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ABSTRACT

This publication is the third of a three volume set summarizing the Energy Advisory Service operated by the New York Institute of Technology. The contents of this volume relate to the energy hot line operation part of this project. Contents include: (1) Hot Line Questions and Answer File; (2) Hot Line Pamphlet Collection; and (3) Key to Hot Line Special Information Packets. Four hundred forty-two common energy questions and answers are given and organized by key words. (MR)

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HOW TO OPERATE AN ENERGY ADVISORY SERVICE

Volume III. New York Tech Energy Hot Line
Resource Material

FINAL REPORT

June 1978

Prepared For
U.S. DEPARTMENT OF ENERGY
Assistant Secretary for Conservation
and Solar Applications
Division of Buildings and Community Systems

Under Contract No. EY-76-S-02-2977

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Prepared by
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Old Westbury, New York

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Washington, DC 20545

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TABLE OF CONTENTS

VOLUME III

Part A. Hot Line Question and Answer File (Revision of March 1, 1978)

Part B. Hot Line Pamphlet Collection

Part C. Key to Hot Line Special Information Packets

PART A

New York Tech Energy Hot Line

QUESTION AND ANSWER FILE

Part A first presents a complete list of "major categories" and "key words" which structure the Hot Line card system.

A complete replica is then provided of all information appearing on the 442 Question and Answer cards. In this section, each page is headed by an italicized "major category" under which specific Hot Line questions are subsumed. For each question, five pieces of information may be provided:

1. the "key words," which summarizes the content of the question, is presented,
2. the question is posed,
3. the answer is provided,
4. citations to documenting sources are made, and
5. code number references to pertinent pamphlets and/ or special information packets appear, where relevant. (Keys to code numbers can be found in Parts B and C.)

Organization of Hot Line Card System

ENERGY CONSERVATION

A/C To Dehumidify
Air Conditioners - Energy Efficiency Ratio
Air Conditioning - Thermostats & Costs
A/C Thermostat Raising Savings - Personal
Appliance Efficiency Improvements Requirements
Caulking and Weatherstripping Savings
Caulking - Where
Cutting Electricity Costs
Damp Walls - Solution
EER Ratings & Costs
Electric Meter Reading
Financing
Fluorescent Lights - On - Off
Fluorescents vs. Incandescents
Furnace Servicing Savings
Heat Loss - Typical
Heat Pumps
Heating System - Routine Servicing
Home Energy Savings
Lights - Leave On, or Off & On (Power Surge)
Returnable Containers
Roofs - Color
Storm Windows & Doors
Storm Windows - Plastic
Thermostats - Temperature Set Back Savings, Clock Thermostats
3 Way Bulbs
Timing, Thermostats
Window Effectiveness, Types

INSULATION

What Is Insulation
Aerolite Foam - Specifications
Basement - First Floor
Basement Walls
Batt - Blankets - Glass Fiber, Rock, Mineral Wools, Characteristics
Borden's Insulspray
Cellin - Cellulose
Cellulose Characteristics
Celsius Foam
Choosing Materials
Crawl Space
Ducts
Fumes -- Toxic
Glass Fiber - Rock Wool Loose Fill
Hot Water Pipes
Hot Water Tank
Polyurethane & Styrene (Styrofoam) Rigid Board
R-Factor (Thermal Resistance)
R-Values - All Types
Rapco Foam - Specifications
Specifications (Flammability) - What Do They Mean?
Tri-Polymer Foam
Urea (Formaldehyde) Foam
Wall Adjacent To Garage
Wall - Best Type
Walls - Cost Savings
Walls - How To Determine If There Is Any Insulation
Wall - Moisture Problems
Walls - Should I Insulate
Vapor Barrier - Definition & Placement

HEATING VENTILATING & AIR CONDITIONING (HVAC)

