STATEMENT OF WORK (SOW)

FOR

ENERGY AUDIT

Preface

These audits are intended to be used for future project identification, prioritization and programming. All calculations and cost estimates required should be provided with the accuracy and detail appropriate for such future use. Cost estimates should reflect true costs which would be expected to be incurred if engineering bid documents were to be produced and opportunities installed.

General Requirements

Scope: The scope of work shall consist of furnishing all professional services, plant, labor, equipment, and materials, and performing all necessary travel and associated services required to identify the current energy consumption levels and profiles for a variety of commercial and industrial type buildings, facilities, and systems. In addition, the scope shall require the identification of all cost-effective system and facility modifications, adjustments, alterations, additions, and retrofits. All demand side management (DSM) programs available through servicing utility companies shall be investigated and utilized, or recommended, as appropriate. Identification of options for advanced meter system to include electric and gas. Investigate opportunities for on site energy production, both renewable and nonrenewable.

Specific Requirements

1. Identification of current conditions and preliminary recommendations. (CONCEPT)

    a. This work shall, as a minimum, consist of identifying the existing types, conditions, operating modes, and energy consumption profiles. Make use ofprevious energy audits if available from the base. Identification shall include the items following below:

        (1) Heating ventilating and air conditioning (HVAC) systems, including space and equipment treatment.

(2) Lighting systems, both interior and exterior, including parking lot, street lighting and airfield lighting.

(3) Process exhaust systems such as welding, painting, etc.

(4) Domestic hot water systems, including generation, storage, and distribution.

(5) Miscellaneous motors such as air compressor motors, etc.

(6) Building envelopes, as concerns conduction, radiation, and infiltration gains and losses.

(7) Existing computerized energy management control systems (EMCS)-e.g., controlling HVAC equipment and lighting systems-including effectiveness of the EMCS and/or feasibility of expanding the system.

(8) Utility systems, including above and below ground heating and cooling lines, electrical distribution, etc.

(9) Base engineer operation/maintenance practices.

(10) Advanced metering optional using EMCS or stand alone advanced metering systems.

(11) Demand charges shall be included in the calculated electrical costs.

(12) System/equipment two-year average energy consumption history, if available from utility bill records, otherwise from an engineering analysis for a one-year period

a. This work shall also include a review of all available DSM services and the procedures to be followed in acquiring those services.

b. Building/facility/system specifications, as-built drawings, and utility billing records and previous audits are available from the base civil engineer. Re-evaluate energy conservation opportunities (ECO) in previous facility audits not implemented to determine current feasibility under current conditions.

c. Develop a list of likely feasible energy conservation opportunities.

d. Develop a list of site energy production opportunities.

2. Identification of Recommendations. (PRE-FINAL)

a. This work shall consist of the development of recommendations for changes in operations and retrofits of facilities, systems, and equipment, based on the approved recommendations at the concept stage. As a minimum, energy upgrade standards shall be in accordance with the Department of Energy (DOE) Federal Energy Conservation Standards, Title 10 CFR, Part 435, or,(latest edition) Energy Efficient Design of New Buildings, Except New Low-Rise Residential Buildings, providing upgrades are shown to be cost effective. Energy Conservation in Existing Buildings may provide guidance with energy audit approaches and in identifying potentially cost effective operational changes and upgrade projects.

b. The PRE-FINAL and FINAL submittals shall carry forward data and information previously presented in the approved concept submittal.

c. Address all question, concerns and recommended changes generated from review of the concept submittal.

d. Each facility, system, or equipment recommendation shall be self-contained and shall be presented in the format shown in Attachment 1. One summary shall be provided for each recommended retrofit. The project title shall include the appropriate category from the list shown in Attachment 2, as well as the retrofit name. The fiscal year (FY) shall be indicated as the year following the analysis year.

e. This work shall also consist of identification of facilities' energy performance history by inspection and analysis of utilities billing records for a period of two consecutive years or, if records are not available, by suitable engineering analysis and simulation.

(1) For HVAC applications, the energy analysis method must use a recognized software program that utilizes local weather data and calculates energy consumption on an hourly-

or-shorter basis. At a minimum, the effects of solar, ambient temperature and humidity will be included in the analysis, along with the thermal effects of the mass of the construction materials used in each building. Building internal loads and outside air loads must also be addressed in the energy analysis.

