

FLORIDA LIFE-CYCLE COST ANALYSIS PROGRAM

For Sustainable State Agencies



FORMS & DOCUMENTS

FORMS: #AE16(B), #AE16(C), #AE16(D), #AE16(E), #AE16(F), & #AE16(G)

INCORPORATED BY REFERENCE IN RULE 60D-4.006, F.A.C.

Prepared For:

**Florida Department of Management Services
Capital Improvements**

Renovations to the Al Lofton Building - FHP Headquarters Troop E

1/26/2010

A/E INFORMATION SHEET

FORM #AE16(B)

ARCHITECT/ENGINEER INFORMATION

NAME OF FIRM:	Johnson, Levinson, Ragan, Davila, Inc.
ADDRESS LINE 1:	1450 Centrepark Blvd
ADDRESS LINE 2:	Suite 350
ADDRESS LINE 3:	
TELEPHONE NUMBER:	561-689-2303
E-MAIL ADDRESS:	mdavila@jlrddinc.com
SUBMISSION DATE:	1/26/2010
PREPARED BY:	Michael Davila, PE
SIGNATURE:	

ARCHITECT/ENGINEER RECOMMENDATION

JLRD recommends Alternative 2, a direct expansion (DX) VAV system based upon the lowest life cycle cost and best energy performance. The sensitivity analysis supports this choice under all variances.

Note: This sheet applies to all "guaranteed energy, water, and wastewater performance contractors" as defined by Section 489.145, Florida Statutes. Such contractors are not required to affix a professional seal below.

Sign, date, and affix professional seal below this line

FLCCA SENSITIVITY ANALYSIS SHEET

FORM #AE16(C)

INSTRUCTIONS

The DOE energy price forecast and real discount rate shall be varied to account for the uncertainty of the discount rate and future energy price escalation rates. The energy price escalation rate and discount rate shall be varied in the DOE Forecast worksheet and the results of the FLCCA Computation worksheet recorded here. For example, increasing the energy price escalation rate by a factor of two is noted as E=2. Likewise, increasing the discount rate to 4% is noted as D=4%. One of the entries shall contain no variance from the DOE energy price forecast and real discount rate. The sensitivity analysis shall vary the discount rate by itself, the DOE energy price forecast by itself, and then both variables simultaneously as shown on this worksheet.

SENSITIVITY ANALYSIS RESULTS

ALTERNATIVE DESIGN:	TOTAL LIFE-CYCLE COST					
	#1	#2	#3	#4	#5	#6
D=3%; E=1 (DOE CRITERIA)	\$1,350,567	\$1,124,593	\$1,337,549	\$1,191,007		
D=4.5%; E=1	\$1,186,457	\$1,002,109	\$1,191,267	\$1,057,272		
D=6%; E=1	\$1,057,180	\$905,688	\$1,076,111	\$951,778		
D=3%; E=1.5	\$1,420,778	\$1,170,493	\$1,395,469	\$1,235,966		
D=3%; E=2	\$1,441,464	\$1,184,016	\$1,412,533	\$1,249,212		
D=4.5%; E=1.5	\$1,246,524	\$1,041,377	\$1,240,819	\$1,095,736		
D=6%; E=2	\$1,122,162	\$948,169	\$1,129,717	\$993,389		

ADDITIONAL INFORMATION

ALTERNATIVE DESIGN:	#1	#2	#3	#4	#5	#6
TOTAL INSTALLED COST	\$287,847	\$333,876	\$391,361	\$318,180		
ANNUAL ENERGY CONSUMPTION (kBtu)	1,728,200	1,089,500	1,432,100	1,106,700		

DMS Analysis:

Option #:	1	2	3	4
Annual Energy Cost:	\$46,133	\$30,159	\$38,057	\$29,541

Notes:

- Option #2 has the lowest life-cycle cost and annual energy consumption.
- Option #2 represents a 37% reduction in annual energy consumption.

Comparing Option #2 to Option #1:

$$ROI = (\$333,876 - \$287,847) / (\$46,133 - \$30,159) = 2.88 \text{ years}$$

Option #1 is allowed by code, but the added cost of Option #2 will payback within 3 years.

Option #2 is preferred.

GENERAL INSTRUCTIONS

Rows may be inserted or the text size reduced in order to accommodate more space. Refer to the FLCCA Requirements & Instructions Form #AE16(A) for detailed instructions regarding the information required in each section.

SCOPE OF WORK

This project is a interior renovation of the Al Lofton Building which serves as the headquarters for Troop E of the Florida Highway Patrol. The project address is 1011 NW 111th Avenue, Miami, Florida 33172. The scope of work includes full replacement of the buildings Mechanical, Electrical and (aboveground) Plumbing systems and coordination with the Architectural floor plan revisions.

SUSTAINABILITY GOAL

The project sustainability goal is certification under LEED for New Construction, version 3.0 as administered by the Green Building Council. The rating system utilizes comparison of the predicted whole building energy cost for the project against the energy cost of a building baseline as defined in ASHRAE 90.1 - 2007. This initial life cycle costing provides a good comparison between the alternatives but is not an actual 90.1 model. Due to the existing glass not being as high performance as the ASHRAE baseline some reduction in the energy savings estimated herein should be expected when the modeling is performed.

MINIMUM ENERGY PERFORMANCE

The minimum energy performance is a 5% reduction in building energy cost as compared to the baseline ASHRAE 90.1 - 2007 building. The baseline HVAC system is a packaged constant volume DX Heat Pump with a minimum EER of 10.6 (ASHRAE 90.1 System 4).