Air Conditioning - Central - Maintaining Efficiency
Air Conditioners Room-EER Ratings & Buying One
Attic Fans - Size
Automatic Dampers
Furnace Size
Heatpipe - Residential
Heating System Efficiency - Gas Furnace
Heating System Efficiency - Oil Furnace
Heating Systems - Coal Furnace Maintenance
Heating System - Electric Furnace Maintenance
Heating System - Forced Hot Air - Maintenance
Heating System - Gas Furnace Maintenance
Heating System - Hot Water Maintenance
Heating System - Oil Burner Maintenance
Heating System - Steam, Maintenance
Home Heating Fuels - Types Of Oil
Home Heating Systems - System Efficiency
Hot Water - Energy Consumption
Hot Water Heater - Location Efficiency
Hot Water - Heater Maintenance
Hot Water Heater - Size Determination
Hot Water Heater - Temperature
Oil Burner - Efficiency Level
Oil Burners - Pressure Type (Gun Burner)
Oil Burner - Servicing Savings
Oil Burner - Testing Measurements
Oil Burner - Testing - Who Does It

APPLIANCES

Electric Blankets
"Instant On" T. V.
Microwave Ovens
Microwave Ovens -- Efficiency
Microwave Ovens -- How They Work
Small Appliances vs. A Range
Small Appliances -- Costs

ENERGY MANAGEMENT

Assigning Responsibilities
Building Survey
Program Implementation
Program Monitoring
Savings Possible
Energy Use

SOLAR

Absorbed Heat, Uses (Low-Grade Heat)
Absorber -- Selectively Blackened Surface
Air vs. Liquid-Pros vs. Cons
Appearance, Interior
Backup Systems, The Best
Collector (Angle, Orientation)
Collector Angle-Space Heating & Cooling
Collector Angle-Space Heating Only
Collector Area Needed
Collector -- Concentrating vs. Flat Plate
Collector - Definition
Collector - Efficiency

SOLAR (continued)

Collector - Flat Plate (Operation)
Collector Fluid - Freezing
Collector Location
Collector - Mirrors or Lenses, Use Of
Collector - Orientation (Position)
Collector - Principal Components
Collector - Quality Determination
Collectors & Shade
Collectors and Snow
Collector, Sun Tracking
Collector Temperatures
Collectors - Types & Qualities of Material
Commercial Building Uses
Components -- Major Heating
Considering Solar - What To Look For
Cooling
Cost vs. Conventional
Costs -- How Much For Home Heating
Design Considerations
Difficulties -- Operations
Economics
Engineers, Contact
Equipment - Application Economics
Equipment Existing Building Installation
Grants or Loans
Heat Pump
Heat Storage
History of Development
Home Appreciation
Home Heating Requirements -- Percentage Of,
Hot Water Sizing -- Rule of Thumb
How They Work
Humidifier
Installation and Maintenance -- Who Handles?
Purchasing (Buying)
Space -- Extra
Space Requirements
Structure Size Limits
Swimming Pools
Swimming Pool Heating
Swimming Pool System - Separate Type
Useable Sunlight - Determining
Weather Data Needed
Who Designs Them

ALTERNATE ENERGY SOURCES

Animal Waste Conversion
Compressed - Air Storage
Energy Recovery - Animal Wastes
Flywheels
Fuel Cell
Geothermal - Definition Of
Geothermal - Electricity From
Geothermal - Forms & Importance Of
Geothermal - Future Of
Geothermal - Pollution Problem From
Geothermal - Potential Of
Geothermal - Research
Geothermal - Resources Of
Geothermal - Where Found
Hydrogen Economy
Magnetohydrodynamics (MHD)
Pump Storage
Synthetic Fuels - From Coal

WIND POWER

Electricity - Storage
Environmental Impact
Magnitude - Potential
Other Uses

WIND POWER (continued)

Rated Speed
Research
Site Determination
Too Much Wind
Windmill - Dutch Type
Wind Mill - Multivane Type
Wind Mill - Thin Bladed Propeller Type

