



LIFE CYCLE CASH FLOW ANALYSIS

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PREPARED FOR – ASHRAE- CT CHAPTER
NOVEMBER 13, 2008

BACKGROUND

- IN 1979, WHEN ENERGY PRICES WERE REACHING THE EQUIVALENT OF \$100 A BARREL IN TODAY'S DOLLARS, THE COMMON METHOD TO EVALUATE AN ENERGY CONSERVATION OPTION WAS ***SIMPLE PAYBACK***. I PUBLISHED THREE ARTICLES, THE FIRST IN AUGUST 1979, THAT POINTED OUT THE NEED TO USE ***LIFE CYCLE COSTING*** AND ***CASH FLOW***. LITTLE HAS CHANGED AND MUCH OF THE SAME INFORMATION IS AS VALID TODAY AS WHEN IT WAS WRITTEN. ONE DISAPPOINTING CHANGE IS THAT ASHRAE HAS STEPPED BACK FROM CASH FLOW ANALYSIS TO LIFE CYCLE COSTING.

BACKGROUND – cont.

OUR INDUSTRY HAS LARGELY MISSED THE ADVANTAGES OF CASH FLOW ANALYSIS, WITH A FEW EXCEPTIONS .

- COMPANIES SUCH AS JOHNSON CONTROLS HAVE SUCCESSFULLY USED CASH FLOW CONCEPTS TO MARKET ENERGY CONSERVATION BY INCORPORATING FINANCING.
- THE SOLAR INDUSTRY HAS LEARNED HOW TO PUT LIP STICK ON A PIG AND MARKET BAD INVESTMENTS BY TAKING ADVANTAGE OF A CASH FLOW ANALYSIS AND INCORPORATING LONG TERM FINANCING, TAX DEDUCTIBILITY OF INTEREST, DEPRECIATION, ETC...AND OBTAINING FAVORABLE GOVERNMENT TAX BENEFITS.

BACKGROUND – cont.

- THE PURPOSE OF THIS TALK IS TO COMPARE THE USE THE FINANCIAL EVALUATION TECHNIQUES OF *LIFE CYCLE COSTING* AND *CASH FLOW ANALYSIS*...AND TO DISCUSS WHY WE SHOULD CARE.

FINANCIAL ANALYSIS

- THE BASIC MATHEMATICAL CALCULATIONS FOR LIFE CYCLE COSTING AND DISCOUNTED CASH FLOW ARE AVAILABLE FROM THE ASHRAE MANUAL AND WILL NOT BE REPEATED.

COMPUTERIZED CALCULATIONS ARE RECOMMENDED BECAUSE OF THE COMPLEXITY.

SEVERAL FINANCIAL ANALYSIS COMPUTER PROGRAMS ARE AVAILABLE.

BUILDING LIFE-CYCLE COST COMPUTER ANALYSIS

- **BUILDING LIFE-CYCLE-COST (BLCC)** – DEVELOPED FOR DOE FOR EVALUATION OF ENERGY CONSERVATION IN NON-MILITARY GOVERNMENT BUILDINGS. IT CAN BE DOWN LOADED FROM INTERNET AT NO COST. THE CURRENT VERSION OF THE PROGRAM DOES NOT INCLUDE TAX EFFECTS OF ENERGY EXPENSES, MAINTENANCE EXPENSES, INTEREST COSTS, AND DEPRECIATION; HOWEVER, AN EARLY DOS VERSION THAT CAN EVALUATE THE TAX EFFECTS OF PRIVATE BUILDING CASH FLOW IS AVAIABLE.

BUILDING LIFE CYCLE COST

- ..\..\..\Program Files\BLCC5

LIFE-CYCLE COST

- A SPREADSHEET CAN BE USED TO ANALYZE THE CUMULATIVE TOTAL OF THE INITIAL, OPERATING, AND MAINTENANCE COSTS. THE COSTS CAN THEN BE DISCOUNTED OVER THE LIFE OF THE SYSTEM OR THE REPAYMENT PERIOD. AN EXAMPLE IS SHOWN IN THE 2007 ASHRAE APPLICATIONS HANDBOOK, CHAPTER 36 – OWNING AND OPERATING COSTS, TABLE 7. TAX EFFECTS ARE NOT CONSIDERED.