TOTAL LIFE-CYCLE COST (AS CALCULATED FROM THE FLCCA WORKSHEETS)

ALTERNATIVE DESIGN #1:	\$1,350,567
ALTERNATIVE DESIGN #2:	\$1,124,593
ALTERNATIVE DESIGN #3:	\$1,337,549
ALTERNATIVE DESIGN #4 (OPTIONAL):	\$1,191,007
ALTERNATIVE DESIGN #5 (OPTIONAL):	
ALTERNATIVE DESIGN #6 (OPTIONAL):	

Note: Provide the life-cycle cost analysis results here based on DOE projections with no variance.

ANNUAL ENERGY CONSUMPTION - kBTU

ALTERNATIVE DESIGN #1:	1,728,200
ALTERNATIVE DESIGN #2:	1,089,500
ALTERNATIVE DESIGN #3:	1,432,100
ALTERNATIVE DESIGN #4 (OPTIONAL):	1,106,700
ALTERNATIVE DESIGN #5 (OPTIONAL):	
ALTERNATIVE DESIGN #6 (OPTIONAL):	

MAXIMUM ALLOWABLE ENERGY CONSUMPTION - kBTU (FOR WHOLE-BUILDING COMPLIANCE ONLY)

MAXIMUM ALLOWABLE ENERGY CONSUMPTION:	1,728,200
---------------------------------------	-----------

PERCENTAGE REDUCTION (FOR WHOLE-BUILDING COMPLIANCE ONLY)

ALTERNATIVE DESIGN #1:	100%
ALTERNATIVE DESIGN #2:	37%
ALTERNATIVE DESIGN #3:	17%
ALTERNATIVE DESIGN #4 (OPTIONAL):	36%
ALTERNATIVE DESIGN #5 (OPTIONAL):	
ALTERNATIVE DESIGN #6 (OPTIONAL):	

ENERGY PERFORMANCE INDEX (FOR WHOLE-BUILDING COMPLIANCE ONLY)

ALTERNATIVE DESIGN #1:	81.5
ALTERNATIVE DESIGN #2:	51.4
ALTERNATIVE DESIGN #3:	67.5
ALTERNATIVE DESIGN #4 (OPTIONAL):	52.2
ALTERNATIVE DESIGN #5 (OPTIONAL):	
ALTERNATIVE DESIGN #6 (OPTIONAL):	

COST UTILIZATION INDEX (FOR WHOLE-BUILDING COMPLIANCE ONLY)

ALTERNATIVE DESIGN #1:	\$2.17
ALTERNATIVE DESIGN #2:	\$1.42
ALTERNATIVE DESIGN #3:	\$1.79
ALTERNATIVE DESIGN #4 (OPTIONAL):	\$1.39
ALTERNATIVE DESIGN #5 (OPTIONAL):	
ALTERNATIVE DESIGN #6 (OPTIONAL):	

GENERAL BUILDING INFORMATION

SPACE # OR NAME (MODIFY AS NEEDED):	1st Floor	2nd Floor	3	4	5
SPACE TYPE:	Office	Office			
# OF WORKERS ON MAIN SHIFT:	53	41			
GROSS SQUARE FOOTAGE:	12,643	8,569			
WEEKLY OPERATING HOURS:	24-7	24-7			
WEEKDAY OPEN/CLOSE TIME:	24-7	8am - 5pm			
WEEKEND OPEN/CLOSE TIME:	24-7	8am - 5pm			
# OF FLOORS:	2	2			
# OF PERSONAL COMPUTERS:	31	13			
PERCENT COOLED/HEATED:	85%	87%			
SEATING CAPACITY (ASSEMBLY AREAS):					
# OF ROOMS (DORMITORIES & RESIDENCE HALLS):	N/A	N/A			
# OF PATIENT ROOMS (FOR HOSPITALS, ETC.):	N/A	N/A			
# OF WALK-IN REFRIGERATORS/FREEZERS:	N/A	N/A			
COOKING FACILITIES PRESENT (YES/NO):	No	No			

TECHNICAL DESCRIPTION OF ALTERNATIVE DESIGNS

ALTERNATIVE DESIGN #1:

Since this is an interior remodeling project certain characteristics are uniform for all of the proposed alternatives. They include the building thermal characteristics (Roof R = 20, wall R = 5, glass U = 1.04) 13% glass (accounting for 15.6% of the load), and shading coefficient of 0.71. The non-HVAC types of energy consuming systems include lighting and domestic hot water, the types of equipment are fluorescent fixtures (T-8), office equipment (computers, copiers, printers) and electric drinking fountain and water heaters. For this LCCA analysis the lighting power density has been taken as 1.2 watts/sqft in keeping with ASHRAE 90.1-2007. Alternative number one is the LEED baseline system for the project, a single zone heat pump with an EER of 10.6 - Since this is a generic baseline there is no specific model number used as a basis for the analysis. Although modeled as a heat pump per floor under this option some type of zoning would be needed to meet the varying loads due to occupancy and thermal exposure. This could be accomplished by an airside system consisting of pressure dependant variable volume zone boxes with a bypass damper. Heat would be of the electric resistance type located in the unit.

ALTERNATIVE DESIGN #2:

The basic building parameters described above apply to this alternative. Alternative number two is the type of system that is currently installed, a DX split system with a VAV airside configuration, except in lieu of pressure independent VAV boxes pressure dependant boxes and a bypass damper is proposed to simplify the system controls. Heating would be of the electrical resistance type consisting of a duct mounted heater. The basis of the analysis is Trane RACJ condensing unit, EER ranges between 11.6 for a 20 ton unit, to 11.9 for the 25 ton unit with 11.6 being used in the energy analysis. This would be coupled to a Trane "Performance" Central Climate Changer.