NUCLEAR

Explode Atom Bomb
Nuclear Accident Insurance (Price - Anderson Act)
Nuclear Power - Cost vs. Conventional
Nuclear Status Outside U. S.
Nuclear Waste Products
Nuclear Waste Reprocessing
Number of Reactors - U. S.
Radiation - Released - Air
Rasmussen Report
U. S. Uranium Reserves
Uranium Conversion

NATURAL GAS

Mcf - Thousand Cubic Feet
Natural Gas - Definition
Natural Gas - How It Works
Natural Gas Imports
Natural Gas Location
Natural Gas - Pipelines
Natural Gas - Producers
Natural Gas Production Decline Reasons
Natural Gas Reserves, U. S.
Natural Gas Reserves, 1973, World
Natural Gas Supplies, U. S. 1975
Natural Gas - Who Controls It?
Pilot Lights - Consumption
Shut-In Well

CRUDE OIL

Crude Oil, Alaskan
Crude Oil Consumption, Middle Coast States
Crude Oil Exports
Crude Oil Imports, Dollar Costs
Crude Oil Imports, OPEC Percentage
Crude Oil Production vs. Consumption - World
Crude Oil Reserves - U. S. & World

COAL

Coal - Future Supply
Coal - Recoverable Reserves - U. S. & World
Coal Resources - U. S.
Coal Usage

ENERGY STATISTICS

Domestic Energy Consumption/Economic Sector
Domestic Energy Consumption Per Capita By Source
Domestic Energy Production In The U. S., Total
Electricity Generation by Source - 1976
Electricity, Power Plant Cost Comparisons
Energy Consumption of Concorde vs. Other Aircrafts
Energy Consumption Patterns - U. S.
Energy Consumption, Residential %'s
Energy Consumption, U. S. - 1974 Figures
Energy Consumption, World
Energy Production, U. S. - Fossil Fuels
Imports, Petroleum (U. S.)
Industrial Consumers, Top 5 Industries
Naval Fuel Reserves For Commerical Use
Number of Wells Drilled
Percentage of Energy Consumption In U. S. By Fuel Type
Petroleum Product Consumption %
Price Comparisons of Crude Oil, Motor Gasoline, Natural Gas & Oil
OCS - Atlantic Production Capacity - Crude Oil
OCS - Atlantic - Crude Oil Reserves
OCS - Atlantic, Natural Gas Production Capacity %
OCS - Atlantic - Natural Gas Reserves
Refinery - Capacity, U. S.
Refineries - Location - U. S.
Refineries - Products Produced - U. S.
Reserves vs. Resources
Shale Oil Reserves - U. S.

TRANSPORTATION

Air Conditioning and Miles Per Gallon
Auto Air Conditioning
Auto Consumption (%)
Braking & Miles Per Gallon
City Buses - MPG
Electric Autos
EPA City Mileage Test
EPA - Highway
Gas Treatments & MPG
Gasoline Cost Per Car (Rule of Thumb)
Idling vs. Restarting
Increasing MPG's
L. I. R. R.
Mileage - Factors Influencing
Mileage - Speed
Mileage - Tires
Mileage - Tuneups
Mileage - Acceleration
Miles & Gallons Consumed
Miles Per Gallon Ratings Requirements
Motor Oils & Miles Per Gallon
Octane & Miles Per Gallon
Radial Tires & Miles Per Gallon
Subways - Efficiency
Tuneup & Miles Per Gallon
Vacuum Gauge
Wheel Alignment & Miles Per Gallon

ENERGY POLICY

Crude Oil Storage For Embargo Contingency
Embargo Contingency Plans (Rationing)