LIFE CYCLE COST – ASHRAE 2007

- [..\Desktop\LCC Analysis Financing.xlsx](#)

LIFE CYCLE CASH FLOW

- A SPREADSHEET CAN BE USED TO ANALYZE THE CUMULATIVE TOTAL OF THE INITIAL, OPERATING, AND MAINTENANCE COSTS AND TAX EFFECTS OF ENERGY, MAINTENANCE, INTEREST AND DEPRECIATION. THE COSTS CAN THEN BE DISCOUNTED OVER THE LIFE OF THE SYSTEM OR THE REPAYMENT PERIOD. AN EXAMPLE IS SHOWN IN THE 1987 ASHRAE APPLICATIONS HANDBOOK, CHAPTER 49 – OWNING AND OPERATING COSTS, TABLE 6.

COMPARISON OF LIFE CYCLE AND CASH FLOW ANALYSIS

LIFE CYCLE COSTING OF A \$2,000,000 RETROFIT WITH \$100,000 TAX CREDIT, \$125,000 ENERGY SAVINGS AT 8% ESCALATION, \$2,000 MAINTENACE SAVINGS AT 3% INFLATION, 10% DISCOUNT RATE, 20 YEAR ANALYSIS

CASH FLOW ANALYSIS SAME AS ABOVE EXCEPT 20 YEAR FINANCING AT 7.5%, DDBL DEPRECIATION FOR 20 YEAR, TAX RATE AT 35%.

	NPV	YRS P.C.F.
• LIFE CYCLE COSTING	\$140,766	10 YEARS
• CASH FLOW ANALYSIS	\$569,595	0 YEARS

NOTES:

- 1) NPV IS NET POSITIVE VALUE AT 10% DISCOUNT RATE.
- 2) YRS P.C.F. IS YEARS TO POSITIVE CASH FLOW.

LIFE CYCLE CASH FLOW – ASHRAE 1987

- ..\Desktop\Energy Cash Flow Analysis
30yearsTaxes.xlsx

REFERENCED ARTICLES

- <http://www.guntermannengineering.com>
- [My Web Sites\guntermann engineering3](#)

Retrofit now for best energy system ROI

- [..\Desktop\Retrofit now for best energy system ROI.pdf](#)

Life-cycle costing and ROI-a must for new construction

- [..\Desktop\Life-cycle costing and ROI-a must for new construction.pdf](#)

Energy Management can revitalize America

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FINANCIAL ANALYSIS

- ENERGY COSTS CAN HAVE A MAJOR IMPACT ON THE PROFITABILITY OR NET INCOME.
- ENERGY CONSERVATION OPPORTUNITIES (ECO) REQUIRE FINANCIAL ANALYSIS IN ORDER TO SUCCESSFULLY COMPETE AGAINST OTHER BUSINESS INVESTMENTS.
- BOTH FOR-PROFIT AND NON-FOR-PROFIT ORGANIZATIONS ARE INTERESTED IN THE BOTTOM LINE.

FINANCIAL ANALYSIS BASICS

- A BASIC UNDERSTANDING OF THE CONCEPTS OF THE FINANCIAL TOOLS IS HELPFUL.
- ANY INVESTMENT REQUIRES CONSIDERATION OF THE PROFITABILITY, CASH FLOW, AND LIQUIDITY OF ANY EXPENDITURE.
- A TAX ACCOUNT'S INPUT IS RECOMMENDED FOR CASH FLOW ANALYSIS.

FINANCIAL TERMS

- FIRST COST
- NET PRESENT VALUE
- SIMPLE PAYBACK
- INTERNAL RATE OF RETURN
- HURDLE RATE
- COST OF CAPITAL
- DISCOUNT RATE
- TIME VALUE OF MONEY

FIRST COST

- FIRST COST IS THE UP FRONT COST THAT IS INCURRED BEFORE THE INVESTMENT GENERATES ANY SAVINGS. LARGE FIRST COSTS PUT SRESS ON AN ORGANIZATON'S BALANCE SHEET AND MAY CAUSE AN INVESTMENT TO BE REJECTED, EVEN IF IT IS PROFITABLE IN THE LONG RUN. THE FIRST COST IS TYPICALLY OBTAINED FROM THE ENERGY AUDIT OR ENGINEER ESTIMATES.