ALTERNATIVE DESIGN #3:

The basic building parameters described above apply to this alternative. Alternative number three is an air-cooled chiller with pressure independent VAV boxes. The chiller efficiency was taken as an EER of 10.0 based upon a Trane CGAM at ARI conditions, it would be coupled to Trane "Performance" Central Climate Changers (one per floor). Heating would be of the electric resistance type at the box discharge.

TECHNICAL DESCRIPTION OF ALTERNATIVE DESIGNS (CONTINUED)

ALTERNATIVE DESIGN #4 (OPTIONAL):

The basic building parameters described above apply to this alternative. Alternative number four is a water source heat pump system consisting of 16 heat pumps coupled to a cooling tower. The heat pumps are based upon Trane model EXH/EXV with an EER of 15. Supplemental heat (when required) would be of the electrical resistance type.

ALTERNATIVE DESIGN #5 (OPTIONAL):

5th Design not Analyzed

ALTERNATIVE DESIGN #6 (OPTIONAL):

6th Design not Analyzed

ANNUAL OPERATING COSTS

The program used (Trane Trace) calculates energy and water costs based upon user input.

For this facility power is provided by FPL, and for the building size the rate type is GSD-1.

The demand charge is \$7.37/KW

The power charge is \$0.06/KWH

Alternative 4 is a water cooled option.

Water costs have been taken at \$2.50/1000 gallons

This cost is for water only, it assumes the utility will only charge a small portion of the total water use for wastewater disposal.

A blowdown water meter will be incorporated into the design to allow verification of the waste stream with the utility.

ANNUAL MAINTENANCE COSTS

ASHRAE research Project 1237-TRP was used for a source of maintenance cost data

<http://xp20.ashrae.org/publicdatabase/default.asp>.

The data is available in a number of categories, we have found over specifying the categories results in a limited sample of buildings. Our methodology was to specify the region and the type of system and use a weighted average of the reported mean maintenance cost per square foot for the buildings in the top two "System Similarity" categories.

The results are as follows:

Alternative 1	\$0.54
Alternative 2	\$0.81
Alternative 3	\$0.72
Alternative 4	\$0.43

The value for Alternative 4 appears too low; it is the only alternative with a monthly cost associated with Tower treatment chemicals and since there are a number of units (16) routine tasks such as filter replacement will cost more.

We also question why the large divergence between alternatives 1 and 2 as both utilize DX equipment.

Using the Alternative 1 costs as a baseline we adjusted these costs as follows:

Alternative 1	\$0.54
Alternative 2	\$0.59
Alternative 3	\$0.64
Alternative 4	\$0.84

We feel these maintenance costs to be valid relative to one another although the absolute costs may not be reflective of what the actual costs are. There is a large variance in the data reported on the ASHRAE website; the actual values could be half of these used in this analysis.

CAPITAL COSTS

Due to the preliminary nature of the design at this point capital costs were estimated on a dollar per square foot basis. The 2010 Mechanical Means estimating guide was used as a base reference. The Means figures were normalized with other projects this firm has designed to more accurately reflect HVAC system costs in South Florida. Specifically contractor provided budget numbers for a water source heat pump project was \$15/sqft. The means figure is \$8.69 so the means numbers will be adjusted by 173%. Using this approach provides the following data:

Alternate 1	13.57/sqft
Alternate 2	15.74/sqft
Alternate 3	18.45/sqft
Alternate 4	15.00/sqft

Equipment replacement costs and frequency were taken as follows;

Alternate 1	\$55,400 for 2 nominal 25 ton packaged rooftop units in years 10 and 20
Alternate 2	\$44,000 for 2 nominal 25 ton air cooled condensing units in years 10 and 20
Alternate 3	\$44,500 for an air cooled 45 ton chiller in years 10 and 20
Alternate 4	\$56,600 for 16 water source heat pumps and a cooling tower in year 15.

Cost data was obtained from Means 2010 - Mechanical

FLCCA COMPUTATION SHEET

SPECIFY ALTERNATIVE DESIGN NUMBER HERE:

1

NOTE: DATA CAN ONLY BE ENTERED IN THE GREEN CELLS (POSITIVE WHOLE NUMBERS ONLY). THE DOE ESCALATION RATES USED IN THIS SPREADSHEET FOR "OTHER FUELS" SHALL ONLY REFERENCE THE ADJUSTED RATES ON THE DOE WORKSHEET.

SPECIFY ANALYSIS PERIOD HERE (YEARS):

25

Table with columns for years 2010-2034 and rows for various cost categories: LIFE-CYCLE OWNERSHIP COST, LIFE-CYCLE OPERATING COST, LIFE-CYCLE MAINTENANCE & REPAIR COST, LIFE-CYCLE REPLACEMENT COST, and RESIDUAL VALUE. Includes sub-rows for electrical, natural gas, and other fuel costs.

FLCCA COMPUTATION SHEET

SPECIFY ALTERNATIVE DESIGN NUMBER HERE: **2**
 SPECIFY ANALYSIS PERIOD HERE (YEARS): **25**

NOTE: DATA CAN ONLY BE ENTERED IN THE GREEN CELLS (POSITIVE WHOLE NUMBERS ONLY). THE DOE ESCALATION RATES USED IN THIS SPREADSHEET FOR "OTHER FUELS" SHALL ONLY REFERENCE THE ADJUSTED RATES ON THE DOE WORKSHEET.

