

Life-Cycle Cost Analysis of Utility Combinations

U.S. Department of Housing
and Urban Development
Office of Public and Indian Housing

OMB. No. 2577-0024
(Exp. 11/30/2003)

Part A—Summary

1. Public/Indian Housing Agency	2. Project Number	3. Date (mm/dd/yyyy)
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4. By (Name and Title)	5. Prepared By
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Utility Combinations	Combination No. _____		Combination No. _____		Combination No. _____		Combination No. _____	
6. Domestic Hot Water Installation								
7a.Space Heating Installation								
b.Space Heating System								
8.Space Air Conditioning Installation								

Fuel and Energy Types and Purchasing Methods	Tenant		Master-meter		Tenant		Master-meter	
9.Lighting and Refrigeration								
10. Cooking								
11. Domestic Hot Water								
12. Space Heating								
13. Space Air Conditioning								

Initial Cost of Utility Installation								
14. Per Dwelling Unit	\$		\$		\$		\$	
15. Total	\$		\$		\$		\$	

Estimated Cost Per Unit Per Month								
16.Electricity	\$		\$		\$		\$	
17. Gas	\$		\$		\$		\$	
18. Fuel and Heating/Cooling Supplies	\$		\$		\$		\$	
19. Heating/Cooling Labor	\$		\$		\$		\$	
20. Repairs, Maintenance and Replacements (20 year average)	\$		\$		\$		\$	
21. Interest	\$		\$		\$		\$	
22. Total Monthly Cost	\$		\$		\$		\$	

23.Recommended: Combination No. _____

24. Justification of Recommendation:

Public reporting burden for this collection of information is estimated to average 6 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. This agency may not conduct or sponsor, and a person is not required to respond to, a collection information unless that collection displays a valid OMB control number.

The life-cycle cost analysis of utility combinations (LCCAUC), is necessary to compare and recommend the most cost-effective utility combination for new constructions or rehabilitation projects. The legal and regulatory authority for LCCAUC are the U.S. Housing Act of 1937, as amended in 1979 (Section 13, P.L. 96-153 dated 12/21/79); the U.S. Housing Act of 1937, as amended in 1980 (Section 5(i), P.L. 96-399 dated 10/8/80); 24 CFR 941.404; 24 CFR 968.115(d); and by 24 CFR 950.603(d). The form was previously a required format for the LCCAUC. Now, in order to reduce the burden on small entities, form HUD-51994 is optional, as long as: 1) the essential elements of the HUD-51994 analysis are included in the HA's own version of a LCCAUC, 2) energy savings for solar energy systems are calculated in accordance with recognized industry procedures, and 3) the LCCAUC is based on criteria which include installation costs and long term operation and maintenance costs. Alternatively, HAs may continue to use HUD-51994 as guidance, if established procedures, existing software, and employee skills of a HA find this form to be more expeditious and cost-effective. Responses to the collection of information are required to obtain a benefit or to retain a benefit. The information requested does not lend itself to confidentiality.

Instructions for Part A - Summary

Space is provided in Part A of this form for all applicable costs and charges for four utility combinations. Use as many sheets of Part A as are required to summarize all combinations. The data required to complete Part A should be derived from Parts B, C, and D.

Domestic Hot Water, Space Heating, and Cooling. Indicate on line 6 the type of water heating to be used in each combination (central plant or individual heaters). If individual heaters, indicate also whether automatic storage, instantaneous, etc. Indicate on line 7a the kind of space heating to be used by each combination (central, separate building plants, or individual dwelling unit systems). Show on line 7b the type of heating system (warm air, steam, water, etc.) Indicate on line 8 the type of cooling system (heat pump, chilled water, chilled air, evaporative coolers, etc.)

Fuel and Energy Types and Purchasing Methods. Enter on lines 9, 10, 11, 12, and 13 for each combination the symbols shown below to indicate the types of fuels and energy to be used for each of these items. If the service is to be supplied by the tenant, insert the appropriate symbols in the Tenant column. If it is to be supplied by the project, insert it in the Mastermeter column.

E-Electricity	C-Coal
G-Gas	PS-Purchased District Heating
LPG-Liquefied Petroleum Gas	S-Solar Energy
FO-Fuel Oil	O-Other (specify)

Initial Cost of Utility Installation. Enter in line 14 the total initial cost per dwelling unit of the facilities and equipment required for each combination as shown at the bottom of Page 2, Part D. Enter in line 15 the total initial cost for the project of the facilities and equipment obtained by multiplying the amounts entered in Line 14 by the number of dwelling units.