ENERGY COST SAVINGS

- ENERGY COST SAVINGS MUST BE CONVERTED FROM ENERGY SAVING TO COST SAVINGS. THE ENERGY SAVINGS CAN BE OBTAINED FROM AN ENERGY AUDIT OR COMPUTER SIMULATION. ENERGY PRICE CHANGES MAY BE INCLUDED FOR FUTURE YEARS.

MAINTENANCE COST SAVINGS

- MAINTENANCE COST SAVINGS CAN RESULT FROM THE REPLACEMENT OF OLD EQUIPMENT WITH NEW EQUIPMENT. IN SOME CASES, THEY CAN RESULT IN ADDITIONAL ENERGY COSTS.

REPLACEMENT COSTS

- REPLACEMENT COSTS OF MAJOR EQUIPMENT MAY VARY BETWEEN SYSTEMS AND SHOULD BE CONSIDERED.
- REPLACEMENT LIFE CAN BE OBTAINED FROM ASHRAE APPLICATIONS MANUAL – OWNING AND OPERATING COSTS – CHAPTER 36, TABLE 4.

OTHER SAVINGS

OTHER SAVINGS CAN BE GENERATED FROM FIRST COST INVESTMENTS INCLUDING:

- BEAUTIFICATION CAN IMPROVE THE WORKER ENVIRONMENT.
- PRODUCTIVITY CAN RESULT IN LABOR SAVINGS.
- INCREASED PROPERTY VALUE RESULT FROM THE FIRST COST INVESTMENT.
- REDUCED FIRST COSTS OF OTHER SYSTEMS SUCH AS INSULATION CAN REDUCE NEW HVAC SYSTEMS.

NET PRESENT VALUE

- NET PRESENT VALUE (NPV) IS THE TOTAL NET CASH FLOW THAT A PROJECT GENERATES OVER ITS LIFETIME, INCLUDING FIRST COSTS, WITH DISCOUNTING APPLIED TO CASH FLOWS THAT OCCUR IN THE FUTURE.

NPV INDICATES WHAT A PROJECT'S LIFETIME CASH FLOW IS WORTH TODAY.

SIMPLE PAYBACK

- SIMPLE PAYBACK IS THE AMOUNT OF TIME, IN YEARS, NECESSARY FOR FUTURE CASH FLOWS TO RETURN THE ORIGINAL INVESTMENT. PAYBACK IS AN INDICATOR OF LIQUIDITY BECAUSE IT MEASURES THE SPEED WITH WHICH AN INVESTMENT IS CONVERTED INTO CASH. SIMPLE PAYBACK IS ALSO USED AS AN INDICATOR OF RISK.
- SIMPLE PAYBACK IGNORES THE TIME VALUE OF MONEY AND INCOME BEYOND THE PAYBACK PERIOD.

INTERNAL RATE OF RETURN

- INTERNAL RATE OF RETURN (IRR) IS THE INTEREST RATE THAT EQUATES THE PRESENT VALUE OF EXPECTED FUTURE CASH FLOWS TO THE INITIAL COST OF THE PROJECT. EXPRESSED AS A PERCENTAGE, IRR CAN EASILY COMPARED WITH HURDLE RATES TO DETERMINE AN INVESTMENTS PROFITABILITY.

HURDLE RATE

- HURDLE RATE IS THE ACCEPT/REJECT CRITERION FOR DETERMINING IF AN INVESTMENT PASSES THE PROFITABILITY TEST. IF THE IRR IS HIGHER THAN THE HURDLE RATE, THE INVESTMENT IS PROFITABLE. HURDLE RATES ARE THE MARGINAL COST OF CAPITAL, ADJUSTED FOR A PROJECT'S RISK. THE HIGHER THE COST OF CAPITAL AND RISK, THE HIGHER THE HURDLE RATE.

COST OF CAPITAL

- COST OF CAPITAL IS THE FINANCE RATE THAT IS USE IN THE CAPITAL BUDGETING PROCESS.

DISCOUNT RATE

- DISCOUNT RATE IS THE INTEREST RATE USED TO DISCOUNT FUTURE REVENUE STREAMS.

