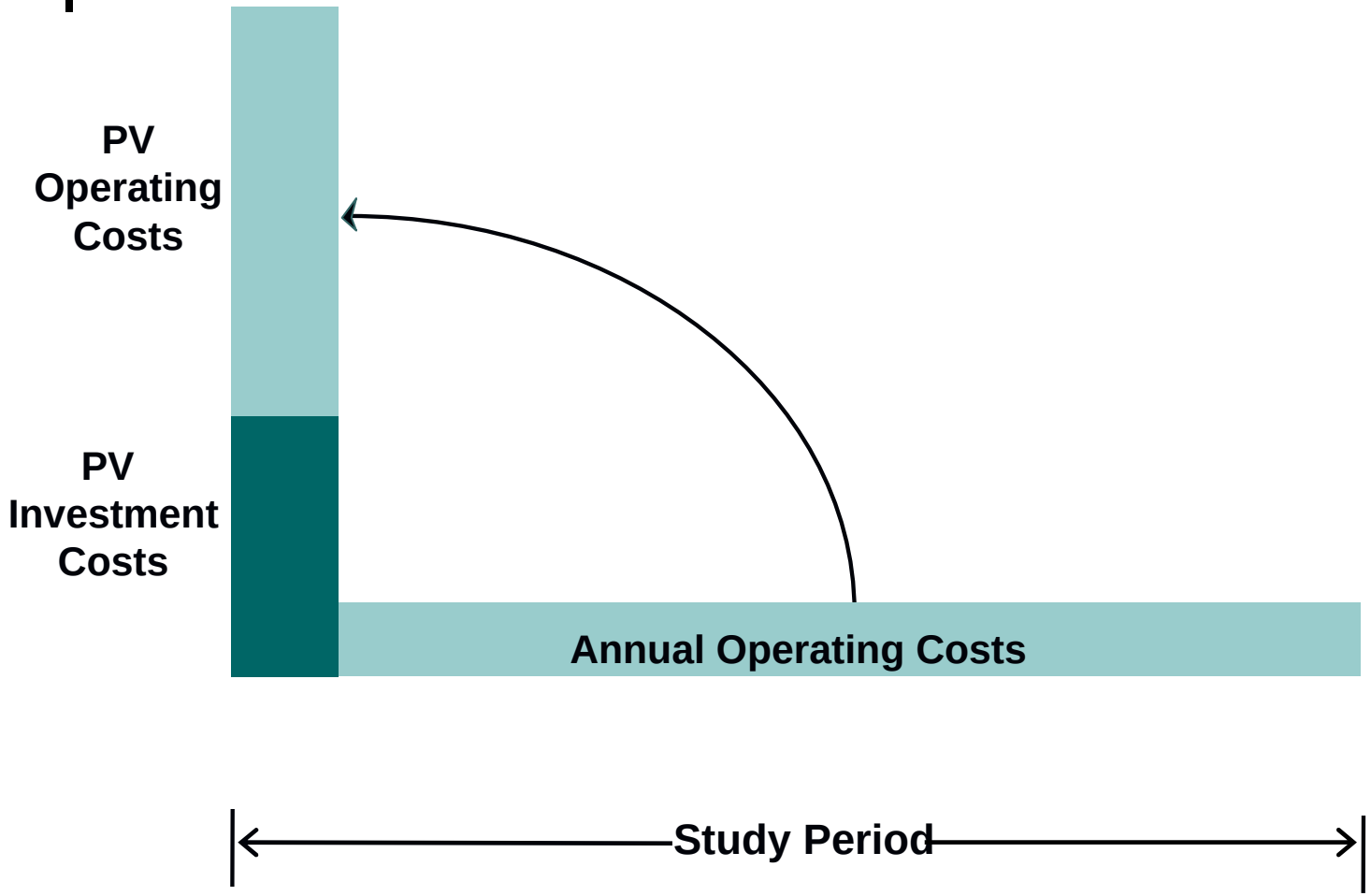
Discount Rate

- the interest rate that makes an investor indifferent between cash amounts paid (received) at different points in time
- set by FEMP for energy and water conservation projects
- set by OMB for non-energy projects

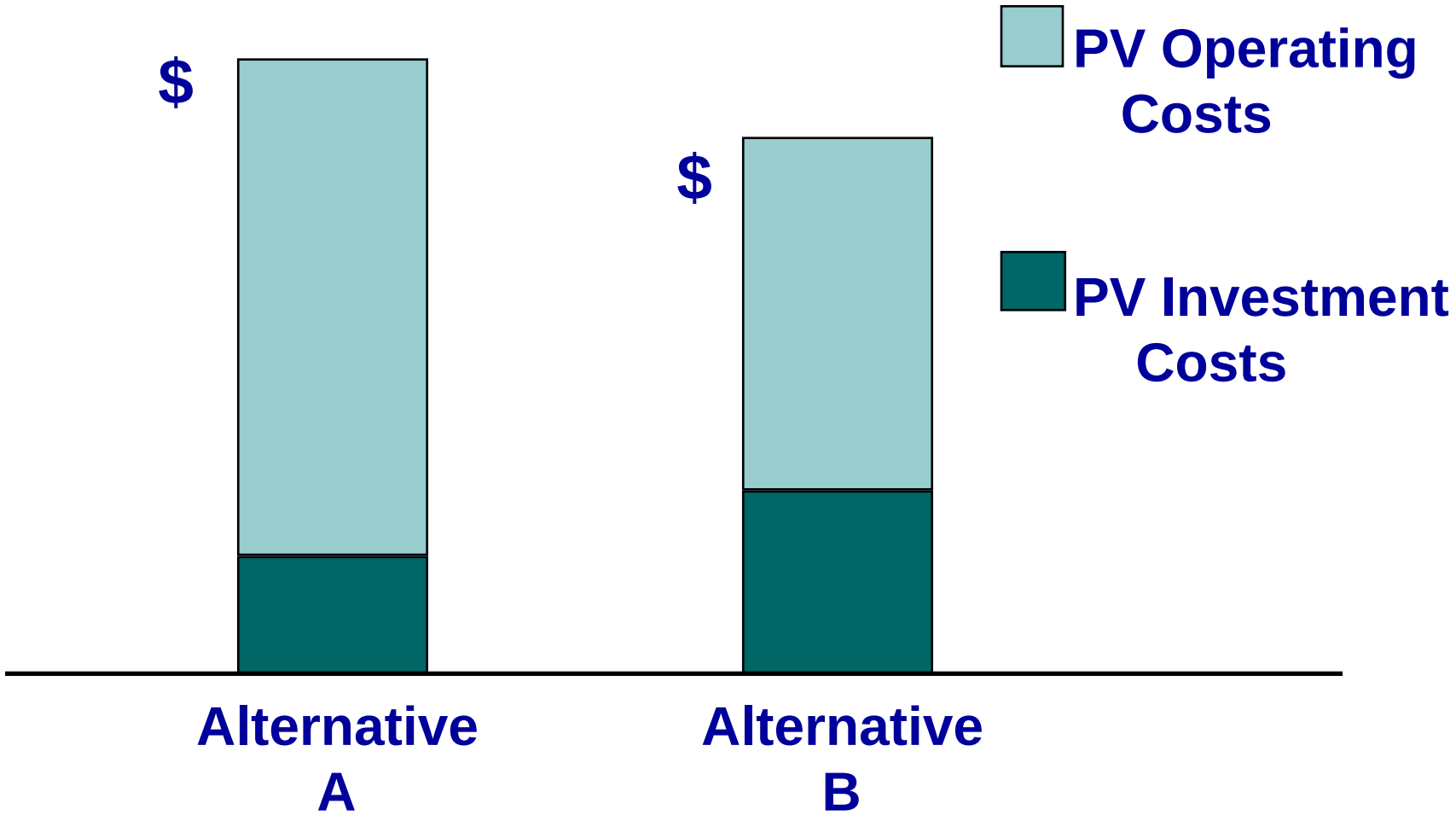
Discounting Investment Costs



Discounting Operating Costs



LCC of Alternatives



Discount Formula

$$PV = C_t \times \frac{1}{(1 + d)^t}$$

$$LCC = \sum_{t=0}^{n} \frac{C_t}{(1 + d)^t}$$

where n = length of study period
t = time of cost occurrence

Discount Factors

SPV – Single Present Value Factor

for one time amounts or non-annually recurring amounts

UPV – Uniform Present Value Factor

for uniform annual amounts

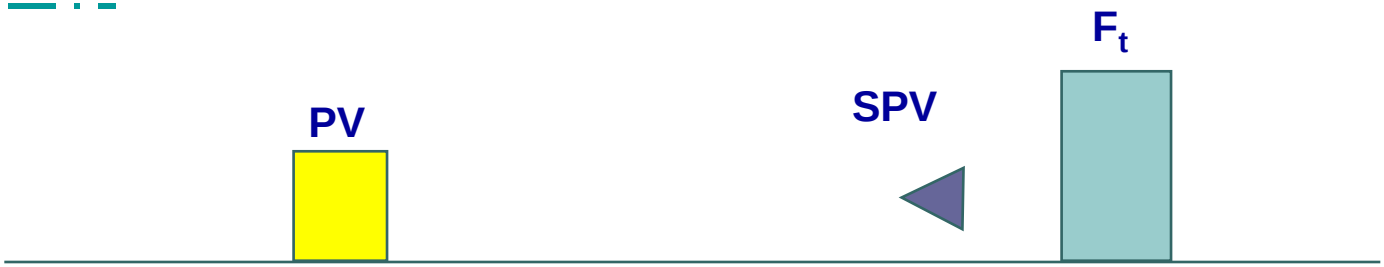
UPV* – Modified UPV Factor

for non-uniform annual amounts

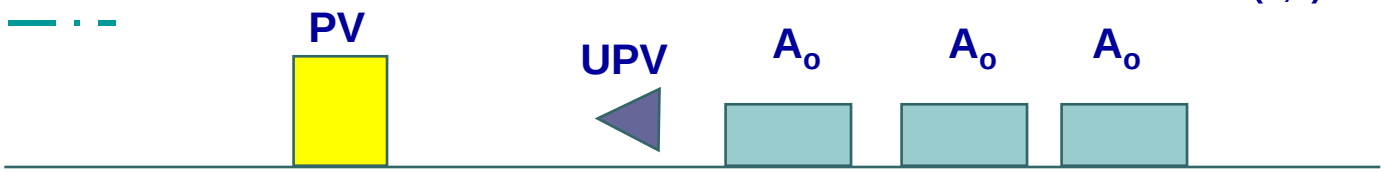
Present Value Factors

Summary

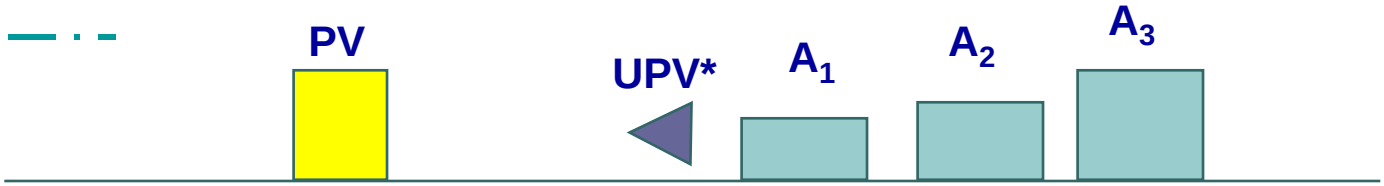
Single future amount (year t) $PV = F_t \times SPV_{(t,d)}$