(2) Cost estimates for implementation of ECO's must be in sufficient detail to enable all costs required for installation are included. They should identify the type and quantity of equipment, materials and labor required for a complete installation and start-up.

f. A complete analysis back-up and rationale shall be provided for each recommended operational change and/or retrofit. Life-cycle cost analyses must be performed. Present worth factors and discount rates shall be taken from the latest publication of National Institute of Standards and Technology (NIST) as published for the Department of Defense (DOD). The following approach shall be used, as a minimum:

(1) Identify potential retrofit candidates.

(2) Accomplish a detailed analysis of each retrofit candidate.

(3) Accomplish a life-cycle cost analysis of each candidate. The output format of the Life Cycle Cost in Design Program (LCCID) is consistent with Attachment 1. The Building Life Cycle Cost (BLCC), software can be used in place of LCCID, providing that the report format is modified to the standard DOD format.

(4) Commercially available economic analysis software programs which are shown to provide detailed analyses equal or superior to those of LCCID or BLCC may be utilized, providing that the report format is consistent with Attachment 1.

a. Proven analyses which have been used elsewhere, and which are clearly shown to be valid at this project site, may be submitted for evaluation prior to development of the Concept Submittal.

b. The weather data to be used in performing energy analyses must be in accordance

c. All established and identified Air Force requirements, including functional and safety standards and construction criteria, shall be adhered to.

3. FINAL SUBMITTAL. Incorporate/address all review comments.

4. Submittals.

a. General.

(1) Provide a "Preface" which shall include a map/layout of the base and shall describe the purpose of the report, with ALL Submittals.

(2) Provide an "Executive Summary," which shall include a building-by-building overall list of the energy conservation measures. Include all measures that are targeted for investigation and analysis. The PRE-FINAL and FINAL Submittal Executive Summaries shall include a prioritized list of all measures that were approved at the CONCEPT Submittal review.

(3) The Executive Summary shall include a description/discussion of the following items:

a. Overview of the scope of the audit.
b. Schedule of proposed Energy Conservation Opportunities with reference number.
c. Summary of cost data listed by either individual ECO's or total building ECO's.

d. Discussion of utilities and utility incentives.
e. List/explanation of those item(s) dropped from further consideration.

b. Concept submittal. Provide the following, as a minimum.

(1) Description of each building/facility audited, including:
a. Name of building/facility and square footage.
b. Year of construction.
c. Type of construction.
d. Envelope U-values.
e. Preliminary evaluation of envelope quality and integrity-e.g., window conditions, infiltration, etc.
f. Function(s) of building/facility.
g. Occupancy level and profile of building, including operating schedule. Include a summary of potential operational improvements and retrofit candidates.
h. Unit energy cost factors, including electrical demand charges.

(2) Description of each significant existing energy consuming system and/or equipment item. As a minimum, include major facility components such as the envelope, HVAC systems, lighting, etc.

(3) For ECO candidates, a description of existing interior lighting systems.

(4) For ECO candidates, a description of existing exterior lighting systems, including parking lot and street lighting.

(5) Indicate which facility energy analysis software will be used. As a minimum, the software should be capable of providing hourly analysis for energy calculations.

(6) Identification of all "likely," or conventional, retrofit candidates which appear not to be effective-for example, installation of gas-fired infrared heating, high-efficiency furnaces and motors, occupancy sensors, passive solar features, enhancing surface treatments, etc.- and the reason(s) why they are not cost effective.

(7) Identification of options for advanced metering systems including recommendations.

(8) Identification of potentially beneficial renewable energy options including recommendations.

c. PRE-FINAL submittal. Upon approval of the CONCEPT submittal, develop the required analyses and provide the following information.

(1) A list of the recommended retrofits. The list shall be prioritized on the basis of the SIR values. This list shall include all those items which have both:

a. Simple and discounted paybacks of less than 10 years; (use 15 years for renewable energy projects).
b. Savings-to-investment ratios (SIR) of at least 1.0.

(2) The results of analysis for each approved retrofit candidate.