TIME VALUE OF MONEY

- TIME VALUE OF MONEY CONSIDERS THAT MONEY RECEIVED TODAY IS VALUED MORE HIGHLY THAN MONEY RECEIVED AT A FUTURE DATE.

CASH FLOW ANALYSIS

- CASH FLOW ANALYSIS CONSIDERS THE NET INCOME/LOSS OVER THE LIFE OF THE PROJECT AND ACCOUNTS FOR THE TIME VALUE OF MONEY. THIS INCLUDES THE YEAR-TO-YEAR COSTS AND SAVINGS FOR ALL INSTALLATION, OPERATION, MAINTENANCE, REPLACEMENT COSTS, SALVAGE/DISPOSAL COSTS, AND ENERGY SAVINGS OVER THE LIFE OF THE EQUIPMENT OR BUILDING. FUTURE COST/SAVINGS ESCALATION AND/OR INFLATION RATES ARE TYPICALLY INCLUDED.

TAXES

- TAXES CAN HAVE A MAJOR AFFECT ON THE CASH FLOW AND THE INVESTMENT. FEDERAL CORPORATE INCOME TAX RATES VARY FROM 15% TO 39%. STATE TAXES MUST BE ADDED ONTO THIS. ENERGY AND MAINTENCE EXPENSES ARE TAX DEDUCTIBLE. ALSO, DEPRECIATION AND LOAN INTEREST RATES ARE ALSO DEDUCTIBLE. THESE CAN BE OMITTED AND A SIMPLIFIED CASH FLOW CAN BE SUBMITTED IN PRE-TAX TERMS.

DEPRECIATION

- DEPRECIATION IS THE LOSS IN VALUE OVER TIME. IT INCREASES THE NET INCOME.
- DEPRECIATION LIFE IS 27.5 YEARS FOR RESIDENTIAL PROPERTY AND 39 YEARS FOR NON-RESIDENTIAL PROPERTY.
- MODIFIED ACCELERATED COST-RECOVERY SYSTEMS (MACRS) + BONUS DEPRECIATION.
 1. SOLAR, WIND, GEOTHERMAL, FUEL CELLS – 5 YEAR ACCELERATED.
 2. 50% BONUS DEPRECIATION TO EXPIRE 2009.
- COST SEGREGATION SERVICES – SOME MECH & ELEC. COMPONENTS HAVE SHORTER LIFE AND COST CAN BE DEPRECIATED OVER 5 YEARS.

FEDERAL TAX CREDITS

BASED ON “EMERGENCY ECONOMIC STABILIZATION ACT OF 2008” FEDERAL TAX CREDITS INCLUDE:

- TAX CREDITS FOR CONSUMERS
 - HOME IMPROVEMENTS
 - CARS
 - SOLAR ENERGY SYSTEMS
 - FUEL CELLS
- TAX CREDITS FOR HOME BUILDERS
- TAX DEDUCTIONS FOR COMMERCIAL BUILDINGS

TAX CREDITS FOR HOME IMPROVEMENTS

TAX CREDITS FOR INSULATION, REPLACEMENT WINDOWS, WATER HEATERS, AND CERTAIN HIGH EFFICIENCY HEATING AND COOLING EQUIPMENT IS \$500 THROUGH DECEMBER 31, 2008.

- INSULATION – 10% OF COST UP TO \$500.
- CENTRAL A/C - \$300
- AIR SOURCE HEAT PUMPS - \$300
- GEO-THERMAL HEAT PUMPS - \$300
- GAS, OIL, PROPANE FURNACE OR BOILER - \$50
- AIR SYSTEM - \$50
- WATER HEAERS - \$300
- SOLAR SYSTEMS – 30% OF COST UP TO \$2,000
- FUEL CELLS – 30% OF COST UP TO \$1,000 PER Kw.

TAX CREDITS FOR HOME BUILDERS

- HOME BUILDERS ARE ELEGIBLE FOR A \$2,000 TAX CREDIT FOR NEW ENERGY EFFICIENT HOMES THAT ACHIEVES 50% SAVINGS FOR HEATING AND COOLING OVER 2004 INTERNATIONAL ENERGY CODE.