Recurring annual amount (over n years) $PV = A_o \times UPV_{(n,d)}$



Constantly escalating annual amount (over n years) $PV = A_o \times UPV^*_{(n,d,e)}$



Discount Factor Sources

- Annual Supplement to Handbook 135
- NIST BLCC computer programs
- NIST DISCOUNT computer program

Inflation Adjustments

Inflation

rate of increase of the general level of prices

Escalation

rate of differential increase in the price of a particular commodity

Inflation Adjustments

Two Approaches to dealing with inflation:

Constant dollars (excluding inflation)

- a real discount rate
- a real escalation rate

Current dollars (including inflation)

- a nominal discount rate
- a nominal escalation rate

Constant vs. Current dollars

Given:

Real Discount rate: 3.0%

Inflation rate: 1.75%

Base Date amount: $500

Time period: 1 year

Constant dollars, with **real discount rate**:

$$\mathbf{PV} = \frac{\$500}{(1+0.030)} = \$485.44$$

Current dollars, with **nominal discount rate**:

$$PV = \frac{\$500\ (1+0.0175)}{(1+0.030)\ (1+0.0175)} = \$485.44$$

Differential Escalation Rate

- Difference between the rate of a good's annual price change and general inflation
- Due to causes other than loss of purchasing power of the dollar
- Relevant to energy pricing

Federal Criteria – FEMP Analyses

Energy and water conservation projects, 10 CFR 436/Handbook 135

- DOE/FEMP discount rate (updated annually)
- Maximum 40-year service period
- Local energy prices
- DOE energy price escalation rates
- Agency-Funded Projects: **Constant-Dollar Analysis**
- Financed Projects: **Current-Dollar Analysis**

Federal Criteria – Non-FEMP Analyses

Other federal projects

(non-energy or non-water conservation)

- OMB Circular A-94
- OMB discount rates (updated annually)

MILCON analyses (energy and non-energy)

- FEMP discount rates for energy conservation
- OMB discount rates for non-energy projects

Heating & Cooling System

An example

- Base Case: Existing Baseboard Heating System with Window AC
- Alternative: Heat Pump

Location:	Maryland
Discount Rate:	3.0 % *real*; 5.0 % *nominal*
Study Period:	15 years
Base Date:	March 2008

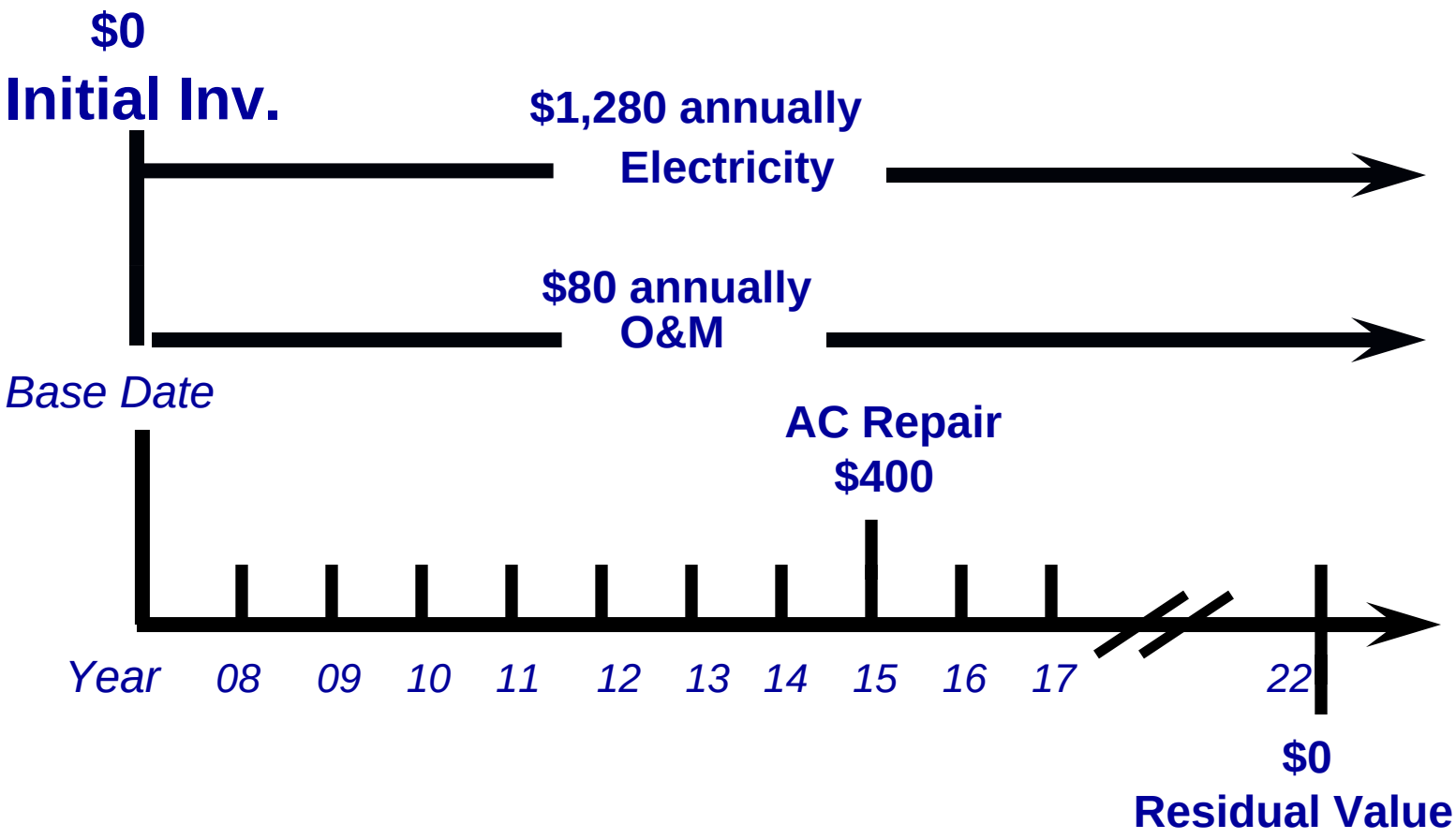
Base Case Data

Baseboard Heat / Window AC

- Initial investment: $0
- Expected Life: 15 years
- Electricity: 16,000 kWh
  $0.08/kWh, commercial
- Annual O&M: $80
- AC repair: $400 in year 8

Cash-Flow Diagram

Base Case



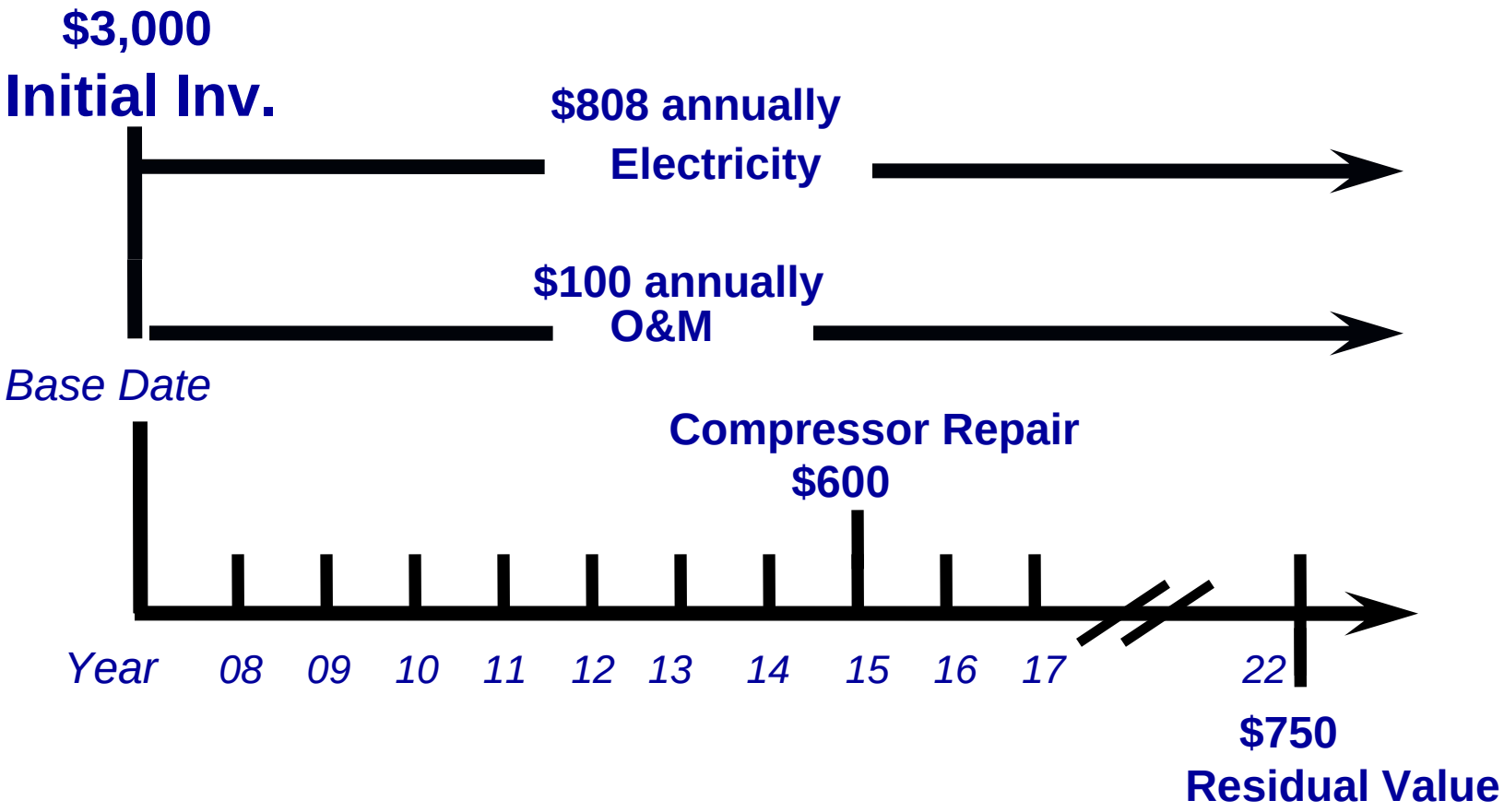
Alternative System Data

Heat Pump

- Initial investment: $3,000
- Expected Life: 20 years
- Residual Value: $750 (25 % of initial cost)
- Electricity: 10,100 kWh
  $0.08/kWh, commercial
- Annual O&M: $100
- Compressor repair: $600 in year 8