ENVIRONMENT

Clean Fuels From Coal Production
Clean Fuel From Coal
Ocean Oil Pollution
Pollution Control - Coal Burning
Pollution Reduction - Home Heating
Recycling - Aluminum - Steel
Refillable vs. Non-refillable Containers
Solid Waste Energy Recovery Techniques
Underground Cable - Advantages
Underground Cables - Disadvantages
Underground Cables - Cost & Installation
Underground Cables - Costs vs. Overhead Lines
Underground Cable - Industry's Goal
Underground Cable Insulation
Underground Cables - Reducing Costs & Research Results

AGRIBUSINESS AND ENERGY

Energy & Farming
Food Production & Energy
Food Processing & Energy
Tractors Energy Efficiency

GLOSSARY

Absorber, Or Absorber Plate
Absorptance
Active Solar System
Alternating Current (AC)
Ambient Temperature
American Gas Association (A.G.A.)
American Petroleum Institute (A.P.I.)
Ampere
Anthracite
Barrels - Gallons (U.S.)
Base Load
Base Load Station
Bioconversion
Bituminous Coal
Blended Fuel Oil
Breeder Ratio
British Thermal Unit (Btu)
Bunker "C" Fuel Oil Or #6
Bureau of Mines
C Value (Heat Flow Measurement)
Catalytic Cracking
Chain Reaction
Chemical Energy
Coal Augering
Coal Gas
Coal Gasification
Coal Gasification, Underground
Coal Liquefaction (Hydrogenation)?
Coal Oil
Coefficient of Performance (C.O.P.)
Coke
Collector Tilt
Combination Utility
Concentrator
Conductivity

GLOSSARY (continued)

Convection
Conversion Factors - Btu
Conversions
Coolant
Critical Mass
Crude - Crude Oil
Deep Mining
Degree Day Cooling (DDC)
Degree Day, Heating (DDH)
Depletion Allowance
Diesel Fuel
Direct Current (D.C.)
Direct Energy Conversion
Distillate Fuel Oil
Drift Mine
Electricity
Emittance
Energy
Energy Consumption, Total Gross
Energy Consumption, Total Net
Environmental Protection Agency (E.P.A.)
Feedstock
Fission
Flue Gas
Fluid
Fly Ash
Fossil Fuels
Fuel
Fuel Cell
Fusion
Gallon
Galvanic Corrosion
Gaseous Diffusion
Gasoline
Geothermal Energy
Geothermal Steam
Gigawatt
Half-Life
Heat Gain
Heat Loss
Heliostat
Hybrid Solar System
Hydroelectric Plant
Hydropower Energy
Insolation
Thermal Conductivity (K-Value)
Kerosine (Kerosene)
Kilowatt
Kilowatt - Hour
Kinetic Energy
Life-Cycle Costing
Light Oil
Liquids, Natural Gases -- Propane, Butane
Langley
Liter
Magnetohydrodynamics (MHD)
Megawatt
Methane (CH_4)
Middle Distillate
MCF (1,000 Cubic Ft.)
Moderator
Natural Gas
Natural Gas Liquids
National Petroleum Council (N.P.C.)
Nuclear Power Plant
Nuclear Reactor
Nuclear Regulatory Commission (NRC)
Ocean Thermal
Oil Gas
Outer Continental Shelf (O.C.S)
Permeance -- (PERM)
Petrochemicals
Petroleum
Photovoltaic
Pollution, Thermal
Power Plant, Thermal

GLOSSARY (continued)

Pyranometer
(R-Factor) Thermal Resistance
Radiation
Reactor, Thermal (Nuclear)
Recovery, Secondary
Recovery, Tertiary
Refining
REM
Reradiation
Reserves
Reserves, Indicated
Reserves, Inferred
Reserves, Measured
Residual Fuel Oil
Resistance Heat
Resources
Resources, Undiscovered
Seasonal Performance Factor (S.P.F.)
Selective Surface
Solar Cell
(Solar) Collector
Solar Collector Efficiency
Solar Constant
Solar Energy
Solar Furnace
Solar Rights
Solar System Efficiency
Solar System -- Passive
Strip Mining
Stripper Well
Subbituminous - Lignite
Sun Tracking
Therm
Thermosyphon System
(U-Factor) - Coefficient of Heat Transmission
U - Value
Uranium (235, 238)
Watt
Wild Cat Well

ENERGY CONSERVATION

1. A/C TO DEHUMIDIFY

2. If I want to dehumidify a room in the summer, what do I set my air conditioner at?

3. In very humid weather, set the fan at a low speed to provide less cooling, but more moisture removal. In addition keep it at low cool.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), page 16.