TAX CREDITS FOR COMMERCIAL BUILDINGS

- A TAX DEDUCTION OF UP TO \$1.80 PER SQ.FT. IS AVAILABLE TO OWNERS OR DESIGNERS OF NEW OR EXISTING COMMERCIAL BUILDINGS THAT SAVE AT LEAST 50% OF THE HEATING AND COOLING ENERGY OF A BUILDING AND MEETS ASHRAE STANDARD 90.1 – 2001. PARTIAL DEDUCTIONS OF UP TO \$.60 PER SQ.FT. FOR SEPARATE BUILDING SUBSYSTEMS: ENVELOPE, LIGHTING, OR HEATING/COOLING SYSTEMS.

STATE TAX INCENTIVES

CONNECTICUT ENERGY CONSERVATION PROGRAMS ESTABLISHED IN JUNE 2007.

- FURNACE REPLACEMENT REBATES
- SALES TAX EXEMPTION: HOME WEATHERIZATION PRODUCTS
- ENERGY CONSERVATION LOANS
- SOLAR POWER SYSTEM REPABATES

A DATA BASE OF STATE TAX CREDITS IS AVAILABLE ON A WEB SITE – WWW.DSIREUSA.ORG .

FURNACE REPLACEMENT REBATE

- FURNACE REPLACEMENT REBATE OF UP TO \$500 TO REPLACE EXISTING RESIDENTIAL FURNACES OR BOILERS WITH MORE EFFICIENT MODELS USING NATURAL GAS, PROPANE, OR OIL THAT ARE AT LEAST 84% EFFICIENT ...DEPENDING ON INCOME. AVAILABLE THRU JULY 1, 2017.

SALES TAX EXEMPTION: HOME WEATHERIZATION PRODUCTS

- PROGRAMMABLE THERMOSTATS
- WINDOW FILMS
- CAULKING
- WINDOW AND DOOR WEATHER STRIPS
- INSULATION
- WATER HEATER BLANKETS
- WATER HEATERS
- BOILERS THAT MEET FEDERAL ENERGY STAR – 85% EFFICIENCY OR GREATER
- NATURAL GAS FURNACES THAT MEET ENERGY STAR.
- PROPANE FURNACES THAT MEET ENERGY STAR.
- WINDOWS THAT MEET ENERGY STAR.
- OIL FURNACES THAT ARE 85% OR GREATER.
- GROUND BASED HEAT PUMPS THAT MEET MINIMUM FEDERAL ENERGY EFFICIENCY STANDARDS

ENERGY CONSERVATION LOANS

- LOW INTEREST LOANS ARE OFFERED FOR SINGLE FAMILY AND MULTI-FAMILY PROPERTY WITHIN INCOME LIMITS. THE MINIMUM AMOUNT IS \$400 AND THE MAXIMUM AMOUNT IS \$25,000. THE MAXIMUM PERIOD OF THE LOAN IS 10 YEARS. GOOD CREDIT IS REQUIRED.

SOLAR POWER SYSTEM REBATES

- THE CONNECTICUT CLEAN AIR FUND OFFERS REBATES FOR RESIDENTIAL SOLAR SYSTEMS. THE SOLAR SYSTEMS MUST BE TIED INTO THE GRID. REBATE AMOUNTS UP TO A MAXIMUM OF \$25,000 PER HOUSEHOLD ARE AVAILABLE.



UTILITY INCENTIVES

MOST OF THE FEDERAL AND STATE ENERGY CONSERVATION INCENTIVES ARE OFFERED THROUGH LOCAL UTILITIES...UNITED ILLUMINATING OR CONNECTICUT LIGHT AND POWER.

FEDERAL *ENERGY STAR* MINIMUM STANDARDS ARE REQUIRED.



OTHER FINANCIAL METHODS

- LEASED BUYBACK
- SHARED SAVINGS

LEASE BACK CASH FLOW

- THIS FINANCIAL ARRANGEMENT ALLOWED CORPORATIONS TO PURCHASE ECO INVESTMENTS TO TAKE ADVANTAGE OF THE TAX DEDUCTIONS FROM PUBLIC AND NON-TAXABLE ORGANIZATION TO IMPROVE THEIR CASH FLOW. THESE LEASE-BACK TAX SHELTERS ARE UNDER ATTACK BY THE IRS AND MANY ARE NO LONGER ALLOWED. FURTHER, THE CURRENT CREDIT CRISIS HAS LEFT SOME USERS WITH LARGE POTENTIAL LOSSES.