Estimated Cost Per Unit Month. Enter on lines 16 and 17 the costs for electricity and gas for each combination as taken from Part C, line 15 (tenant) or line 18 (mastermeter) as the case may be. Enter on lines 16-18 fuel costs (other than electricity or gas) as shown on lines 15 or 18 of Part C, and the cost of Heating/Cooling supplies as shown on line 20 of Part C. Enter on line 19 the estimated cost of Heating/Cooling Labor taken from Line 26 of Part C. Enter on line 20 the average monthly expense for Repairs, Maintenance, and Replacements, which is 1/2 of the amount shown at the bottom of Page 2 of Part D. Enter on line 21 the monthly interest charge, which is 1/2 of the interest of the initial cost as shown above on line 14 of Part A. The total of the amounts entered in lines 16 to 21 inclusive should be entered on line 22 for each combination.

Recommended Combinations. Enter opposite this heading the number of the utility combination which the Public/Indian Housing Agency recommends for the project.

Justification of Recommendation. If the utility combination recommended is the lowest estimated cost per dwelling unit, the Public/Indian Housing Agency shall state that it considers the combination suitable for the locality. If, however, a combination other than the one resulting in the lowest cost is recommended, a detailed and comprehensive justification must be submitted, using additional sheets if necessary.

Part B General Information

1. Public Housing Agency	2. Project Number	3. Date (mm/dd/yyyy)
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Please make sure the information on this form is as complete and accurate as possible. One Part B is required for each project. On lines 4 through 8, Column 1, indicate the number of dwelling units in each category listed. On lines 4 through 8, Column 4, indicate the number of buildings of the various heights entered in Column 3. Column 5 shows the total number of rooms in the buildings.

Dwelling Size	Number of Dwellings	Height of Buildings (Number of Stories)	Number of Buildings	Number of Rooms
4. One Bedroom				
5. Two Bedrooms				
6. Three Bedrooms				
7. Four Bedrooms				
8. Total				

Climatic Data. Winter/Summer design temperatures are the established base temperatures for design of heating/cooling installations in the locality. It may be obtained from the Handbook of the American Society of Heating, Refrigeration and Air-Conditioning Engineers. Annual Degree Days and Equivalent full Load Hours may be obtained from the same source or from the Weather Bureau. Average Cold Water Temperature may be obtained from the local water utility.

12a. Winter Design Temperature	°F	13a. Annual Degree Days	14. Average Cold Water Temp.	°F
12b. Summer Design Temperature	°F	13b. Equivalent Full Load Hours		

Energy and Fuel Supplies. Enter names of suppliers of electricity, gas, fuel oil and coal, together with physical characteristics as indicated. Volts, cycles, and Btu contents per unit of measure may be obtained from the respective suppliers. In space provided, list any fuel or energy other than those listed.

15. Electricity Supplied by:	Volts	cycles
16. Gas Supplied by:	BTU per:	
17. No. Fuel Oil Supplied by:	BTU per:	
18. Coal Supplied by:	BTU per:	
19. (Other) Supplied by:	BTU per:	

Estimated Average Unit Costs. Enter the appropriate value for the combination recommended by the Public Housing Agency and the other three combinations of lowest cost. These values may be calculated from the quantities and costs shown in Part C. For retail purchases, divide costs from Line 11, Part C, by quantities from Line 8, Part C. For wholesale purchases, divide costs from Line 14 by quantities on Line 10 for the particular combination.

Estimated Average Unit Costs	Comb. No. ____		Comb. No. ____		Comb. No. ____		Comb. No. ____	
	Tenant	Mastermeter	Tenant	Mastermeter	Tenant	Mastermeter	Tenant	Mastermeter
20. Electricity ¢ per kwh								
21. Gas ¢ per Mcf or Therm.								
22. Fuel Oil ¢ per gallon or \$ per barrel								
23. Coal ¢ per ton								
24. Other								

Instructions for Part B - General Information

Part B provides for the assembly of information relating to the project, to local conditions under which the project will operate, and fuel and energy available for utility services. Please make sure the information on this form is as complete and accurate as possible. One Part B is required for each project.

Dwelling Size. On lines 4 to 8, column 2, indicate the number of dwelling units in each category listed in column 1.