(3) The results of an LCCA analysis for each feasible candidate to include LCCID's appropriate reporting format for each retrofit item.

(4) An LCCID analysis and report for a composite project-i.e., including all qualifying retrofit items in a single construction package-to identify the feasibility of a single comprehensive upgrade project.

(5) All back-up analyses and rationales for each candidate retrofit item.

(6) A statement indicating that available utility company demand side management (DSM) services have been identified and are listed. All available rebates and incentives from all local utilities shall be identified and listed. Include recommendations for utilization of specific offerings.

(7) Evidence that the effects of power factor correction, demand reduction, peak shaving, and load leveling were considered-for example, the effect of installing energy management systems, reduced lighting loads, etc.-in performing life cycle cost analyses.

d. FINAL submittal. Shall include same elements as PRE-FINAL submittal but shall be revised to include any PRE-FINAL review comments. Shall be submitted in paper and electronic format versions.

e. All submittals shall be provided to the following agencies:

5. Audit scope.

a. Items to be audited can include buildings, facilities, and systems such as flight simulators. The information provided includes: building number (NO) and NAME; gross area in square feet (SF); year of construction (YR), including year of construction for major building additions; primary building FUNCTION(s) such as office or maintenance or warehouse or composite dining/office or etc.; and typical number of occupied hours per week (HRS/WK).

b. A "comprehensive" energy audit is defined in terms of the detailed requirements listed in paragraphs 1.a., 1.b, and 1.c. The following base buildings, facilities, and systems are identified for comprehensive energy auditing:

6. OTHER REQUIREMENTS

a. Professional Qualifications. The Project/Field Director will be a 100 per cent time dedicated position during project fieldwork and the preparation of the draft report. The Project/Field Director shall have a background background of professional training and experience appropriate for the required study, and a record of successful project formulation, execution and reporting.

b. Responsibility for field work. The Contractor shall be responsible for all damages to persons and property that occur as a result of the Contractor's fault or negligence in connection with field work, and shall save and hold the government free from all claims and suits arising from such damage.

c. Security/Installation passes. The contractor shall be responsible for obtaining and monitoring assigned security badges (used by his own staff) during the duration of this contract. All security badges or passes shall be returned to the base POC upon expiration of the badge, upon completion of the project, or when possession of the badge is no longer necessary (e.g. upon removal of contracted personnel from specific projects). Photography of any kind must be coordinated through the installation POC.

d. The contractor shall be responsible for the accuracy and completeness of all data submitted.

7. GOVERNMENT FURNISHED MATERIALS: The will provide access to existing information and documentation required to complete the tasks within this statement of work.

8. GOVERNMENT POINTS OF CONTACT:

   a. Governor Contracting Officer:

Appendices:

1. Building/Facility/System
2. LCCA Summary (Format), (Attachment Number 1- 2 pages)
3. Recommended Economic Analysis Life, (Attachment Number 2- 2 pages)

BUILDING/FACILITY/SYSTEM

MMIIIMMIrBUILDING/FACILITY/SYSTEM

NO	NAMESQ	S F)	YEAR BUILT	FUNCTION	HRSANK	PREVIOUS AUDIT FULULIMITED
160	Warehouse	62,971	1993	Supply & Warehouse	40	
199	Corrosion Control	35,045	1992	Aircraft Corrosion Control	40	
206	Warehouse	62,178	1969	Supply & Warehouse	40	
208	Maintenance Dock	63,150	1995	Aircraft Maintenance Hangar	40	
356	BCE Covered Storage	49,694	1997	BCE Maintenanc e Shops & Storage	40	
444	Gymnasium	50,053	1977	Gymnasium	40	
555	Dormitory	41,000	1994	Dormitory	168	
600	HQ Wing	85,500	1986	MPF, Civilian Personnel, Education Center, Admin	40	
1400	Clinic	145,678	1968	Medical/Dental Clinic	40	

LIFE CYCLE COST ANALYSIS (LCCA) SUMMARY
ENERGY UPGRADE PROJECT

BASE:_____ STATE: __ REGION NO: ___ PN: _____
4

PROJ TITLE: _____ FY:

ANALYSIS DATE: _____ECONOMIC LIFE: N=___ YRS PREPARED BY: _____

1. INVESTMENT COSTS:

CONSTRUCTION COST $ (1,4)

A. SIOH $ (1.B.)

B. DESIGN COST $ (1.C.)

C. TOTAL COST (1.A.+1.B.+1.C) $ (1.D.)

D. SALVAGE VALUE OF EXISTING EQUIPMENT $ (1.E.)

E. PUBLIC UTILITY COMPANY REBATE $ (1.F.)

F. TOTAL INVESTMENT (1.D_-1.E.-1.F.) $ (1.G.)

2. ENERGY DOLLAR SAVINGS (+) OR COST (-):
(DATE OF "NISTR 85-3273-X" USED FOR DISCOUNT FACTORS: _____
(FOR ENERGY-RELATED PROJECTS, USE TABLES Ba-1 TO Ba-4, "COMMERCIAL" COLUMN, FOR DISCOUNT FACTORS FOR EACH ENERGY TYPE).

	(1)	(2)	(a)	(4)	(5)
ENERGY SOURVE	COST $IMJ	SAVINGS IN ANNUAL $ MJ/YR	SAVINGS	DISCOUNT FACTOR	DISCOUNTED SAVINGS
A. ELEC -	$		$		$
B. DIST -	$		$		$
C. RESID -	$		$		$
D. NAG-	$		$		$
E. PPG -	$		$		$
F. COAL -	$		$		$
G. OTHER -	$		$		$
H. DEMAND SAVINGS			$		$
N TOTALS -			$ (2.N.(3))		$- (2.N.(5))

ATCH 2-1

3. NON-ENERGY DOLLAR SAVINGS (+) OR COST (-):

A. ANNUALLY RECURRING O&M (+ OR -): $ (3.A.)

(1) DISCOUNT FACTOR (TABLE A-2, "FEMP"COLUMN); (3.A.(1))
(2) DISCOUNTED SAVINGS OR COST (3A. x 3.A..(1)) $ (3.A.(2))

B. NON-ANNUALLY RECURRING O&M AND REPAIR (+ OR -): (USE TABLE A-1 FOR DISCOUNT FACTORS FOR ENERGY RELATED PROJECTS, "FEMP" COLUMN.)

ITEM	(1) SAVINGS (+) COST (-)	(2) YR OF OCCUR	(3) DISCOUNT FACTOR	(4) DISCOUNTED SAV/COST (+1-)
a.	$			$
b.	$			$
c.	$			$
d.	$			$
e.	$ (3.B.e.(1))			$

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (+) OR COST (-)
(3.A.(2) + 3.B.e.(4)): $ (3.C.(4))

4. FIRST YEAR DOLLAR SAVINGS
(2.N.(3) + 3.A. + (3.b.E.(1)/YEARS OF ECONOMIC LIFE* _____

5. TOTAL NET DISCOUNTED SAVINGS (2.N.5. + 3.C.(4)): $ _____ (5.)

6. SIMPLE PAYBACK (1.G.14.) _____YRS

7. DISCOUNTED PAYBACK (1.G./5./YEARS OF ECONOMIC LIFE)): YRS

8. SAVINGS-TO-INVESTMENT .....RATIO, SIR (5.11.G.):

PROVIDE ANY ASSUMPTIONS, CLARIFICATIONS, OR ADDITIONAL COMPUTATIONS IN THE SPACE BELOW OR ON ADDITIONAL SHEETS

ATCH 2-2

ENERGY COMERVATICIN PEOJEC: TYPES
(Maxim= Economic Life)