ACTUAL YEAR (MODIFY AS NEEDED)	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	TOTAL		
RELATIVE YEAR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	TOTAL		
LIFE-CYCLE OWNERSHIP COST:																												
NON-FINANCED OWNERSHIP COSTS:																												
TOTAL CONSTRUCTION COSTS	\$333,876																										\$333,876	
FINANCED OWNERSHIP COSTS (AS APPLICABLE):																												
ANNUALIZED CONSTRUCTION COSTS		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
ANNUALIZED INVESTMENT GRADE AUDIT COSTS		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
ANNUALIZED MEASUREMENT & VERIFICATION COSTS		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
ANNUALIZED FINANCING COSTS		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
MISCELLANEOUS ANNUALIZED COSTS (SPECIFY)		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
COMBINED OWNERSHIP COSTS:																												
TOTAL ANNUAL OWNERSHIP COSTS	\$333,876	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$333,876	
DOE REAL DISCOUNT RATE	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
ANNUAL PRESENT VALUE OWNERSHIP COSTS	\$333,876	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$333,876	
TOTAL PRESENT VALUE LIFE-CYCLE OWNERSHIP COST:																												
	\$333,876																										\$333,876	
LIFE-CYCLE OPERATING COST:																												
ELECTRICAL COSTS:																												
ANNUAL ELECTRICAL COST (INITIAL YEAR)	\$30,159	\$30,159	\$30,159	\$30,159	\$30,159	\$30,159	\$30,159	\$30,159	\$30,159	\$30,159	\$30,159	\$30,159	\$30,159	\$30,159	\$30,159	\$30,159	\$30,159	\$30,159	\$30,159	\$30,159	\$30,159	\$30,159	\$30,159	\$30,159	\$30,159	\$30,159	\$30,159	\$751,864
DOE ELECTRIC PRICE FORECAST	1.00	0.91	0.91	0.91	0.91	0.92	0.93	0.94	0.95	0.96	0.97	0.99	1.00	1.02	1.02	1.02	1.02	1.02	1.03	1.05	1.07	1.08	1.09	1.10	1.11			
ANNUAL ENERGY COST (ALL YEARS)	\$30,159	\$27,445	\$27,445	\$27,445	\$27,445	\$27,746	\$28,048	\$28,349	\$28,651	\$28,953	\$29,254	\$29,857	\$30,159	\$30,762	\$30,762	\$30,762	\$30,762	\$30,762	\$31,064	\$31,667	\$32,270	\$32,572	\$32,873	\$33,175	\$33,476		\$751,864	
NATURAL GAS COSTS:																												
ANNUAL NATURAL GAS COST (INITIAL YEAR)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
DOE NATURAL GAS PRICE FORECAST	1.00	0.99	1.04	1.06	1.06	1.07	1.08	1.10	1.12	1.14	1.17	1.21	1.24	1.26	1.25	1.24	1.25	1.28	1.32	1.35	1.38	1.40	1.42	1.44				
ANNUAL ENERGY COST (ALL YEARS)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	
OTHER FUEL COSTS (SPECIFY FUEL HERE IF APPLICABLE):																												
ANNUAL FUEL COSTS (INITIAL YEAR)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
DOE ENERGY PRICE FORECAST																												
ANNUAL ENERGY COST (ALL YEARS)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0
WATER COSTS:																												
ASSUMED REAL ESCALATION RATE (1 + FLAT RATE)		1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005
ANNUAL WATER COST	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
COMBINED OPERATING COSTS:																												
TOTAL ANNUAL OPERATING COSTS	\$30,159	\$27,445	\$27,445	\$27,445	\$27,445	\$27,746	\$28,048	\$28,349	\$28,651	\$28,953	\$29,254	\$29,857	\$30,159	\$30,762	\$30,762	\$30,762	\$30,762	\$31,064	\$31,667	\$32,270	\$32,572	\$32,873	\$33,175	\$33,476		\$751,864		
DOE REAL DISCOUNT RATE	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
ANNUAL PRESENT VALUE OPERATING COSTS	\$29,281	\$25,869	\$25,116	\$24,384	\$23,674	\$23,237	\$22,805	\$22,379	\$21,959	\$21,543	\$21,134	\$20,941	\$20,537	\$20,337	\$19,745	\$19,170	\$18,612	\$18,070	\$17,715	\$17,533	\$17,347	\$16,999	\$16,657	\$16,320	\$15,989		\$517,353	
TOTAL PRESENT VALUE LIFE-CYCLE OPERATING COST:																												
	\$517,353																										\$517,353	
LIFE-CYCLE MAINTENANCE & REPAIR COST:																												
RECURRING ANNUAL MAINTENANCE COST	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$312,875
NON-RECURRING ANNUAL REPAIR COST	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL MAINTENANCE & REPAIR COST	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$12,515	\$312,875	
DOE REAL DISCOUNT RATE	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
ANNUAL PRESENT VALUE MAINTENANCE & REPAIR COSTS	\$12,150	\$11,797	\$11,453	\$11,119	\$10,796	\$10,481	\$10,176	\$9,879	\$9,592	\$9,312	\$9,041	\$8,778	\$8,522	\$8,274	\$8,033	\$7,799	\$7,572	\$7,351	\$7,137	\$6,929	\$6,727	\$6,531	\$6,341	\$6,157	\$5,977		\$217,926	
TOTAL PRESENT VALUE LIFE-CYCLE MAINTENANCE COST:																												
	\$217,926																										\$217,926	
LIFE-CYCLE REPLACEMENT COST:																												
TOTAL REPLACEMENT COSTS (AS APPLICABLE)											\$44,000															\$44,000	\$88,000	
DOE REAL DISCOUNT RATE	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
PRESENT VALUE REPLACEMENT COSTS	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$31,787	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$55,439	
TOTAL PRESENT VALUE LIFE-CYCLE REPLACEMENT COST:																												
	\$55,439																										\$55,439	
RESIDUAL VALUE (ENTER POSITIVE VALUES):																												
TOTAL RESIDUAL VALUE (AS APPLICABLE)																											\$0	
DOE REAL DISCOUNT RATE	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
PRESENT VALUE RESIDUAL VALUE	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
TOTAL PRESENT VALUE RESIDUAL (NEGATIVE COST):																												
	\$0																										\$0	
TOTAL LIFE-CYCLE COST:	\$1,124,593																										\$1,124,593	

FLCCA COMPUTATION SHEET

SPECIFY ALTERNATIVE DESIGN NUMBER HERE:

3

NOTE: DATA CAN ONLY BE ENTERED IN THE GREEN CELLS (POSITIVE WHOLE NUMBERS ONLY). THE DOE ESCALATION RATES USED IN THIS SPREADSHEET FOR "OTHER FUELS" SHALL ONLY REFERENCE THE ADJUSTED RATES ON THE DOE WORKSHEET.