On lines 4 to 8, column 4, indicate the number of buildings of the various heights entered in column 3. Column 5 shows the total number of rooms for the buildings of different heights.

Climatic Data. Winter and summer design temperatures are the established bases for design of heating installations in the locality. These may be obtained from the 'Handbook of the American Society of Heating, Refrigeration, and Air-Conditioning Engineers.' Annual Degree Days and Equivalent Full Load Hours may be obtained from the same sources or from the Weather Bureau. Average cold water temperature may be obtained from the local water utility.

Energy and Fuel Supplies. On lines 15, 16, 17, and 18, enter the names of the suppliers of electricity, gas, fuel oil and coal, together with the physical characteristics as indicated. Volts, cycles and BTU contents per unit of measurement may be obtained from the respective suppliers. Line 19 is for any fuel or energy other than those listed.

Estimated Average Unit Costs. On lines 20, 21, 22, 23 and 24, enter the appropriate values for the combination recommended by the Public Housing Agency and the other three combinations of lowest cost. These values may be calculated from the quantities and costs shown in Part C. For retail purchases, divide the costs from line 17, Part C by the quantities from line 11 Part C. Similarly for wholesale purchases, divide the costs from the line 20 by the quantities shown in line 16 for the particular combination.

**Part C
Fuel and Energy Heating Supplies,
Heating labor**

1. Public Housing Agency	2. Project Number	3. Date (mm/dd/yyyy)
4. Combination No.		

Fuel and Energy ©	Electricity		Gas	Oil	Coal	Other
Method of Purchase (Mastermeter or Tenant)						
Rate Schedule Designation (Rates used in determining cost on Line 15, 17 & 18)						
Average Monthly Consumption per Dwelling Unit For:	KW Demand	KWH Consumption	MCF or Therms	Gallons	Tons	Other
5. Lighting and Refrigeration						
6. Space Air Conditioning						
7. Cooking						
8. Domestic Hot Water						
9. Space Heating						
10. Street Lighting						
11. General Project use						
12. Net Total						
13. On-Site Losses						
14. Total Fuel and energy Per Dwelling Unit						
Tenant Purchases						
15. Average Cost Per DU Per Month		\$	\$	\$	\$	\$
Mastermeter Purchases						
16. Average Project Demand and Consumption Per Month						
17. Average Project Cost per Month		\$	\$	\$	\$	\$
18. Average Cost Per DU Per Month		\$	\$	\$	\$	\$
Heating/Cooling Supplies						
19. Estimated Total Per Year					\$	
20. Cost Per DU Per Month						
Heating/Cooling Labor						
21.	Chief Engineer	for	months, at	\$		\$
22.	Engineers	for	months, at	\$		\$
23.	Firemen	for	months, at	\$		\$
24.	Other	for	months, at	\$		\$
25. Total Annual Labor Cost						\$
26. Labor Per Dwelling Unit Per Month						\$

Replaces HUD-51994-A, 51994-B, 51994-C, and 51994-D, which are obsolete. Previous editions are obsolete.

Instructions for Part C - Cost of Fuel, Energy, Heating Supplies, and Heating Labor

Part C of Form HUD-51994 provides for the assembly of data and computation of costs for one utility combination. Prepare separate forms for each utility combination analyzed.

Sources of Data. Data for consumption and cost should be based upon local experience where available. Otherwise data may be obtained from local distributors and from Handbook 7418.1

Fuel and Energy. On line captioned "Method of Purchase" indicate, for each type of fuel or energy, whether purchased at matermeter or tenant. On line captioned 'Rate Schedule Designation' show schedule designation of the rates used in determining the cost on lines 15, 17 and 18. On lines numbered 5 to 11 enter estimated monthly consumption in kw.-hr. per dwelling unit for each use of electric energy. Where the rate schedule includes a demand charge, insert, in the space provided, the deman in kilowatts; if demand is measured in kilvolt-amperes or horsepower, substitute the proper term in column heading. Add the demands and consumption and enter totals on Line 12. For energy and fuels purchased matermeter, insert estimated losses on line 13, and total on line 14. Proceed similarly for other fuels except that no on-site losses should be calculated for oil, coal, and similar fuels.

The blank column at the right-hand edge of the form is for any fuel or energy other than those listed. List the fuel used at head of column.

Tenant Purchases. Values for line 15 may be obtained by applying the proper rate schedules and fuel costs to demand and consumption figures on line 14 for columns representing retail purchases.