CALCULATIONS

Cash Flows Calculations	
Guaranteed Savings:	\$171,338
Total Project Cost:	\$1,685,105
# of Years:	12
Lease Payments:	\$2,005,480
Over 12 Years:	\$50,581
Assumption(s):	
Utility Rebates (deducted from Project Cost)	\$107,500
Interest Rate (Tax Exempt)	3.9%
Municipal Lease	
No Escalation in Energy	
Prices Expected in Next 10 Years	

Year	Lease Payments	Guaranteed Savings	Net Cashflow
1	\$167,123	\$171,338	\$4,215
2	\$167,123	\$171,338	\$4,215
3	\$167,123	\$171,338	\$4,215
4	\$167,123	\$171,338	\$4,215
5	\$167,123	\$171,338	\$4,215
6	\$167,123	\$171,338	\$4,215
7	\$167,123	\$171,338	\$4,215
8	\$167,123	\$171,338	\$4,215
9	\$167,123	\$171,338	\$4,215
10	\$167,123	\$171,338	\$4,215
11	\$167,123	\$171,338	\$4,215
12	\$167,123	\$171,338	\$4,215
	\$2,005,480	\$2,056,061	\$50,581

Comprehensive Project Approach

Measure Description	Payback	Investment	Annual Savings
Elementary School			
Lighting Improvements	3 Years	\$9,767	\$2,916
Lighting Controls	3 Years	\$33,526	\$12,345
Insulation Measures	4 Years	\$12,366	\$3,322
Replace Motors	6 Years	\$12,451	\$2,205
Domestic Water Conservation	6 Years	\$4,039	\$707
VFD on Hot Water Pump	8 Years	\$6,558	\$780
Install New DDC EMS	9 Years	\$34,860	\$3,852
New High Efficiency Boilers	13 Years	\$114,442	\$8,761
Photovoltaic Generation - 5kW PV	37 Years*	\$50,000	\$734
Subtotal	7.8 Years	\$278,009	\$35,622
Municipal Building			
Replace Steam Traps	3 Years	\$15,389	\$5,794
Lighting Improvements	3 Years	\$20,884	\$6,970
Domestic Water Conservation	4 Years	\$3,110	\$860
Install New DDC EMS	7 Years	\$22,604	\$3,023
New High Efficiency Boilers	17 Years	\$59,577	\$3,483
Replace Air Cooled Chillers	33 Years	\$103,126	\$3,114
Subtotal	9.7 Years	\$224,690	\$23,244
High School			
Retro-Commissioning	3 Years	\$55,234	\$18,012
Lighting Controls	3 Years	\$12,661	\$3,894
Lighting Improvements	4 Years	\$247,266	\$55,544
Heat Pumps Controls	7 Years	\$7,869	\$1,050
Kitchen Fume Hood Controls	7 Years	\$40,464	\$6,010
Replace Windows	25 Years	\$28,720	\$1,133
Replace Roof Top Units	37 Years	\$495,192	\$13,228
Pool Heating - Solar Thermal System	16 Years	\$195,000	\$12,134
Photovoltaic Generation - 10kW PV	37 Years*	\$100,000	\$1,468
Subtotal	10.5 Years	\$1,182,406	\$112,473
Totals	10 Years	\$1,685,105	\$171,338
* Payback calculation includes utility rebate of \$4.50/Watt			

Key:	
Green	Low Hanging Fruit
Yellow	Good Payback
Blue	Infrastructure Improvement

SOLAR LIFE CYCLE CALCULATION

- ..\Desktop\Energy Cash Flow Analysis
30yearsTaxes5.xlsx

VARY CASH FLOW PERIOD

- Initial cost - \$100,000; interest rate - 7.5%; energy savings - \$10,000; fuel escalation - 10%; tax rate - 35%; discount cash flow rate - 5%

PERIOD	SIMPLE PAYBACK	ACCUMULATED CASH FLOW	NET PRESENT VALUE	INTERNAL RATE OF RETURN	YEARS TO POSITIVE CASH FLOW
10	10	\$8,897	\$6,624	NONE	0
20	10	\$244,768	\$125,856	NONE	0
30	10	\$99,962	\$330,899	NONE	0
40	10	\$266,1447	\$826,348	NONE	0