Cash-Flow Diagram

Alternative



LCC Calculation

Base Case

Cost Item (1)	Base Date Cost (2)	Year of Occurrence (3)	Discount Factor (4)	Present Value (5) = (2)X(4)
Initial Investment	$ 0	Base date	Already PV	$ 0
Electricity	$ 1,280	Annual	**UPV*$_{15}$** 11.73	$ 15,014
O&M Cost	$ 80	Annual	**UPV$_{15}$** 11.94	$ 955
AC Repair	$ 400	8	**SPV$_{8}$** 0.789	$ 316

Total PV LCC costs = $16,285

LCC Calculation

Alternative

Cost Items (1)	Base Date Cost (2)	Year of Occurrence (3)	Discount Factor (4)	Present Value (5) = (2)X(4)
Initial Cost	$ 3,000	Base date	Already PV	$ 3,000
Residual Value	$ 750	15	**SPV_{15}** 0.642	-$ 482
Electricity	$ 808	Annual	**UPV^*_{15}** 11.73	$ 9,478
O&M Cost	$ 100	Annual	**UPV_{15}** 11.94	$ 1,194
Comp. Repair	$ 600	8	**SPV_8** 0.789	$ 473

Total PV LCC costs = $13,663

Lowest LCC

Base Case: LCC_{BB} = $16,285

Alternative: LCC_{HP} = $13,663*

Additional Measures of Worth

Net Savings (NS)

difference in LCCs of Base Case and Alternative

Savings-to-Investment Ratio (SIR)

Ratio of PV operational savings to PV additional investment costs

Net Savings

An example

NS for heat pump

- Net Savings = LCC_{BB} - LCC_{HP}
- NS = $16,285 - $13,663 = **$2,622**

Savings-to-Investment Ratio

An example

SIR for heat pump

$$= \frac{\text{operation-related savings}}{\text{additional investment costs}}$$

$$= \frac{\$16{,}285 - \$11{,}145}{(\$3{,}000 - \$482) - \$0}$$

$$= \frac{\$5{,}140}{\$2{,}518}$$

$$SIR_{HP} = 2.04$$

Steps in an LCC Analysis

Summary

- Identify feasible project alternatives
- Establish common assumptions
  - Base Year
  - Study period
  - Discount rate (real vs. nominal)
  - Inflation assumption (constant $ vs. current $)
- Identify relevant project costs
- Convert all $-amounts to present value
- Compute and compare LCCs of alternatives
- Interpret results

Alternative Financing

- Compare LCCs of
  - agency-funded and financed projects
  - individual ECMs or in combination
- Inclusion of contract costs
- Phasing-in of ECMs over study period
- Comparison of contract payments and savings

NIST LCC Support Software

BLCC5

- FEMP
- MILCON
  - FEMP criteria
  - ECIP criteria and report
- OMB – Non-energy projects
- Alternative Financing
  - Energy Savings Performance Contract
  - Utility Energy Services Contract

BLCC 5.3

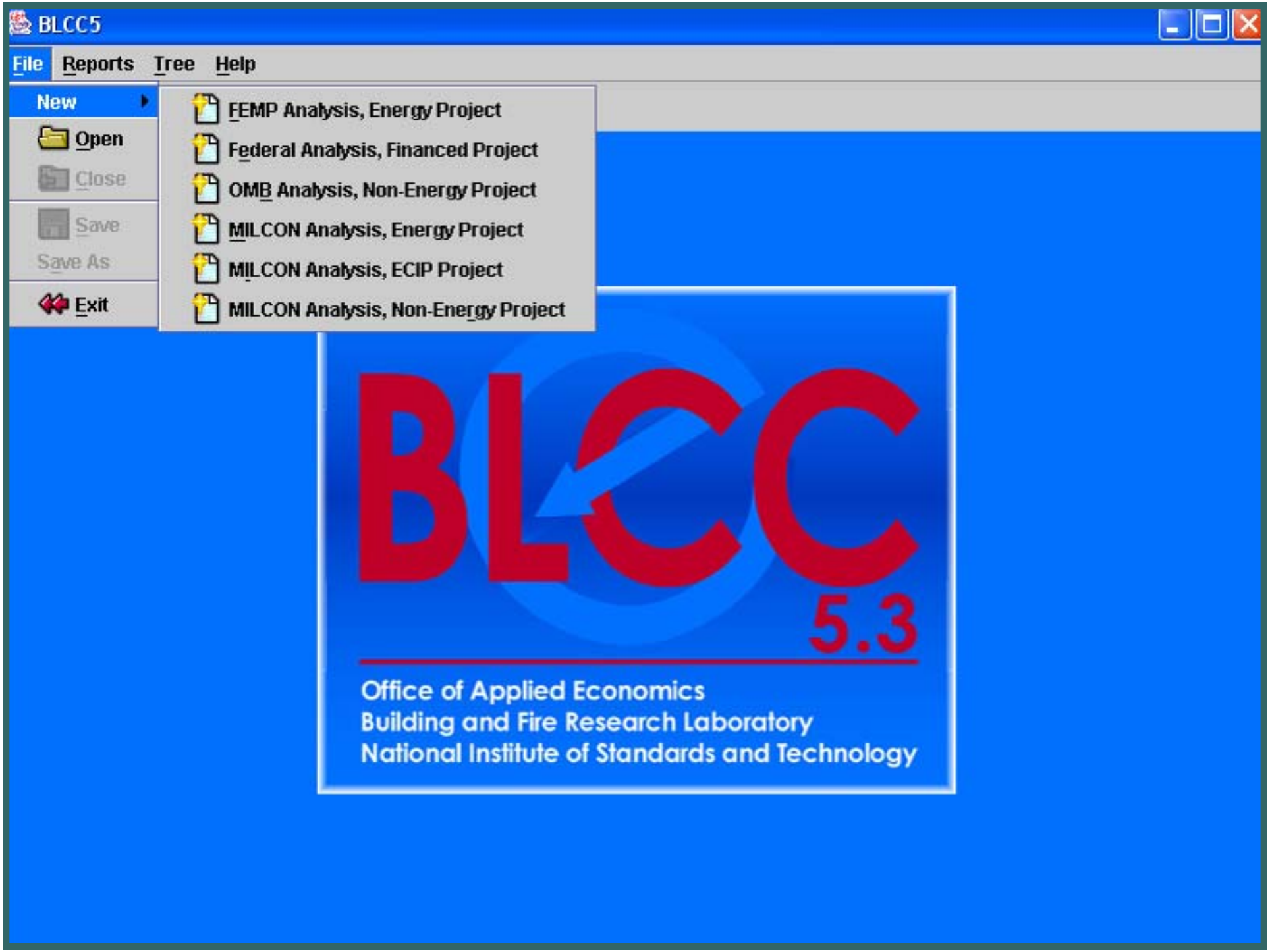
- Java-programmed
  - platform-independent
  - xml file format
- Familiar, windowed user interface
- Program-integrated help
- Downloadable from DOE web site