Mastermeter Purchases. Values for line 16 may be obtained by multiplying the demand and consumption figures on line 14 for columns representing mastermeter purchases by the number of dwelling units.

Values for line 17 may be obtained by applying the proper rate schedules and fuel costs to the demand and consumption figures in line 16.

Values for line 18 may be obtained by dividing the respective figures from line 17 by the number of dwelling units.

Heating/Cooling Supplies. On line 19 enter estimated total cost per year for Heating Supplies for the combination being analyzed. Divide by the number of dwelling units and again divide by 12 to obtain cost per dwelling unit per month and enter result on line 20.

Heating/Cooling Labor. For central, group, or building plants calculate the labor requirements and costs and enter in the spaces provided. On line 25 enter the total of lines 21, 22, 23, and 24. Divide the amount shown for Total Annual Labor cost in line 25, by the number of dwelling units and again divide by 12. Enter the result in line 26.

Part D (Page 1)
Initial Costs and Annual Repair,
Maintenance and Replacement Expense
Per Dwelling Unit

1. Public/Indian Housing Agency	2. Project Number	3. Date (mm/dd/yyyy)
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Facilities or Equipment	Combo. No. ____			Combo. No. ____			Combo. No. ____		
	Initial Cost Per DU	Annual RM & R Expense Per DU		Initial Cost Per DU	Annual RM & R Expense Per DU		Initial Cost Per DU	Annual RM & R Expense Per DU	
		Total Factor	Amount		Total Factor	Amount		Total Factor	Amount
Electric System									
Sub-station: Outdoor	\$	%	\$	\$	%	\$	\$	%	\$
Indoor									
Exterior Distribution									
Interior Wiring									
Checkmeters									
Gas System									
Exterior Distribution	\$	%	\$	\$	%	\$	\$	%	\$
Interior Piping									
Checkmeters									
Project Operated Domestic Hot Water									
Boilers & Aux. (DHW Only)	\$	%	\$	\$	%	\$	\$	%	\$
Firing Equipment (DHW Only)									
Tank with Heating Coil									
Circulating Pump									
Exterior Distribution									
Interior Piping									
Project Operated Space Heating/ Cooling									
Boilers & Aux. (SPH & DHW)	\$	%	\$	\$	%	\$	\$	%	\$
Firing Equipment (SPH & DHW)									
Exterior Distribution									
Interior Piping, Rads, etc.									
Electrical Work									
H ₂ O/Air Cooled Chiller									
H ₂ O/Air Cooled Absorption									
Comp. with Chiller									
Carried Forward	\$	/	\$	\$	/	\$	\$	/	\$

Part D (Page 2)
Initial Costs and Annual Repair,
Maintenance and Replacement Expense
Per Dwelling Unit

1. Public/Indian Housing Agency	2. Project Number						3. Date (mm/dd/yyyy)		
Facilities or Equip- ment	Combo. No. ____			Combo. No. ____			Combo. No. ____		
	Initial Cost Per DU	Annual RM & R Expense Per DU		Initial Cost Per DU	Annual RM & R Expense Per DU		Initial Cost Per DU	Annual RM & R Expense Per DU	
		Total Factor	Amount		Total Factor	Amount		Total Factor	Amount
Brought Forward	\$		\$	\$		\$	\$		\$
Tenant Operated Domestic Hot Water									
Auto. Storage Heaters	\$	%	\$	\$	%	\$	\$	%	\$
Side Arm Heaters									
Pot Stove (coal fired)									
Storage Tank									
Hot Water Piping									
Tenant Operated Space Heating/Cooling									
Space Heaters	\$	%	\$	\$	%	\$	\$	%	\$
Floor Furnances									
Warm Air Furnaces									
Steam Boiler, Radiators									
Hot Water Boiler, Radiators									
Burner (oil)									
Blower									
Draft Fan									
Pump									
Electrical Work									
Conversion Burner									
Heat Pump									
Thin-Wall A/C Unit									
Other Items									
Roads	\$	%	\$	\$	%	\$	\$	%	\$
Boiler Room									
Basement or Crawl Space									
Flues									
Major Appliances									
Refrigerators	\$	%	\$	\$	%	\$	\$	%	\$
Ranges									
Washer									
Dryer									
Total Per Dwelling Unit	\$		\$	\$		\$	\$		\$

Replaces HUD-51994-A, 51994-B, 51994-C, and 51994-D, which are obsolete. Previous editions are obsolete.