VARY CURRENT ENERGY COSTS

- Initial cost - \$100,000; finance interest rate - 7.5%; current energy cost - varies; energy escalation rate - 10%; cash flow period - 20 years; discount cash flow rate - 5%; tax rate - 35%

ENERGY COSTS	SIMPLE PAYBACK	ACCUMULATED CASH FLOW	NET PRESENT VALUE	INTERNAL RATE OF RETURN	YEARS TO POSITIVE CASH FLOW
\$5,000	20	\$58,624	\$26,047	NONE	0
\$10,000	10	\$244,768	\$125,856	NONE	0
\$15,000	6.67	\$430,911	\$225,665	NONE	0
\$20,000	5	\$617,055	\$325,474	NONE	0

VARY ENERGY ESCALATION RATE

- Initial cost - \$100,000; interest rate - 7.5%; energy savings - \$10,000; cash flow period - 20 years; 10%; tax rate - 35%; discount cash flow rate

ENERGY ESCALATION RATE	SIMPLE PAYBACK	ACCUMULATED CASH FLOW	NET PRESENT VALUE	INTERNAL RATE OF RETURN	YEARS TO POSITIVE CASH FLOW
0	10	\$2,480	\$7,243	NONE	0
5	10	\$87,409	\$50,048	NONE	0
10	10	\$244,768	\$125,856	NONE	0
15	10	\$538,363	\$262,183	NONE	0

VARY TAX RATE

- Initial cost - \$100,000; interest rate - 7.5%; energy savings - \$10,000; energy escalation rate - 10%; cash flow period - 20 years; 10%; discount cash flow rate - 5%

TAX RATE	SIMPLE PAYBACK	ACCUMULATED CASH FLOW	NET PRESENT VALUE	INTERNAL RATE OF RETURN	YEARS TO POSITIVE CASH FLOW
0	10	\$376,566	\$184,860	NONE	0
15	10	\$320,081	\$159,573	NONE	0
30	10	\$263,596	\$134,285	NONE	0
45	10	\$207,111	\$108,998	NONE	0

VARY FINANCE INTEREST RATE

- Initial cost - \$100,000; energy savings - \$10,000; energy escalation rate - 10%; cash flow period - 20 years; discount cash flow rate - 5%; tax rate - 35%

INTEREST RATE	SIMPLE PAYBACK	ACCUMULATED CASH FLOW	NET PRESENT VALUE	INTERNAL RATE OF RETURN	YEARS TO POSITIVE CASH FLOW
0	10	\$307,287	\$162,433	NONE	0
5	10	\$267,972	\$139,582	NONE	0
10	10	\$219,590	\$110,830	NONE	0
15	10	\$164,598	\$77,672	NONE	0

VARY DOWN PAYMENT

- Initial cost - \$100,000; finance interest rate - 7.5%; vary down payment; current energy savings - \$10,000; energy escalation rate - 10%; cash flow period - 20 years; discount cash flow rate - 5%; tax rate - 35%

DOWN PAYMENT	SIMPLE PAYBACK	ACCUMULATED CASH FLOW	NET PRESENT VALUE	INTERNAL RATE OF RETURN	YEARS TO POSITIVE CASH FLOW
\$0	10	\$244,768	\$125,856	NONE	0
\$25,000	10	\$260,398	\$125,578	NONE	4
\$50,000	10	\$276,028	\$125,300	NONE	6
\$100,000	10	\$307,287	\$124,744	NONE	8

VARY TAX CREDIT

- Initial cost - \$100,000; finance interest rate - 7.5%; vary tax credit; current energy savings - \$10,000; energy escalation rate - 10%; cash flow period - 20 years; discount cash flow rate - 5%; tax rate - 35%

TAX CREDIT	SIMPLE PAYBACK	ACCUMULATED CASH FLOW	NET PRESENT VALUE	INTERNAL RATE OF RETURN	YEARS TO POSITIVE CASH FLOW
\$0	10	\$244,768	\$125,856	NONE	0
\$25,000	7.5	\$285,398	\$150,578	NONE	0
\$50,000	5	\$326,08	\$175,300	NONE	0
\$75,000	2.5	\$366,658	\$200,022	NONE	0