SPECIFY ANALYSIS PERIOD HERE (YEARS):

25

ACTUAL YEAR (MODIFY AS NEEDED)	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034			
RELATIVE YEAR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	TOTAL		
LIFE-CYCLE OWNERSHIP COST:																												
NON-FINANCED OWNERSHIP COSTS:																												
TOTAL CONSTRUCTION COSTS	\$391,361																										\$391,361	
FINANCED OWNERSHIP COSTS (AS APPLICABLE):																												
ANNUALIZED CONSTRUCTION COSTS		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
ANNUALIZED INVESTMENT GRADE AUDIT COSTS		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
ANNUALIZED MEASUREMENT & VERIFICATION COSTS		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
ANNUALIZED FINANCING COSTS		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
MISCELLANEOUS ANNUALIZED COSTS (SPECIFY)		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
COMBINED OWNERSHIP COSTS:																												
TOTAL ANNUAL OWNERSHIP COSTS	\$391,361	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$391,361	
DOE REAL DISCOUNT RATE	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
ANNUAL PRESENT VALUE OWNERSHIP COSTS	\$391,361	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$391,361	
TOTAL PRESENT VALUE LIFE-CYCLE OWNERSHIP COST:																												
	\$391,361																											
LIFE-CYCLE OPERATING COST:																												
ELECTRICAL COSTS:																												
ANNUAL ELECTRICAL COST (INITIAL YEAR)	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057	\$38,057
DOE ELECTRIC PRICE FORECAST	1.00	0.91	0.91	0.91	0.91	0.92	0.93	0.94	0.95	0.96	0.97	0.99	1.00	1.02	1.02	1.02	1.02	1.02	1.03	1.05	1.07	1.08	1.09	1.10	1.11			
ANNUAL ENERGY COST (ALL YEARS)	\$38,057	\$34,632	\$34,632	\$34,632	\$34,632	\$35,012	\$35,393	\$35,774	\$36,154	\$36,535	\$36,915	\$37,676	\$38,057	\$38,818	\$38,818	\$38,818	\$38,818	\$38,818	\$39,199	\$39,960	\$40,721	\$41,102	\$41,482	\$41,863	\$42,243	\$42,243	\$948,761	
NATURAL GAS COSTS:																												
ANNUAL NATURAL GAS COST (INITIAL YEAR)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
DOE NATURAL GAS PRICE FORECAST	1.00	0.99	1.04	1.06	1.06	1.07	1.08	1.10	1.12	1.14	1.17	1.21	1.24	1.26	1.25	1.24	1.25	1.28	1.32	1.35	1.38	1.40	1.42	1.44				
ANNUAL ENERGY COST (ALL YEARS)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
OTHER FUEL COSTS (SPECIFY FUEL HERE IF APPLICABLE):																												
ANNUAL FUEL COSTS (INITIAL YEAR)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
DOE ENERGY PRICE FORECAST																												
ANNUAL ENERGY COST (ALL YEARS)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
WATER COSTS:																												
ASSUMED REAL ESCALATION RATE (1 + FLAT RATE)		1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005
ANNUAL WATER COST	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
COMBINED OPERATING COSTS:																												
TOTAL ANNUAL OPERATING COSTS	\$38,057	\$34,632	\$34,632	\$34,632	\$34,632	\$35,012	\$35,393	\$35,774	\$36,154	\$36,535	\$36,915	\$37,676	\$38,057	\$38,818	\$38,818	\$38,818	\$38,818	\$38,818	\$39,199	\$39,960	\$40,721	\$41,102	\$41,482	\$41,863	\$42,243	\$42,243	\$948,761	
DOE REAL DISCOUNT RATE	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
ANNUAL PRESENT VALUE OPERATING COSTS	\$36,949	\$32,644	\$31,693	\$30,770	\$29,874	\$29,322	\$28,778	\$28,240	\$27,709	\$27,185	\$26,668	\$26,425	\$25,915	\$25,663	\$24,916	\$24,190	\$23,486	\$22,802	\$22,354	\$22,125	\$21,890	\$21,451	\$21,019	\$20,594	\$20,176	\$20,176	\$652,837	
TOTAL PRESENT VALUE LIFE-CYCLE OPERATING COST:																												
	\$652,837																											
LIFE-CYCLE MAINTENANCE & REPAIR COST:																												
RECURRING ANNUAL MAINTENANCE COST	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$339,400
NON-RECURRING ANNUAL REPAIR COST																												\$0
TOTAL ANNUAL MAINTENANCE & REPAIR COST	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$13,576	\$339,400
DOE REAL DISCOUNT RATE	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
ANNUAL PRESENT VALUE MAINTENANCE & REPAIR COSTS	\$13,181	\$12,797	\$12,424	\$12,062	\$11,711	\$11,370	\$11,039	\$10,717	\$10,405	\$10,102	\$9,808	\$9,522	\$9,245	\$8,975	\$8,714	\$8,460	\$8,214	\$7,974	\$7,742	\$7,517	\$7,298	\$7,085	\$6,879	\$6,678	\$6,484	\$6,484	\$236,401	
TOTAL PRESENT VALUE LIFE-CYCLE MAINTENANCE COST:																												
	\$236,401																											
LIFE-CYCLE REPLACEMENT COST:																												
TOTAL REPLACEMENT COSTS (AS APPLICABLE)											\$45,200																\$45,200	\$90,400
DOE REAL DISCOUNT RATE	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
PRESENT VALUE REPLACEMENT COSTS	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$32,653	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$56,951
TOTAL PRESENT VALUE LIFE-CYCLE REPLACEMENT COST:																												
	\$56,951																											
RESIDUAL VALUE (ENTER POSITIVE VALUES):																												
TOTAL RESIDUAL VALUE (AS APPLICABLE)																												\$0
DOE REAL DISCOUNT RATE	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
PRESENT VALUE RESIDUAL VALUE	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL PRESENT VALUE RESIDUAL (NEGATIVE COST):																												
	\$0																											
TOTAL LIFE-CYCLE COST:																												
	\$1,337,549																										\$1,337,549	