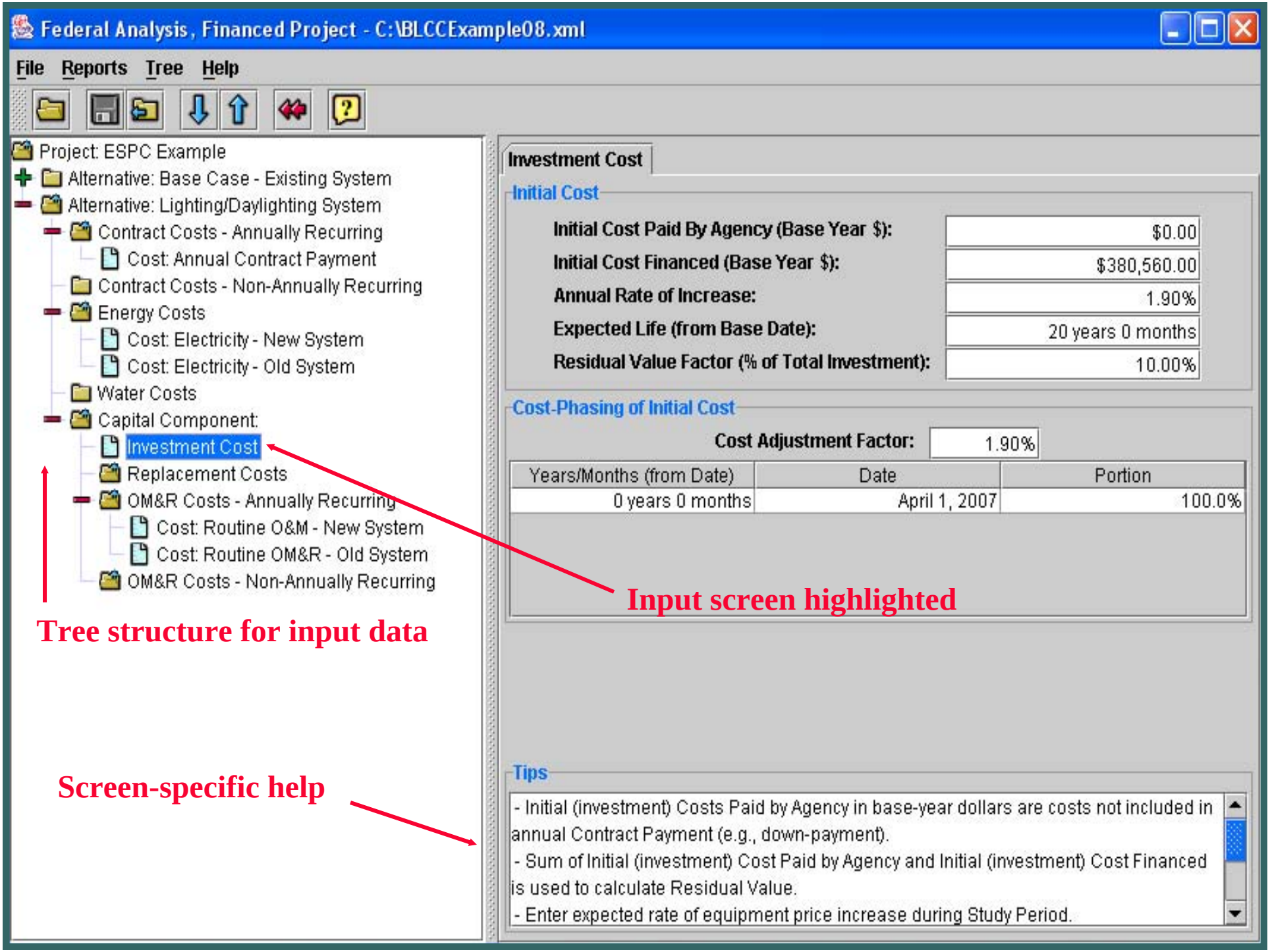
BLCC 5.3 – ESPC Example

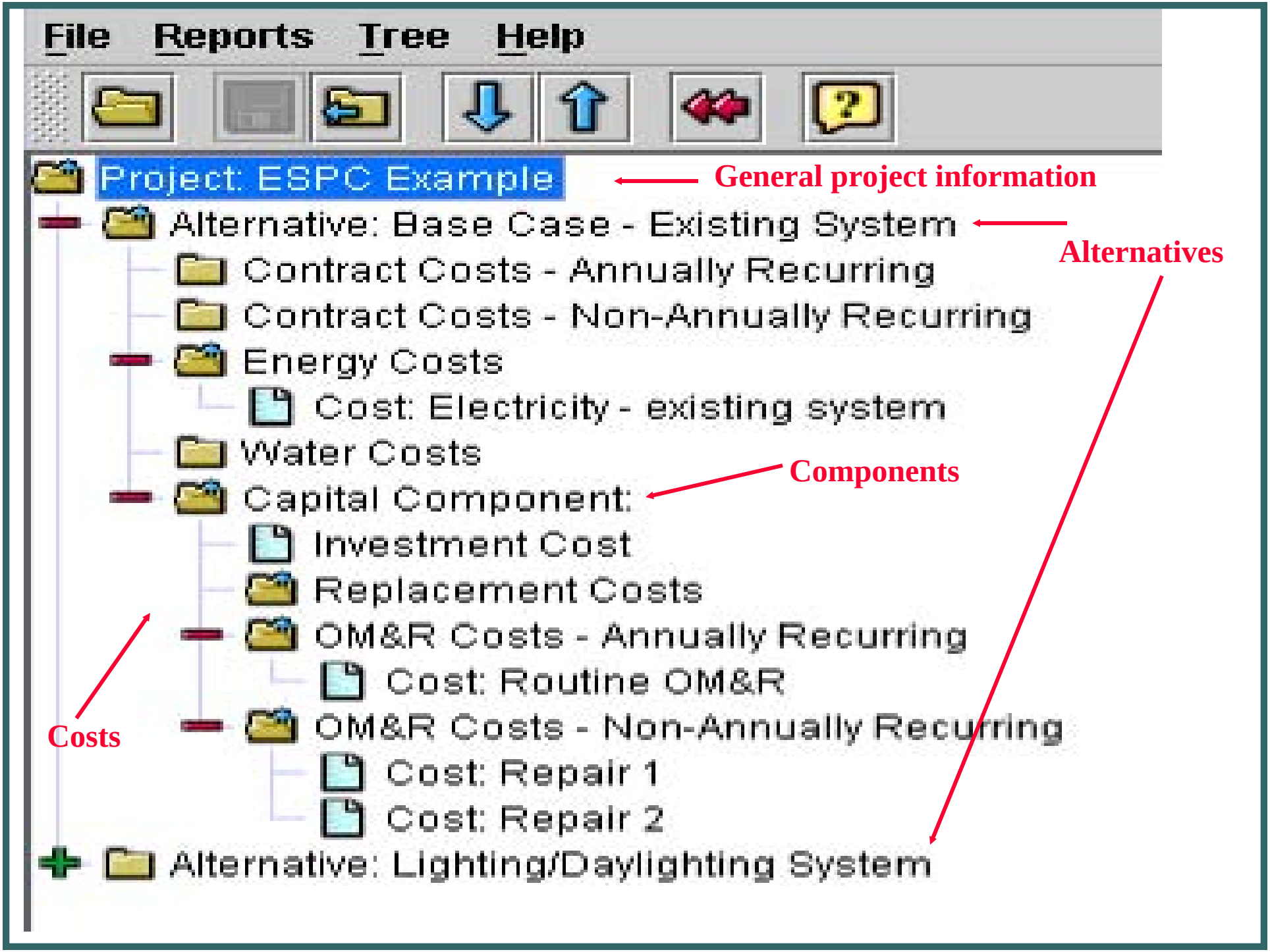
Replace existing lighting system in a federal office building in Arizona with a new system financed through an ESPC (Energy Savings Performance Contract)

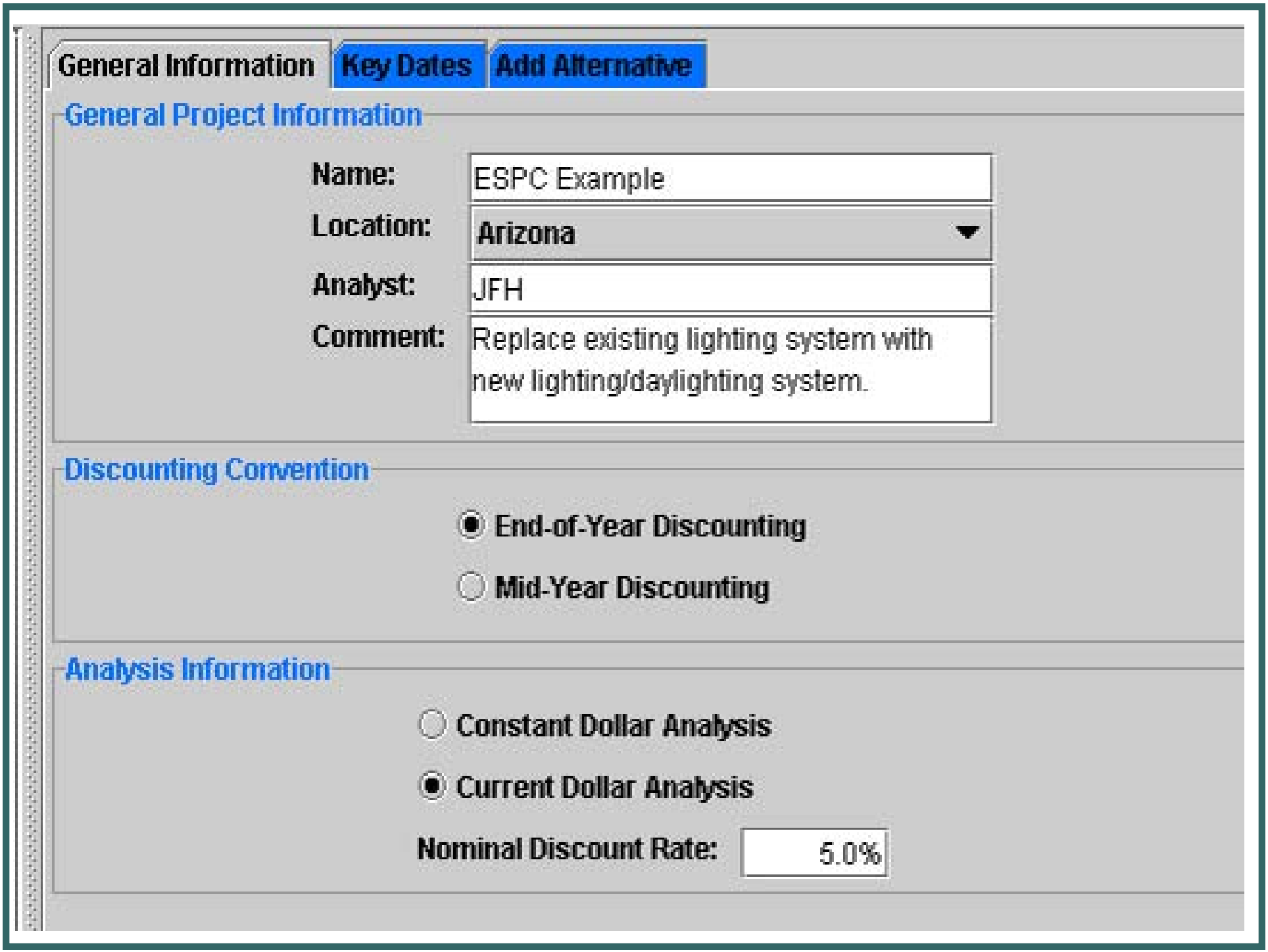
- **Amount financed:** **$380,560**
- **Contract payments:** **$58,000**
- **Study period:** **20 years**
- **Contract period:** **10 years**
- **Implementation period:** **1 year**

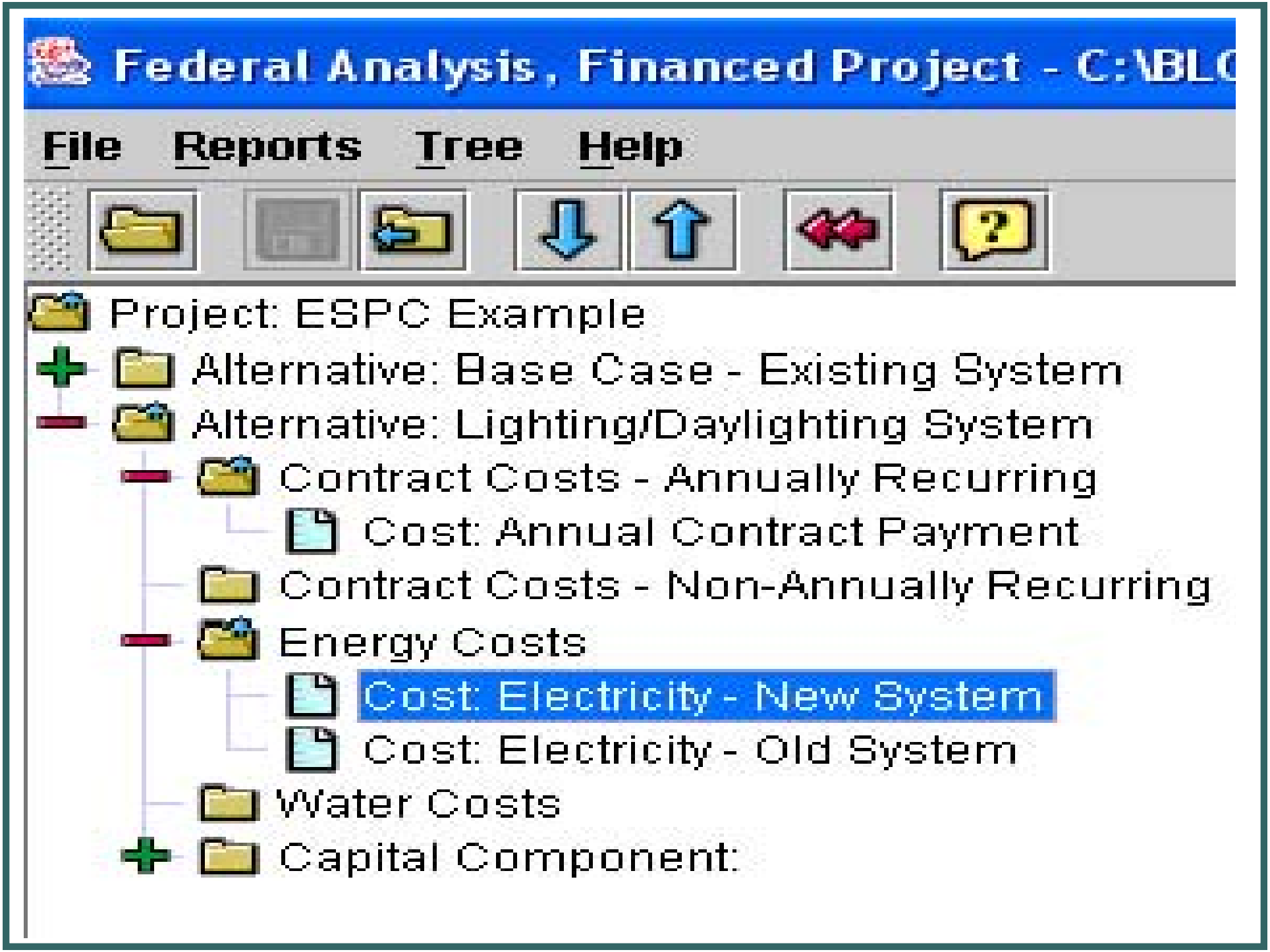
Determine whether the proposed system is cost-effective and whether the expected savings cover the contract payments.