5. 104

1. AIR CONDITIONERS - ENERGY EFFICIENCY RATIO

2. What is the Energy Efficient Ratio (EER) on room air conditioners? How is it determined? Which is better; high or low EER?

3. The EER is the measure of the amount of cooling a room air conditioner can do relative to the amount of electricity it uses. Air conditioners with the same capacity for cooling (as measured by Btu per hour) may vary greatly in efficiency. Some air conditioners use much more electricity to achieve the same cooling and dehumidifying effect than others. EER is determined by dividing the Btu per hour rating of a room air conditioner by the watts it uses. Air conditioners with higher EER ratings are relatively more efficient than those with lower EER's. More efficient models consume less electricity and are less costly to operate.

4. EER Air Conditioning and You, Nassau County Bureau of Energy Resources.

5. 020, 104

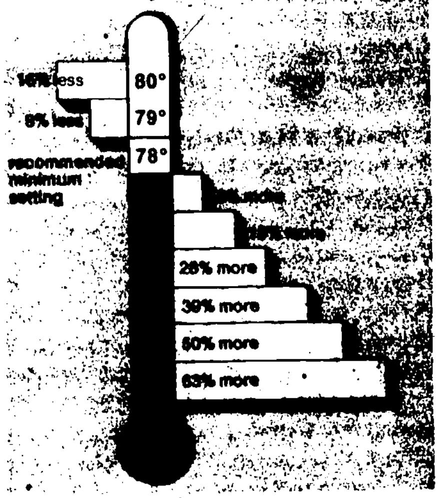
ENERGY CONSERVATION

1. AIR CONDITIONING - THERMOSTATS & COSTS

2. How much will I save by adjusting my air conditioning thermostat in the summer?

3. **A Few Degrees Will Make a Difference.**

The cost, on a percentage basis, of keeping room temperatures above or below 78 degrees with air conditioning.



4. Consolidated Edison Company of New York, Inc., Customer News, June 1976.

5. 104, 020, 072

1. A/C THERMOSTAT RAISING SAVINGS - PERSONAL

2. By turning up my thermostat, how much will I save?

3. You should save betwen 12 and 47 percent in cooling costs, depending on where you live.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), page 15.

5. 104, 020

ENERGY CONSERVATION

1. APPLIANCE EFFICIENCY IMPROVEMENTS REQUIREMENTS

2. Are there any energy efficiency targets proposed for appliances?

3. YES! Under the Energy Policy and Conservation Act of 1975, the Federal Energy Administration (now the Department of Energy) is authorized to set standards for any product that uses more than 100 kilowatt-hours per year (average usage). The voluntary targets listed below are designed to encourage the maximum feasible improvement in the products' energy efficiency, but it is expected that by 1980 each appliance will have to meet at least a 20% increase over its 1972 energy efficiency level.

	Some proposed rate of efficiency improvements		
Refrigerators	43 - 50%		
Freezers	33 - 40%		
Dishwashers	22 - 40%		
Clothes Dryers (Gas)	14 - 20%	(Electric)	6 - 14%
Room Air Conditioners	28 - 40%		
Clothes Washers	11 - 50%		
Water Heaters (Non-Electric)	33 - 35%	(Electric)	10 - 12%
Televisions (Black & White)	92 - 94%	(Color)	50 - 80%
Ranges & Ovens (Electric)	8 - 20%	(Non-Electric)	43 - 50%

4. Prentice- Hall, Inc., Energy Controls (Englewood Cliffs: Prentice - Hall, Inc. 1976), Report Bulletin #20 - 5/21/76, page 1 - 2.