FLCCA COMPUTATION SHEET

FORM #AE16(E)

SPECIFY ALTERNATIVE DESIGN NUMBER HERE:

3

NOTE: DATA CAN ONLY BE ENTERED IN THE GREEN CELLS (POSITIVE WHOLE NUMBERS ONLY). THE DOE ESCALATION RATES USED IN THIS SPREADSHEET FOR "OTHER FUELS" SHALL ONLY REFERENCE THE ADJUSTED RATES ON THE DOE WORKSHEET.

SPECIFY ANALYSIS PERIOD HERE (YEARS):

25

ACTUAL YEAR (MODIFY AS NEEDED)	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	TOTAL	
RELATIVE YEAR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		
LIFE-CYCLE OWNERSHIP COST:																											
NON-FINANCED OWNERSHIP COSTS:																											
TOTAL CONSTRUCTION COSTS	\$318,180																										\$318,180
FINANCED OWNERSHIP COSTS (AS APPLICABLE):																											
ANNUALIZED CONSTRUCTION COSTS		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
ANNUALIZED INVESTMENT GRADE AUDIT COSTS		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
ANNUALIZED MEASUREMENT & VERIFICATION COSTS		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
ANNUALIZED FINANCING COSTS		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
MISCELLANEOUS ANNUALIZED COSTS (SPECIFY)		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
COMBINED OWNERSHIP COSTS:																											
TOTAL ANNUAL OWNERSHIP COSTS	\$318,180	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$318,180
DOE REAL DISCOUNT RATE	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
ANNUAL PRESENT VALUE OWNERSHIP COSTS	\$318,180	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$318,180
TOTAL PRESENT VALUE LIFE-CYCLE OWNERSHIP COST:	\$318,180																										
LIFE-CYCLE OPERATING COST:																											
ELECTRICAL COSTS:																											
ANNUAL ELECTRICAL COST (INITIAL YEAR)	\$29,541	\$29,541	\$29,541	\$29,541	\$29,541	\$29,541	\$29,541	\$29,541	\$29,541	\$29,541	\$29,541	\$29,541	\$29,541	\$29,541	\$29,541	\$29,541	\$29,541	\$29,541	\$29,541	\$29,541	\$29,541	\$29,541	\$29,541	\$29,541	\$29,541	\$29,541	\$29,541
DOE ELECTRIC PRICE FORECAST	1.00	0.91	0.91	0.91	0.91	0.92	0.93	0.94	0.95	0.96	0.97	0.99	1.00	1.02	1.02	1.02	1.02	1.02	1.03	1.05	1.07	1.08	1.09	1.10	1.11		
ANNUAL ENERGY COST (ALL YEARS)	\$29,541	\$26,882	\$26,882	\$26,882	\$26,882	\$27,178	\$27,473	\$27,769	\$28,064	\$28,359	\$28,655	\$29,246	\$29,541	\$30,132	\$30,132	\$30,132	\$30,132	\$30,132	\$30,427	\$31,018	\$31,609	\$31,904	\$32,200	\$32,495	\$32,791	\$736,457	
NATURAL GAS COSTS:																											
ANNUAL NATURAL GAS COST (INITIAL YEAR)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
DOE NATURAL GAS PRICE FORECAST	1.00	0.99	1.04	1.06	1.06	1.07	1.08	1.10	1.12	1.14	1.17	1.21	1.24	1.26	1.25	1.24	1.25	1.28	1.32	1.35	1.38	1.40	1.42	1.44			
ANNUAL ENERGY COST (ALL YEARS)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0
OTHER FUEL COSTS (SPECIFY FUEL HERE IF APPLICABLE):																											
ANNUAL FUEL COSTS (INITIAL YEAR)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
DOE ENERGY PRICE FORECAST																											
ANNUAL ENERGY COST (ALL YEARS)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0
WATER COSTS:																											
ASSUMED REAL ESCALATION RATE (1 + FLAT RATE)		1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005	1.005
ANNUAL WATER COST	\$1,061	\$1,066	\$1,072	\$1,077	\$1,082	\$1,088	\$1,093	\$1,099	\$1,104	\$1,110	\$1,115	\$1,121	\$1,126	\$1,132	\$1,138	\$1,143	\$1,149	\$1,155	\$1,161	\$1,166	\$1,172	\$1,178	\$1,184	\$1,190	\$1,196	\$28,179	
COMBINED OPERATING COSTS:																											
TOTAL ANNUAL OPERATING COSTS	\$30,602	\$27,949	\$27,954	\$27,959	\$27,965	\$28,266	\$28,566	\$28,867	\$29,168	\$29,469	\$29,770	\$30,366	\$30,667	\$31,264	\$31,270	\$31,275	\$31,281	\$31,287	\$31,588	\$32,185	\$32,781	\$33,082	\$33,384	\$33,685	\$33,986	\$764,636	
DOE REAL DISCOUNT RATE	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
ANNUAL PRESENT VALUE OPERATING COSTS	\$29,711	\$26,344	\$25,582	\$24,841	\$24,123	\$23,672	\$23,227	\$22,788	\$22,355	\$21,928	\$21,507	\$21,298	\$20,883	\$20,669	\$20,071	\$19,490	\$18,925	\$18,378	\$18,014	\$17,820	\$17,621	\$17,265	\$16,915	\$16,571	\$16,232	\$526,230	
TOTAL PRESENT VALUE LIFE-CYCLE OPERATING COST:	\$526,230																										
LIFE-CYCLE MAINTENANCE & REPAIR COST:																											
RECURRING ANNUAL MAINTENANCE COST	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$445,450
NON-RECURRING ANNUAL REPAIR COST	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL ANNUAL MAINTENANCE & REPAIR COST	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$17,818	\$445,450
DOE REAL DISCOUNT RATE	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
ANNUAL PRESENT VALUE MAINTENANCE & REPAIR COSTS	\$17,299	\$16,795	\$16,306	\$15,831	\$15,370	\$14,922	\$14,488	\$14,066	\$13,656	\$13,258	\$12,872	\$12,497	\$12,133	\$11,780	\$11,437	\$11,104	\$10,780	\$10,466	\$10,161	\$9,865	\$9,578	\$9,299	\$9,028	\$8,765	\$8,510	\$310,267	
TOTAL PRESENT VALUE LIFE-CYCLE MAINTENANCE COST:	\$310,267																										
LIFE-CYCLE REPLACEMENT COST:																											
TOTAL REPLACEMENT COSTS (AS APPLICABLE)															\$56,600												\$56,600
DOE REAL DISCOUNT RATE	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
PRESENT VALUE REPLACEMENT COSTS	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$36,329	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$36,329
TOTAL PRESENT VALUE LIFE-CYCLE REPLACEMENT COST:	\$36,329																										
RESIDUAL VALUE (ENTER POSITIVE VALUES):																											
TOTAL RESIDUAL VALUE (AS APPLICABLE)																											\$0
DOE REAL DISCOUNT RATE	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
PRESENT VALUE RESIDUAL VALUE	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
TOTAL PRESENT VALUE RESIDUAL (NEGATIVE COST):	\$0																										
TOTAL LIFE-CYCLE COST:	\$1,191,007																									\$1,191,007	