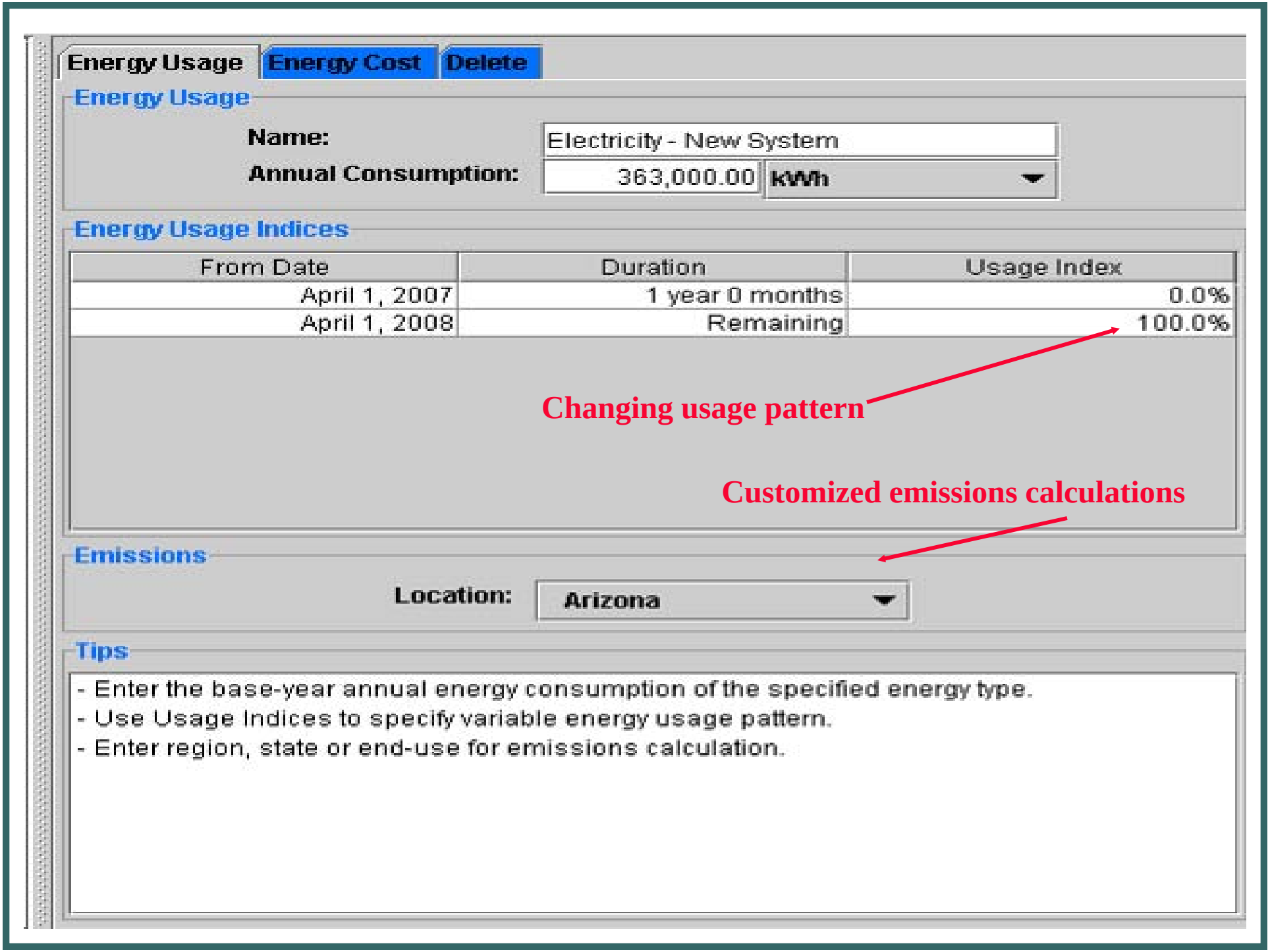

BLCC5
File
Reports
Tree
Help
New
Open
Close
Save
Save As
Exit
FEMP Analysis, Energy Project
Federal Analysis, Financed Project
OMB Analysis, Non-Energy Project
MILCON Analysis, Energy Project
MILCON Analysis, ECIP Project
MILCON Analysis, Non-Energy Project
BLCC
5.3
Office of Applied Economics
Building and Fire Research Laboratory
National Institute of Standards and Technology

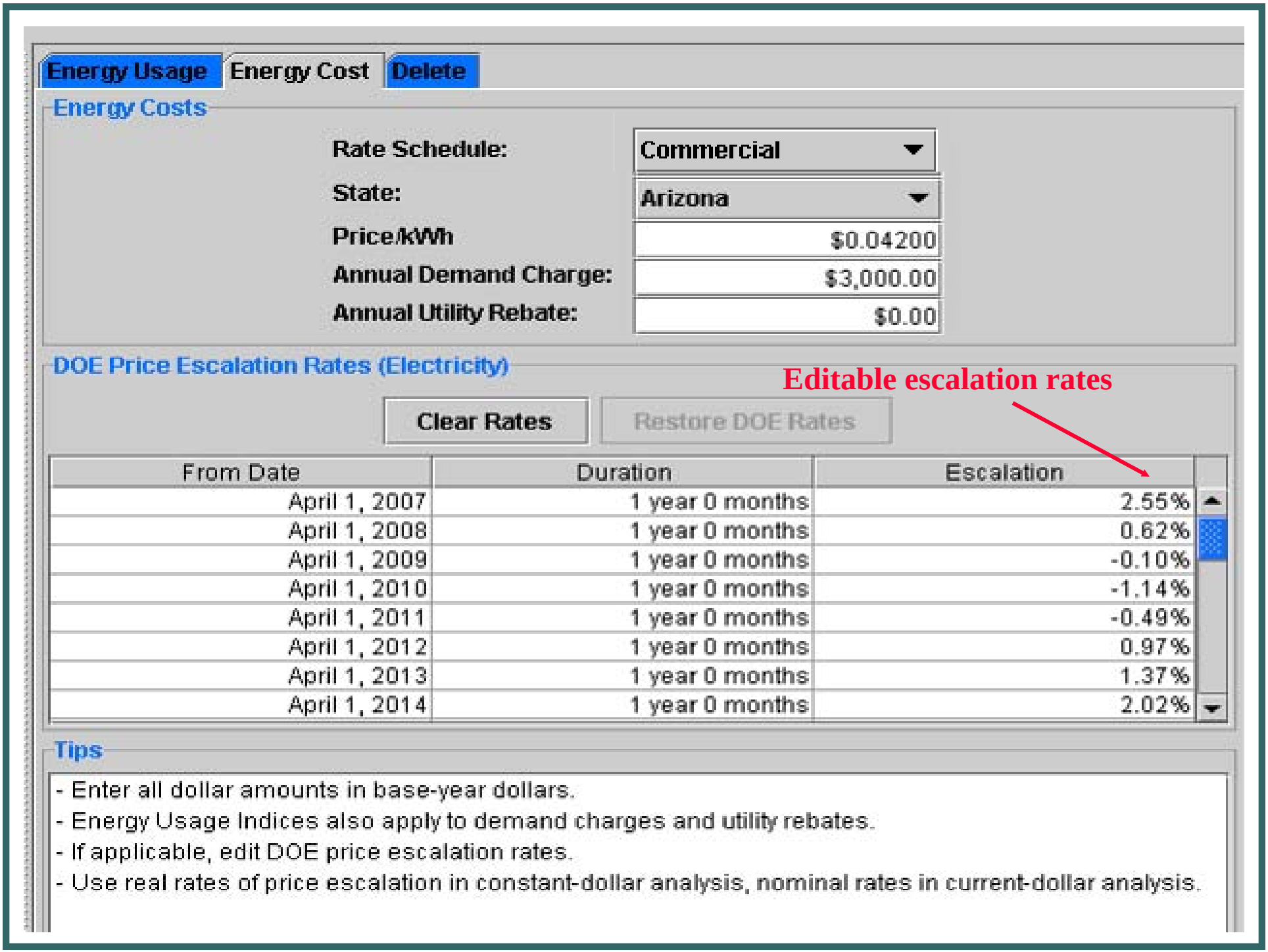

Federal Analysis, Financed Project - C:\BLCCExample08.xml
File Reports Tree Help
Project: ESPC Example
Alternative: Base Case - Existing System
Alternative: Lighting/Daylighting System
Contract Costs - Annually Recurring
Cost: Annual Contract Payment
Contract Costs - Non-Annually Recurring
Energy Costs
Cost: Electricity - New System
Cost: Electricity - Old System
Water Costs
Capital Component:
Investment Cost
Replacement Costs
OM&R Costs - Annually Recurring
Cost: Routine O&M - New System
Cost: Routine OM&R - Old System
OM&R Costs - Non-Annually Recurring
Investment Cost
Initial Cost
Initial Cost Paid By Agency (Base Year $): $0.00
Initial Cost Financed (Base Year $): $380,560.00
Annual Rate of Increase: 1.90%
Expected Life (from Base Date): 20 years 0 months
Residual Value Factor (% of Total Investment): 10.00%
Cost-Phasing of Initial Cost
Cost Adjustment Factor: 1.90%
Years/Months (from Date) Date Portion
0 years 0 months April 1, 2007 100.0%
Tips
- Initial (investment) Costs Paid by Agency in base-year dollars are costs not included in annual Contract Payment (e.g., down-payment).
- Sum of Initial (investment) Cost Paid by Agency and Initial (investment) Cost Financed is used to calculate Residual Value.
- Enter expected rate of equipment price increase during Study Period.
Tree structure for input data
Input screen highlighted
Screen-specific help