1. CAULKING AND WEATHERSTRIPPING SAVINGS

2. How much can I save by caulking and weatherstripping?

3. You could reduce your family's energy costs by 10% or more by properly caulking and weatherstripping.

4. Federal Energy Admininstration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), page 11.

5. D-1, 104

ENERGY CONSERVATION

1. CAULKING - WHERE

2. Where do I caulk my house?

3. a) Between window drip caps (tops of windows) and siding.

   b) Between door drip caps and siding.

   c) At joints between window frames and siding.

   d) At joints between door frames and siding.

   e) Between window sills and siding.

   f) At corners formed by siding.

   g) At sills where wood structure meets foundation.

   h) Outside water faucets, or other special breaks in the outside house surface.

   i) Where pipes and wires penetrate the ceiling below an unheated attic.

   j) Between porches and main body of the house.

   k) Where chimney or masonry meets siding.

   l) Where storm windows meet the window frame, except for drain holes at window sills.

   m) And if you have a heated attic: where the wall meets the eave at the gable ends.

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Printing Office, October 1977), page 34.

5. 104

ENERGY CONSERVATION

1. CUTTING ELECTRICITY COSTS

2. What should I do to reduce my electric bill?

3. Lowering lighting levels is an easy way. For example, you should
   a) Turn off unneeded lights.
   b) Reduce wattage where possible.
   c) Use fluorescents when suitable.
   d) Use outdoor lights only when necessary.
   e) Install solid state dimmer switches.
   f) Use one large bulb rather than several small ones.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), pages 24 - 25.

5. 104

1. DAMP WALLS - SOLUTION

2. What do I do for damp walls in my basement?

3. There is a commercial treatment for damp walls that consists of an application of sealer on the outside of the basement wall.

   If walls are damp, but not leaking water, a brush-applied sealer can reduce the moisture problem significantly. The product is available at paint stores.

   The basement floor can be painted with concrete floor enamel. This will seal the pores on the concrete. The paint should be applied in the winter when the concrete is dry.

4. Henry R. Spies et al., 350 Ways to Save Energy (and Money) In Your Home and Car (New York: Crown Publishers, Inc., 1974), page 62.

5. D-2, D-7, 056, 104

ENERGY CONSERVATION

1. EER RATINGS & COSTS

2. How much will an air conditioner with a higher EER rating save me?

3.

Unit Btu	EER Range	Est. Hourly Cost	Est. Season Cost
4.000	5.4	6.4¢	$45
	8.8	4.0¢	28
5.000	5.4	8.0¢	56
	8.8	5.0¢	35
6.000	5.5	9.4¢	66
	9.3	5.6¢	39
9.000	5.6	14.0¢	98
	10.7	7.3¢	51
12.000	5.0	20.9¢	146
	9.1	11.4¢	80
15.000	5.4	24.1¢	169
	9.3	14.0¢	98
18.000	6.0	26.1¢	183
	9.3	16.9¢	118

4. Consolidated Edison Company of New York, Inc., Customer News, June 1976.

5. 104, 020

1. ELECTRIC METER READING

2. How do I read the electric meter on my house?

3. Your electric meter has four or five dials, numbered 0 - 9. Read the righthand dial first then proceed from right to left.

When the hand on a dial is between two numbers always read the lower of the two numbers.

4. Long Island Lighting Company, Guide to Meter Reading.

5. 069, 032

ENERGY CONSERVATION

1. FINANCING

2. Is there financing available for home energy efficiency fix-up programs? Where can I get it? What kind is available?

3.