DOE FORECAST SHEET

FORM #AE16(F)

2009 DOE REAL DISCOUNT RATE: **3.00%** SOURCE: THE 2009 ANNUAL SUPPLEMENT TO NIST HANDBOOK 135 (NISTIR 85-3273-24)

DISCOUNT RATE (D) FOR ANALYSIS: **3.00%** NOTE: THIS DISCOUNT RATE SHALL BE ADJUSTED FOR SENSITIVITY ANALYSIS. REFER TO THE REQUIREMENTS & INSTRUCTIONS AND SENSITIVITY ANALYSIS WORKSHEET.

DOE ESCALATION RATE MULTIPLIER (E): **1.00** NOTE: THIS MULTIPLE SHALL BE ADJUSTED FOR SENSITIVITY ANALYSIS. REFER TO THE REQUIREMENTS & INSTRUCTIONS AND SENSITIVITY ANALYSIS WORKSHEET.

1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------

PROJECTED ENERGY PRICE FORECAST:

YEAR	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033		
DOE ENERGY PRICE INDICES																											
ELECTRICITY:	1.00	0.91	0.91	0.91	0.91	0.92	0.93	0.94	0.95	0.96	0.97	0.99	1.00	1.02	1.02	1.02	1.02	1.02	1.03	1.05	1.07	1.08	1.09	1.10	1.11		
AVG. ANNUAL ESCALATION RATE (ELECTRIC)	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%		
DISTILLATE OIL (HEATING OIL & DIESEL):	1.00	0.73	0.81	0.95	1.07	1.17	1.25	1.32	1.38	1.43	1.46	1.49	1.49	1.50	1.52	1.53	1.53	1.54	1.55	1.57	1.61	1.62	1.65	1.68	1.71		
AVG. ANNUAL ESCALATION RATE (DISTILLATE OIL)	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%		
RESIDUAL OIL (LOW GRADE):	1.00	1.18	1.53	1.77	1.98	2.14	2.32	2.44	2.53	2.62	2.68	2.72	2.76	2.78	2.81	2.82	2.79	2.80	2.82	2.86	2.89	2.92	2.98	3.03	3.09		
AVG. ANNUAL ESCALATION RATE (RESIDUAL OIL)	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%		
NATURAL GAS:	1.00	0.99	1.04	1.06	1.06	1.07	1.08	1.10	1.12	1.14	1.17	1.21	1.24	1.26	1.26	1.25	1.24	1.25	1.28	1.32	1.35	1.38	1.40	1.42	1.44		
AVG. ANNUAL ESCALATION RATE (NATURAL GAS)	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%		
LPG:	1.00	0.92	0.98	1.06	1.13	1.20	1.26	1.31	1.35	1.38	1.40	1.41	1.42	1.43	1.44	1.45	1.43	1.44	1.45	1.46	1.47	1.48	1.50	1.52	1.53		
AVG. ANNUAL ESCALATION RATE (COAL)	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%		
MOTOR GASOLINE:	1.00	0.97	1.13	1.24	1.32	1.39	1.46	1.52	1.58	1.63	1.66	1.70	1.71	1.72	1.73	1.74	1.73	1.74	1.75	1.77	1.81	1.80	1.82	1.84	1.87		
AVG. ANNUAL ESCALATION RATE (MOTOR GASOLINE)	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%		
<small>SOURCE: TABLE CA-3 OF THE 2009 ANNUAL SUPPLEMENT TO NIST HANDBOOK 135 (NISTIR 85-3273-24)</small>																											
ADJUSTED DOE ENERGY PRICE INDICES																											
<small>(USE THESE IN THE FLCCA COMPUTATION WORKSHEET)</small>																											
ELECTRICITY:	1.00	0.91	0.91	0.91	0.91	0.92	0.93	0.94	0.95	0.96	0.97	0.99	1.00	1.02	1.02	1.02	1.02	1.02	1.03	1.05	1.07	1.08	1.09	1.10	1.11		
ASSUMED ANNUAL ESCALATION RATE (ELECTRIC)		0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%		