Category	Title	Description
1	Energy Management and Control Systems (EPICS): (15 years)	Projects to install systems that include a central processing **unit which actuates** control systems according to **a prograz=ed** strategy to decrease energy demands and consumption.
2	Steam and Condensate Systems; (25 years)	**Projects** to **install condensate** return lines, cross connect lines, distribution **system loops, and rehabilitate** existing h as including improved insulation and steam flow metering and controls.
3	Boiler Plant Modification: (25 years)	Projects to repair, modify, or replace boilers or boiler plant auxiliary equipment to improve overall plant efficiency.
4	Heating, Ventilation, Air Conditioning (HVAC): (15 years).	Projects to install more efficient HVAC systems including **replacing** inefficient and visteful controls, **adding controls** where there are none, and replacing entire systems.
5	Weatherization; (25 years)	Projects to install storm vindovs, insulation, or weatherstripping in existing buildings
6	Lighting Systems:	Projects to replace inefficient **fixtures** with sources such as high pressure sodium vapor which has a higher light output per watt. Includes installation or selective controls, timers, and photoelectric cells.
7	Facility Energy Improvements: (25 years)	Projects which contain vork **of more than** one energy category **or projects not** falling into one of these categories.
8	Energy Recovery **Systems:** (25 years)	Projects to install systems to recover and reuse energy that would otherwise be lost to the environment
9	Electrical Energy Systems: (25 years	Projects to install systems to reduce electrical energy **consumption including** motor replacement and consolidation of motor/transformer loads
10	Solar: 25 7-art	**Projects to Install equipment to collect and apply solar energy to domestic hot vater, apace heating, and low temperature process.**
11	**Thermal Storage:** **(25** years)	**Systems vhieh offset major ice. :o off peak hours for reduction in de: .d charges.**

ATCH 3-1

See ASERAE "1991 Applications Hazdbook', Chs;mer 33. —able 3 below for **additional acceptable Economic, or Service, lives.**

Titbit 3 **Estimates of irrasee Ines of Vandal** **i mmoone** reu

Eau tame vat	'Amon Wan	&summer!' hem	Magian Yearn	F.quitirrient hem	1.1 Mum Veen
Alf corn:wren'en		**Air rerminam**		**Alt-ecroleo conuennts**	**20**
Window ono .	**10**	**Diffusers. trsllc ano mustn't**		**Evaporaitre condensers**	**... 20**
Resmenual unite or split facUie •	**13**	**Induction and fan-coil until.....**	**29**	**Insulation**	
Lommereras throueEtheDwail	**13**	**VAV arta dant:0(4,01 OPUS**	**20**	**Molded**	
Wit -tooted outage.....	**13**	**Alt anthers .....**	**17**	**Blanket.....**	**24**
Hut pumps		**Dlartbebra .....**	**30**	**Pumps**	
Fihribentill Mr -10-at r	**IS'**	**Dampers.....**	**20**	**Base-rno%. curd**	
Communal mr-to-ur	**15**	**Fine**		**Pipe Lrn nu hied**	**....10**
Commercial en ter. io-li r	**19**	**Centrifugal.....**	**23**	**Sum!) and we it**	**10**
Roof-ion air condummert		**Auer.....**	**20**	**Conde:nese .....**	**Ij**
Single-sons.....	**13**	**Propelier.....**		**Rca.orsaciung comma**	
Multi:A:me	**13**	**Verilltattna roof Dmounted**	**20**	**Steam turning.....**	**30**
Bohan. hot Neater ntem)		**Coils**		**Eleetne meteors .....**	**If**
Steel win-tune	**24 (303**	**DX. water. or steam**	**20**	**Motor starters .....**	**17**
Steel fire-it:De	**..23 (231**	**Eleanc .....**	**15**	**Electric transformen**	**30**
Cell min	**..330301**	**Heat Earner's,**		**Controls**	
Ekon:	**13**	**Shell-and-toot**	**24**	**Payouts: is .....**	**20**
Burners	**21**	**Rendrocazing compressors .**	**20**	**Electric.....**	**16**
Furnaces		**Paceake chillers**		**EircEracue.....**	**IS**
Cat- or oti.fired	**13**	**Renotocating .....**	**29**	**Valve actuators**	
Unit heaters		**Centrzfugar...**	**23**	**Hydraulic .**	
Cat or e r-::.	**13**	**Absorption**	**13**	**Pneyenure .....**	**1:5**
Hat water or steam	**20**	**Cooling towers**		**St1l-contInted**	**10**
LIChans heaters		**Galvanized metal.. ,**	**20**		
Slat- -	**'7**	**wd -•,**	**:0**		
Hot xaltD .... ..::a	**:**	**.. *rm* rn 1 :**	**14**		

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ATCH 3-2