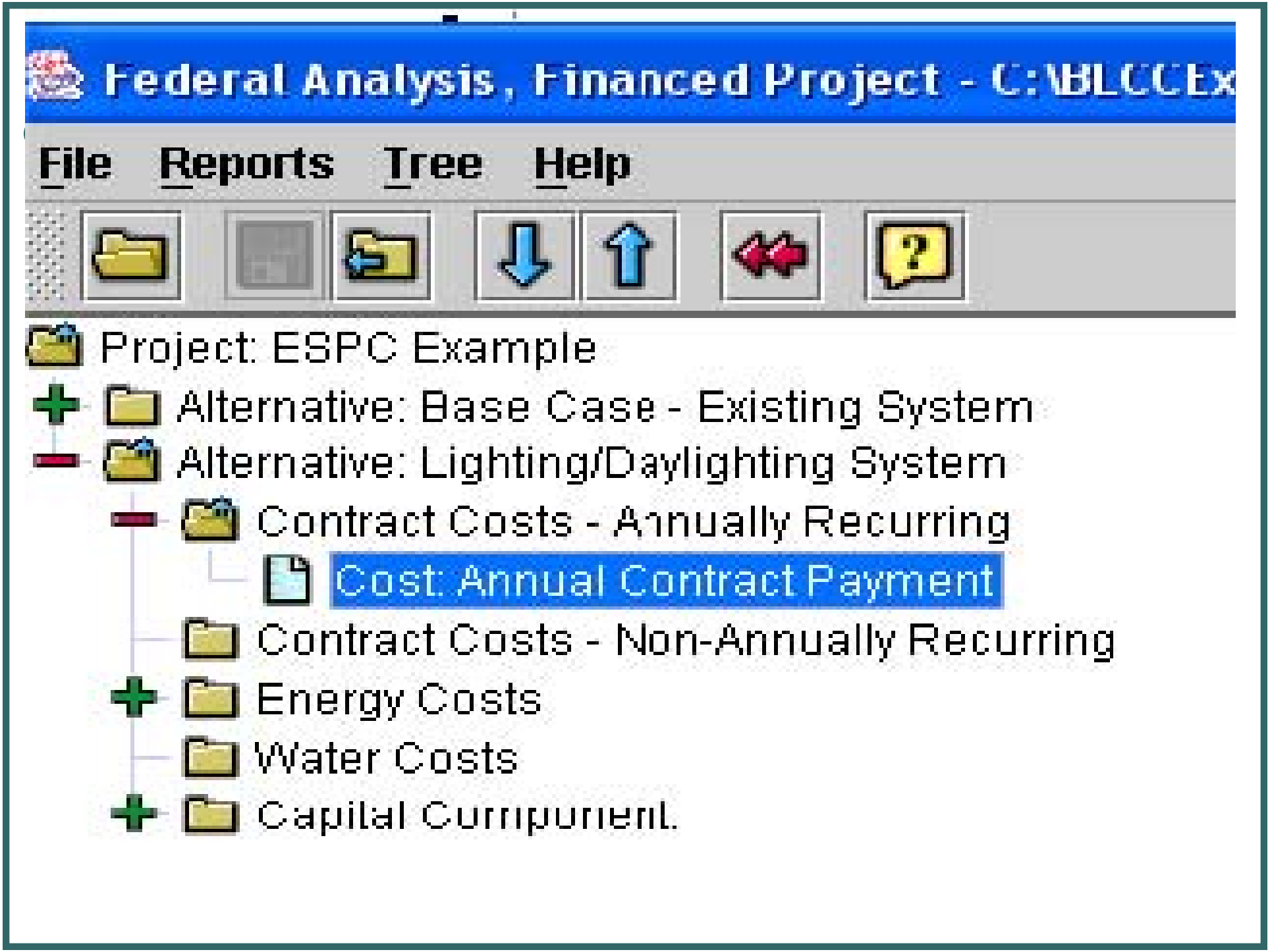

File
Reports
Tree
Help
Project: ESPC Example
General project information
Alternative: Base Case - Existing System
Alternatives
Contract Costs - Annually Recurring
Contract Costs - Non-Annually Recurring
Energy Costs
Cost: Electricity - existing system
Water Costs
Components
Capital Component:
Investment Cost
Replacement Costs
OM&R Costs - Annually Recurring
Cost: Routine OM&R
Costs
OM&R Costs - Non-Annually Recurring
Cost: Repair 1
Cost: Repair 2
Alternative: Lighting/Daylighting System

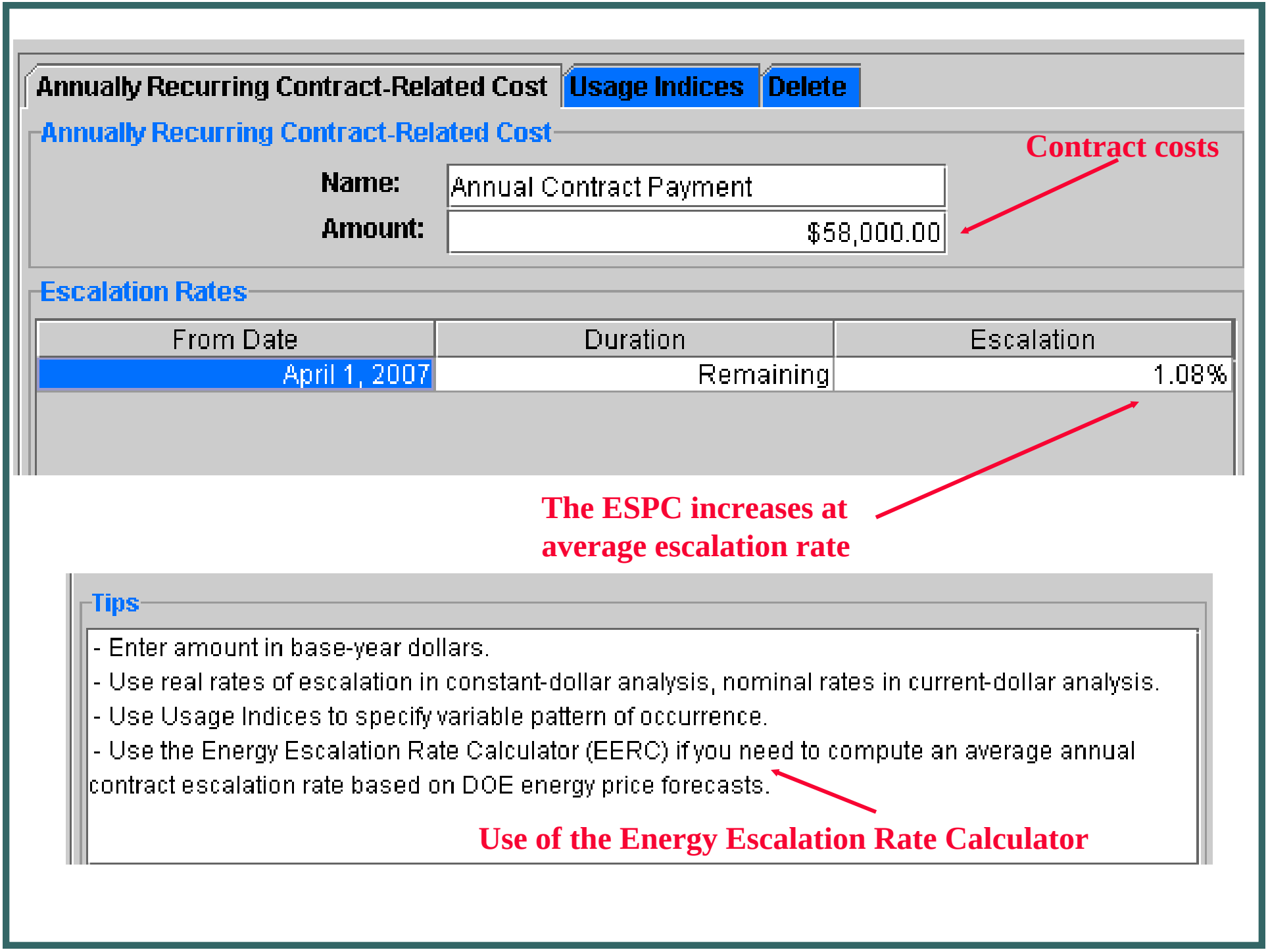

General Information
Key Dates
Add Alternative
General Project Information
Name:
ESPC Example
Location:
Arizona
Analyst:
JFH
Comment:
Replace existing lighting system with new lighting/daylighting system.
Discounting Convention
End-of-Year Discounting
Mid-Year Discounting
Analysis Information
Constant Dollar Analysis
Current Dollar Analysis
Nominal Discount Rate:
5.0%


Federal Analysis, Financed Project - C:\BLC
File
Reports
Tree
Help
Project: ESPC Example
Alternative: Base Case - Existing System
Alternative: Lighting/Daylighting System
Contract Costs - Annually Recurring
Cost: Annual Contract Payment
Contract Costs - Non-Annually Recurring
Energy Costs
Cost: Electricity - New System
Cost: Electricity - Old System
Water Costs
Capital Component:


Energy Usage
Energy Cost
Delete
Energy Usage
Name:
Electricity - New System
Annual Consumption:
363,000.00
kWh
Energy Usage Indices
From Date
Duration
Usage Index
April 1, 2007
1 year 0 months
0.0%
April 1, 2008
Remaining
100.0%
Changing usage pattern
Customized emissions calculations
Emissions
Location:
Arizona
Tips
- Enter the base-year annual energy consumption of the specified energy type.
- Use Usage Indices to specify variable energy usage pattern.
- Enter region, state or end-use for emissions calculation.