DISTILLATE OIL (HEATING OIL & DIESEL):	1.00	0.73	0.81	0.95	1.07	1.17	1.25	1.32	1.38	1.43	1.46	1.49	1.49	1.50	1.52	1.53	1.53	1.54	1.55	1.57	1.61	1.62	1.65	1.68	1.71		
ASSUMED ANNUAL ESCALATION RATE (DISTILLATE OIL)		2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%	2.84%		
RESIDUAL OIL (LOW GRADE):	1.00	1.18	1.53	1.77	1.98	2.14	2.32	2.44	2.53	2.62	2.68	2.72	2.76	2.78	2.81	2.82	2.79	2.80	2.82	2.86	2.89	2.92	2.98	3.03	3.09		
ASSUMED ANNUAL ESCALATION RATE (RESIDUAL OIL)		8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%	8.36%		
NATURAL GAS:	1.00	0.99	1.04	1.06	1.06	1.07	1.08	1.10	1.12	1.14	1.17	1.21	1.24	1.26	1.26	1.25	1.24	1.25	1.28	1.32	1.35	1.38	1.40	1.42	1.44		
ASSUMED ANNUAL ESCALATION RATE (NATURAL GAS)		1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%	1.76%		
LPG:	1.00	0.92	0.98	1.06	1.13	1.20	1.26	1.31	1.35	1.38	1.40	1.41	1.42	1.43	1.44	1.45	1.43	1.44	1.45	1.46	1.47	1.48	1.50	1.52	1.53		
ASSUMED ANNUAL ESCALATION RATE (LPG)		2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%	2.12%		
MOTOR GASOLINE:	1.00	0.97	1.13	1.24	1.32	1.39	1.46	1.52	1.58	1.63	1.66	1.70	1.71	1.72	1.73	1.74	1.73	1.74	1.75	1.77	1.81	1.80	1.82	1.84	1.87		
ASSUMED ANNUAL ESCALATION RATE (MOTOR GASOLINE)		3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%		

SERVICE LIFE SHEET

FORM #AE16(G)

EQUIPMENT ITEM	SERVICE LIFE (YEARS)	EQUIPMENT ITEM	SERVICE LIFE (YEARS)
AIR-CONDITIONERS		COILS	
WINDOW UNIT	10	DX, WATER, OR STEAM	20
RESIDENTIAL SINGLE OR SPLIT PACKAGE	15	ELECTRIC	15
COMMERCIAL THROUGH-THE-WALL	15	HEAT EXCHANGERS	
WATER-COOLED PACKAGE	15	SHELL-AND-TUBE	24
HEAT PUMPS		RECIPROCATING COMPRESSORS	20
RESIDENTIAL AIR-TO-AIR	15	PACKAGE CHILLERS	
COMMERCIAL AIR-TO-AIR	15	RECIPROCATING	20
COMMERCIAL WATER-TO-AIR	19	CENTRIFUGAL	23
ROOF-TOP AIR CONDITIONERS		ABSORPTION	23
SINGLE-ZONE	15	COOLING TOWERS	
MULTI-ZONE	15	GALVANIZED METAL	20
BOILERS, HOT WATER (STEAM)		WOOD	20
STEEL WATER-TUBE	24 (30)	CERAMIC	34
STEEL FIRE-TUBE	25 (25)	AIR-COOLED CONDENSORS	20
CAST IRON	35 (30)	EVAPORATIVE CONDENSERS	20
ELECTRIC	15	INSULATION	
BURNERS	21	MOLDED	20
FURNACES		BLANKET	24
GAS OR OIL-FIRED	18	PUMPS	
UNIT HEATERS		BASE-MOUNTED	20
GAS OR ELECTRIC	13	PIPE-MOUNTED	10
HOT WATER OR STEAM	20	SUMP AND WELL	10
RADIANT HEATERS		CONDENSATE	15
ELECTRIC	10	RECIPROCATING ENGINES	20
HOT WATER OR STEAM	25	STEAM TURBINES	30
AIR TERMINALS		ELECTRIC MOTORS	18
DIFFUSERS, GRILLES, AND REGISTERS	27	MOTOR STARTERS	17
INDUCTION AND FAN-COIL UITS	20	ELECTRIC TRANSFORMERS	30
VAV AND DOUBLE-DUCT BOXES	20	CONTROLS	
AIR WASHERS	17	PNEUMATIC	20
DUCTWORK	30	ELECTRIC	16
DAMPERS	20	ELECTRONIC	15
FANS		VALVE ACTUATORS	
CENTRIFUGAL	25	HYDRAULIC	15
AXIAL	20	PNEUMATIC	20
PROPELLOR	15	SELF-CONTAINED	10
VENTILATING ROOF-MOUNTED	20		

Source: 2007 ASHRAE Handbook - HVAC Applications, Chapter 36, Table 4