WHERE TO GET FINANCING	WHAT KIND OF FINANCING	HOW LONG TO REPAY
Commercial Bank	Home Improvement Loan	2 - 5 years
Savings and Loan		
Mutual Savings Bank	FHA/HUD Title I	12 years (this is a recent increase from 7)

Note: Lenders are not allowed to charge fees of any kind for this type of loan and the maximum permissible amount that can be made under Title I has just been increased from $5,000.00 to $10,000.00.

Your Credit Union	Depends on the credit union but usually includes Title I loans	Varies with type of loan.

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Printing Office, October 1977), page 66.

5. 056, 104

ENERGY CONSERVATION

1. FLUORESCENT LIGHTS - ON - OFF

2. I have fluorescent lights. Should I turn them off or leave them on?

3. A lighting manufacturer's pre-energy crisis study showed an approximate 15 minute "off" time to be the break-even point in deciding whether or not to turn off a fluorescent light for economic reasons.

   Note however, that as the price of fuel goes up and, consequently, the price of electricity, the shut off time required to break even grows shorter and shorter. By early 1974 the break-even point was down to 10 minutes.

4. Consolidated Edison Company of New York, Inc., Energy Saver 5: How To Achieve Good Lighting and Save Money, Too.

5. 104

1. FLUORESCENTS VS. INCANDESCENTS

2. Which are better fluorescent lights or incandescent bulbs?

3. Fluorescent lights are better.

   Example: One 40 watt fluorescent tube provides more light than 3 - 60 watt incandescent bulbs.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), page 24.

5. 104

ENERGY CONSERVATION

1. FURNACE SERVICING SAVINGS

2. a) How much will I save by servicing my furnace regularly?
   b) When should I do it?
   c) How often?

3. a) About a 10% savings on fuel costs.
   b) Preferably in the fall.
   c) Once a year.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), page 14.

5. 104, F-1

1. HEAT LOSS - TYPICAL

2. What is the heat loss of an uninsulated home compared to one that is fully insulated?

3. Simple 25' X 25' uninsulated house, frame construction, crawl space below, attic above, seven windows, two doors, 65°F. inside.

	Uninsulated					Insulated		
	Area F^2	"U"	°T	Hrs/D	Loss Btu/D	"U"	Loss Btu/D	Saving Btu/D
Walls	900	.25	25°	24	135,000	.10	54,000	81,000
Ceiling	625	.65	25°	24	243,750	.075	28,125	215,625
Floor	625	.38	25°	24	142,500	.06	22,500	120,000
Windows	84	1.13	25°	24	56,952	.53	26,712	30,240
Doors	40	.64	25°	24	15,360	.37	8,880	6,480

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page 13.

5. 056, 068, 104

ENERGY CONSERVATION

1. HEAT PUMPS

2. What is a heat pump?

3. A heat pump is merely an air conditioner that can run in either direction. In summer, heat extracted from inside air is pumped to the outside. In winter, the unit extracts heat from outside air - even winter air contains heat -- and funnels it inside the house.

   A heat pump is attractive because it is efficient. For example, when you use electricity to heat your home directly by running it through resistance - heating coils, you get exactly what you put in. So for every kilowatt-hour of electricity used you get the equivalent amount of heat produced; or 3400 Btu. On the other hand a heat pump can produce three times this amount when the air temperature is 50°F.

4. Ronald Derven, "Heat Pumps: Cheapest Cooling and Heating for Your Home?," Popular Science, September 1976, page 93.

5. 063, C-1

1. HEATING SYSTEM - ROUTINE SERVICING

2. How can I reduce fuel consumption in my heating and cooling equipment?

3. A periodic checkup and maintenance of your heating and cooling equipment can reduce your fuel consumption by about 10%. Locating a good heating/cooling specialist and sticking with him is a good way to ensure that your equipment stays in top fuel-saving condition. Your local fuel supplier or heating/cooling system repair specialist are the people to call. You can find them in the Yellow Pages under: Heating Contractors; Air conditioning equipment; Furnaces-heating; Electric heating; Oil burner-equipment and service.