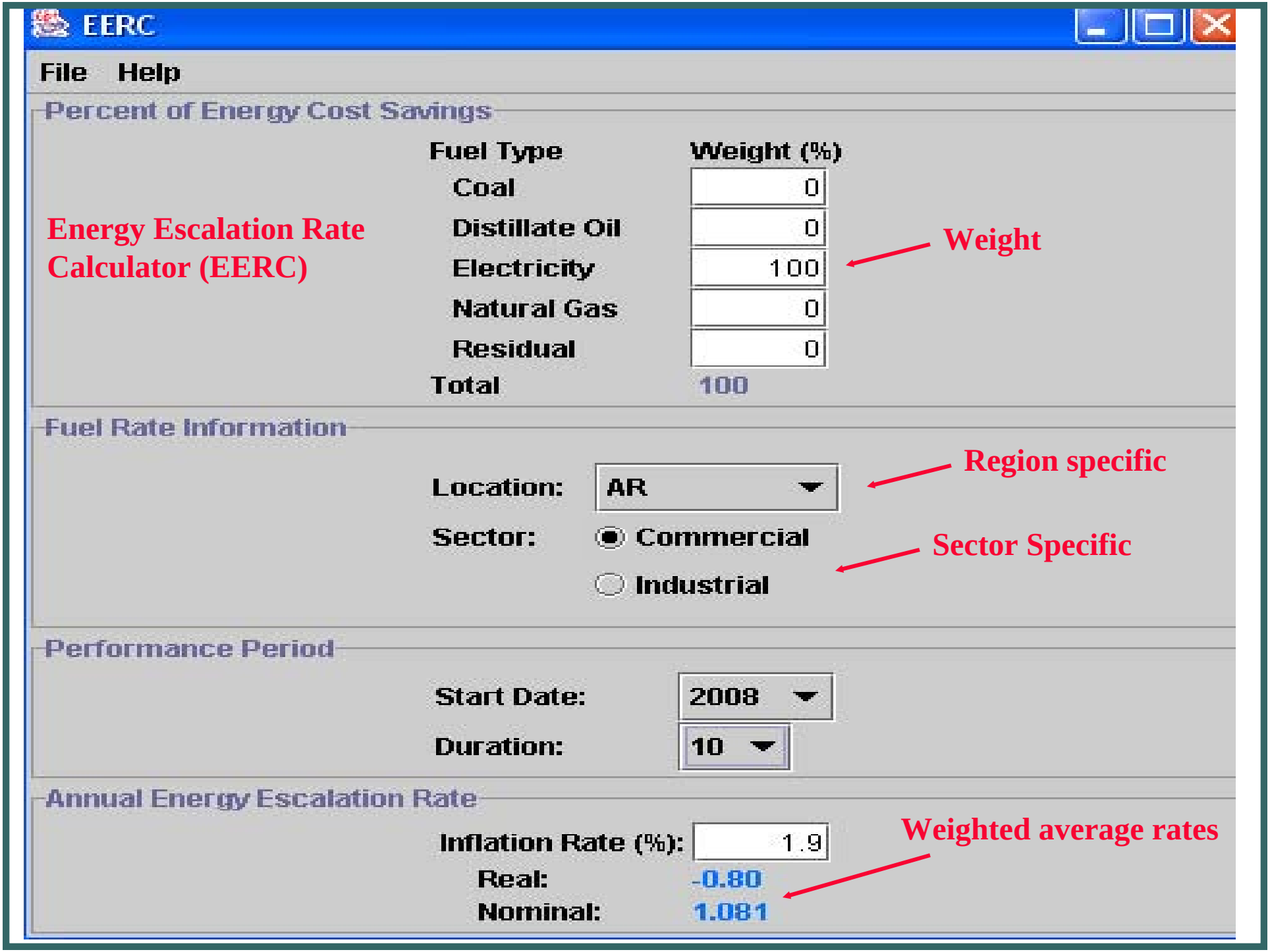

Energy Usage
Energy Cost
Delete
Energy Costs
Rate Schedule:
Commercial
State:
Arizona
Price/kWh
$0.04200
Annual Demand Charge:
$3,000.00
Annual Utility Rebate:
$0.00
DOE Price Escalation Rates (Electricity)
Editable escalation rates
Clear Rates
Restore DOE Rates
From Date
Duration
Escalation
April 1, 2007
1 year 0 months
2.55%
April 1, 2008
1 year 0 months
0.62%
April 1, 2009
1 year 0 months
-0.10%
April 1, 2010
1 year 0 months
-1.14%
April 1, 2011
1 year 0 months
-0.49%
April 1, 2012
1 year 0 months
0.97%
April 1, 2013
1 year 0 months
1.37%
April 1, 2014
1 year 0 months
2.02%
Tips
- Enter all dollar amounts in base-year dollars.
- Energy Usage Indices also apply to demand charges and utility rebates.
- If applicable, edit DOE price escalation rates.
- Use real rates of price escalation in constant-dollar analysis, nominal rates in current-dollar analysis.


Federal Analysis, Financed Project - C:\BLCCEx
File
Reports
Tree
Help
Project: ESPC Example
Alternative: Base Case - Existing System
Alternative: Lighting/Daylighting System
Contract Costs - Annually Recurring
Cost: Annual Contract Payment
Contract Costs - Non-Annually Recurring
Energy Costs
Water Costs
Capital Curripurient.


Annually Recurring Contract-Related Cost
Usage Indices
Delete
Annually Recurring Contract-Related Cost
Name:
Annual Contract Payment
Amount:
$58,000.00
Contract costs
Escalation Rates
From Date
Duration
Escalation
April 1, 2007
Remaining
1.08%
The ESPC increases at average escalation rate
Tips
- Enter amount in base-year dollars.
- Use real rates of escalation in constant-dollar analysis, nominal rates in current-dollar analysis.
- Use Usage Indices to specify variable pattern of occurrence.
- Use the Energy Escalation Rate Calculator (EERC) if you need to compute an average annual contract escalation rate based on DOE energy price forecasts.
Use of the Energy Escalation Rate Calculator

EERC

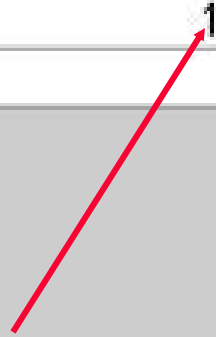
- The Energy Escalation Rate Calculator (EERC) computes an average annual escalation rate for fuel prices
- EERC is updated annually; available on the DOE website
- The rate is used to escalate the contract payments in ESPCs when payments are based on the projected annual energy cost savings
- Based on a LCC methodology; uses rates projected by EIA


EERC
File Help
Percent of Energy Cost Savings
Fuel Type
Weight (%)
Coal 0
Distillate Oil 0
Electricity 100
Natural Gas 0
Residual 0
Total 100
Energy Escalation Rate Calculator (EERC)
Weight
Fuel Rate Information
Location: AR
Region specific
Sector: Commercial
Industrial
Sector Specific
Performance Period
Start Date: 2008
Duration: 10
Annual Energy Escalation Rate
Inflation Rate (%): 1.9
Real: -0.80
Nominal: 1.081
Weighted average rates

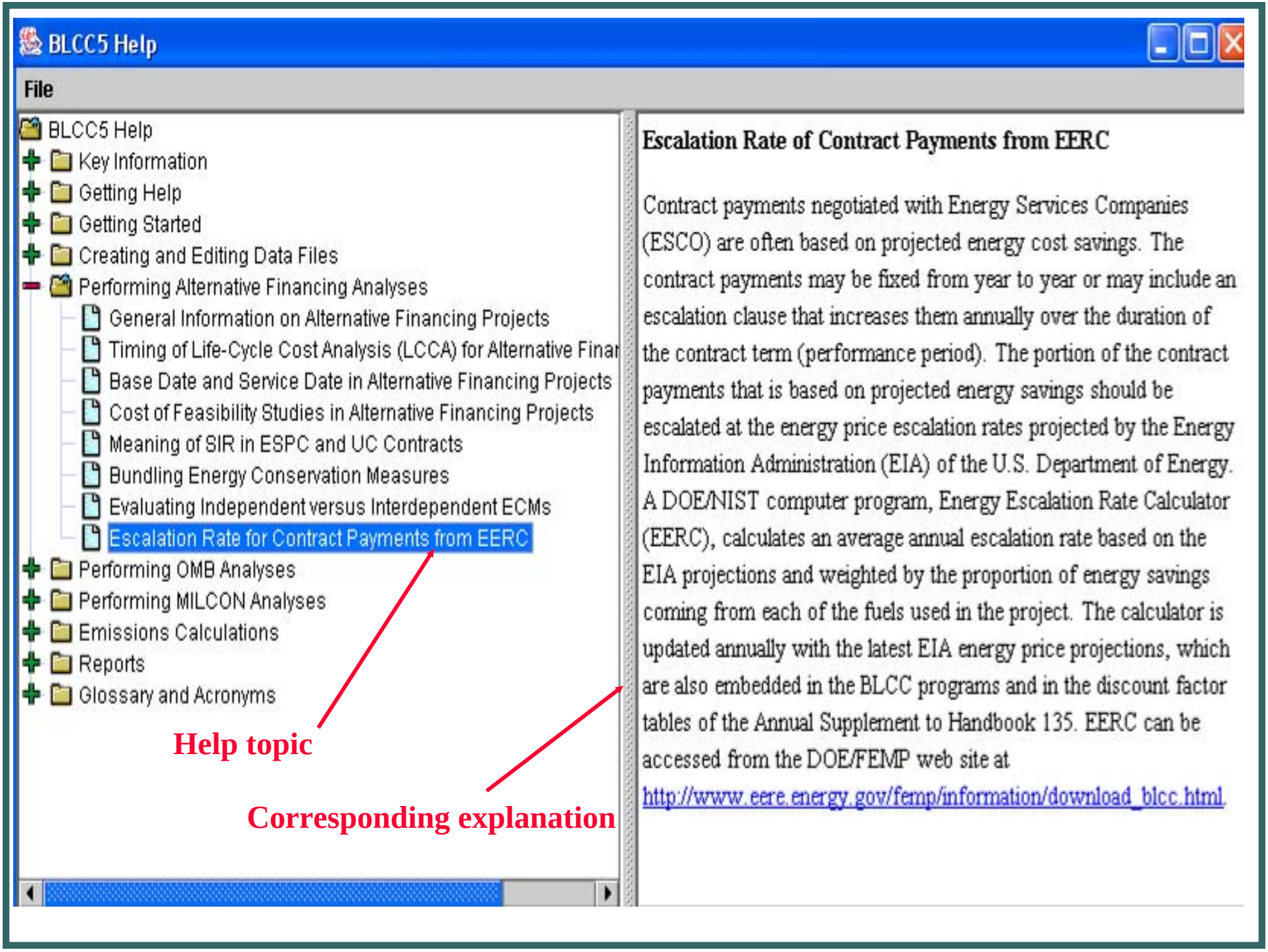
Annually Recurring Contract-Related Cost | Usage Indices | Delete

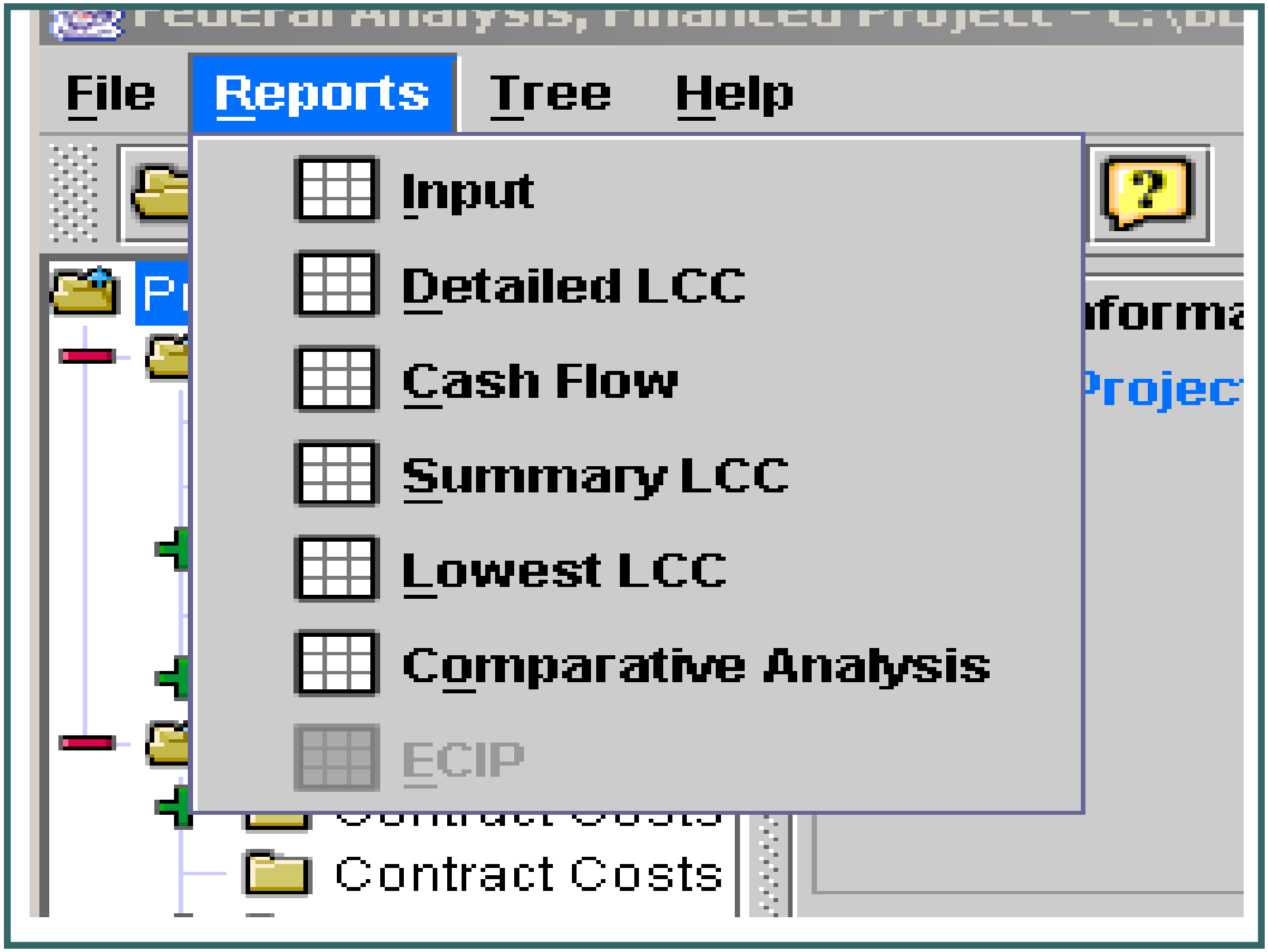
Usage Indices

From Date	Duration	Usage Factor
April 1, 2007	1 year 0 months	0.00%
April 1, 2008	10 years 0 months	100.00%
April 1, 2018	Remaining	0.00%



Contract period


BLCC5 Help
File
BLCC5 Help
Key Information
Getting Help
Getting Started
Creating and Editing Data Files
Performing Alternative Financing Analyses
General Information on Alternative Financing Projects
Timing of Life-Cycle Cost Analysis (LCCA) for Alternative Finar
Base Date and Service Date in Alternative Financing Projects
Cost of Feasibility Studies in Alternative Financing Projects
Meaning of SIR in ESPC and UC Contracts
Bundling Energy Conservation Measures
Evaluating Independent versus Interdependent ECMs
Escalation Rate for Contract Payments from EERC
Performing OMB Analyses
Performing MILCON Analyses
Emissions Calculations
Reports
Glossary and Acronyms
Help topic
Corresponding explanation
Escalation Rate of Contract Payments from EERC
Contract payments negotiated with Energy Services Companies (ESCO) are often based on projected energy cost savings. The contract payments may be fixed from year to year or may include an escalation clause that increases them annually over the duration of the contract term (performance period). The portion of the contract payments that is based on projected energy savings should be escalated at the energy price escalation rates projected by the Energy Information Administration (EIA) of the U.S. Department of Energy. A DOE/NIST computer program, Energy Escalation Rate Calculator (EERC), calculates an average annual escalation rate based on the EIA projections and weighted by the proportion of energy savings coming from each of the fuels used in the project. The calculator is updated annually with the latest EIA energy price projections, which are also embedded in the BLCC programs and in the discount factor tables of the Annual Supplement to Handbook 135. EERC can be accessed from the DOE/FEMP web site at
http://www.eere.energy.gov/femp/information/download_blcc.html


File
Reports
Tree
Help
Input
Detailed LCC
Cash Flow
Summary LCC
Lowest LCC
Comparative Analysis
ECIP
Contract Costs

Lowest Report

File

NIST BLCC 5.3-07: Lowest LCC

Lowest LCC Report

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

General Information

File Name:	C:\BLCCExample08.xml
Date of Study:	Fri Apr 18 16:04:11 EDT 2008
Analysis Type:	Federal Analysis, Financed Project
Project Name:	ESPC Example
Project Location:	Arizona
Analyst:	JFH
Comment:	Replace existing lighting system with new lighting/daylighting system.
Base Date:	April 1, 2007
Study Period:	20 years 0 months (April 1, 2007 through March 31, 2027)
Discount Rate:	5%
Discounting Convention:	End-of-Year

Lowest LCC

Comparative Present-Value Costs of Alternatives
(Shown in Ascending Order of Initial Cost, * = Lowest LCC)

Alternative	Initial Cost (PV)	Life Cycle Cost (PV)
Base Case - Existing System	$0	$1,203,400
Lighting/Daylighting System	$0	$772,284 *

Lowest LCC

Comparative Analysis Report

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs Paid By Agency:			
Capital Requirements as of Base Date	$0	$0	$0
Future Costs:			
Recurring and Non-Recurring Contract Costs	$0	$455,659	-$455,659
Energy Consumption Costs	$953,938	$264,908	$689,029
Energy Demand Charges	$163,532	$50,415	$113,117
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$85,930	$22,202	$63,729
Capital Replacements	$0	$0	$0
Residual Value at End of Study Period	$0	-$20,900	$20,900
Subtotal (for Future Cost Items)	$1,203,400	$772,284	$431,116
Total PV Life-Cycle Cost	$1,203,400	$772,284	$431,116

Net Savings from Alternative Compared with Base Case

PV of Operational Savings	$865,875
- PV of Differential Costs	$434,759
Net Savings	$431,116

Net Savings from Alternative

Comparative Analysis Report

Comparison of Contract Payments and Savings from Alternative

(undiscounted)

Year Beginning	Savings in Contract Costs	Savings in Energy Costs	Savings in Total Operational Costs	Savings in Total Costs
Apr 2007	$0	$0	$0	$0
Apr 2008	-$59,259	$64,424	$70,239	$10,980
Apr 2009	-$59,898	$64,094	$70,019	$10,121
Apr 2010	-$60,545	$63,397	$69,435	$8,890
Apr 2011	-$61,200	$63,249	$69,401	$8,201
Apr 2012	-$61,860	$63,939	$70,208	$8,347
Apr 2013	-$62,528	$64,885	$71,274	$8,746
Apr 2014	-$63,203	$66,057	$74,849	$11,646
Apr 2015	-$63,887	$67,766	$74,399	$10,512
Apr 2016	-$64,576	$69,643	$76,402	$11,826
Apr 2017	-$65,273	$70,853	$77,741	$12,467
Apr 2018	$0	$71,458	$74,716	$74,716
Apr 2019	$0	$72,730	$76,051	$76,051
Apr 2020	$0	$74,302	$77,686	$77,686
Apr 2021	$0	$75,950	$82,001	$82,001
Apr 2022	$0	$77,423	$80,937	$80,937

Comparative Analysis Report

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	1,250,000.0 kWh	407,447.2 kWh	842,552.8 kWh	16,848,750.2 kWh

Energy Savings Summary (in MBtu)

Energy Type	Average Annual Consumption Base Case	Alternative	Savings	Life-Cycle Savings
Electricity	4,265.2 MBtu	1,390.3 MBtu	2,874.9 MBtu	57,490.3 MBtu

Comparative Analysis Report

Emissions Reduction Summary

Energy Type	-----Average Base Case	Annual Alternative	Emissions----- Reduction	Life-Cycle Reduction
Electricity				
CO2	1,187,150.01 kg	386,868.45 kg	800,281.57 kg	16,003,440.27 kg
SO2	820.54 kg	271.51 kg	549.03 kg	10,979.18 kg
NOx	2,367.32 kg	771.46 kg	1,595.86 kg	31,912.84 kg
Total:				
CO2	1,187,150.01 kg	386,868.45 kg	800,281.57 kg	16,003,440.27 kg
SO2	820.54 kg	271.51 kg	549.03 kg	10,979.18 kg
NOx	2,367.32 kg	771.46 kg	1,595.86 kg	31,912.84 kg

Emissions reductions for air pollutants

by energy type

totals

Additional Resources

- NIST Handbook 135
- NIST Training Videos
- BLCC5 Support
- FEMP-Qualified Instructors

Contacts

- **BLCC, associated programs and user guides:** www.eere.energy.gov/femp/program/lifecycle.html
- **Handbook 135 and Annual Supplement:**

  1-800-DOE-EREC (1-800-363-3732)
- **Technical Assistance:**
  - **NIST Office of Applied Economics:** www.bfrl.nist.gov/oae
  - **LCC Method:** barbara.lippiatt@nist.gov
  - **BLCC software:** amy.rushing@nist.gov

Thank you

Questions?

Comments ?