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Printing Office, October 1977), page 62.

5. 104, F-1

ENERGY CONSERVATION

1. HOME ENERGY SAVINGS

2. How can I save energy in my home?

3. Many ways:
   a) Dialing down thermostats in winter.
   b) Dialing up thermostats in summer if you have central air conditioning.
   c) Turning off unneeded lights.
   d) Shutting drapes.
   e) Closing off unused rooms.
   f) Furnace tune up, every few years.

4. U. S. Department of Commerce, National Bureau of Standards and the Federal Energy Administration, Office of Energy Conservation and Environment, Making the Most of Your Energy Dollars, by Madeleine Jacobs and Stephen R. Petersen (Washington, D. C.: U. S. Government Printing Office, June 1975), page 1.

5. 104

ENERGY CONSERVATION

1. LIGHTS - LEAVE ON, OR OFF & ON? (POWER SURGE)

2. Should I leave my lights on or turn them off even if I leave the room for only a minute? What about the surge?

3. Forget the "Surge" - There is a general misconception that leaving lights on saves more electricity than turning them off and then on again. Not true! There is a momentary surge of power when a light is turned on, but it is equal only to a second or two of lighting time.

4. Energy, Mines and Resources Canada, Office of Energy Conservation, 100 Ways to Save Energy & Money In the Home (Ottawa: Information Canada, March 1975), page 115.

5. 104

ENERGY CONSERVATION

1. RETURNABLE CONTAINERS

2. How much energy can be saved by using returnable containers?

3. Quite a lot. For example: Oregon, the first state to mandate use of returnable containers for beer and soft drinks, estimates it has conserved 1.32 trillion Btu's in one year, enough energy to meet all the energy needs of 2% of the state's population for one year.

4. League of Women Voters Education Fund, Energy 13 - Solid Waste: Energy to Burn (Washington, D. C.: LWVEF, 10/74), Publication #529.

5. 104

1. ROOFS - COLOR

2. Which is better, a dark or light colored roof?

3. If you live in a warm climate, remember that light-colored roofing can help keep houses cooler.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), page 38.

5. 104

ENERGY CONSERVATION

1. STORM WINDOWS & DOORS

2. How much can I save by installing storm windows and doors?

3. They could reduce individual fuel costs by about 15% and generally make the house more comfortable all year.

4. Federal Energy Admininstration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), page 11.

5. 104, 056, 031

1. STORM WINDOWS - PLASTIC

2. My storm windows are in poor condition. What can I do besides buying new ones?

3. Use 6 mil thick polyethelene plastic sheets available at hardware stores. Measure the width of your larger windows to determine the width of the plastic rolls to buy. Measure the length of your windows to see how many linear feet and therefore how many rolls or the kit size you need to buy.

   Attach to the inside or outside of the frame so that the plastic will block airflow that leaks around the moveable parts of the window. If you attach the plastic to the outside use the slats and tacks. If you attach it to the inside, masking tape will do. Inside installation is easier and will provide greater protection to the plastic. Outside installation is more difficult especially on a two story house, and the plastic is more likely to be damaged by the elements.

   Be sure to install tightly and securely, and remove all excess. Besides looking better, this will make the plastic less susceptible to deterioration during the course of the winter.

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Printing Office, October 1977), page 40.

5. 104, 031

ENERGY CONSERVATION

1. <u>THERMOSTATS - TEMPERATURE SET BACK SAVINGS, CLOCK THERMOSTATS</u>

2. How much will I save by turning down my thermostat?

   What are the advantages of clock thermostats?

3. Lower your thermostat to 65 degrees during the day and 55 degrees at night. You can save about 3% on your fuel costs for every degree you reduce the average temperature in your home. You can save about 1% on your heating bills for every degree you dial down only at night.

   The clock thermostat will turn the heat down automatically at a regular hour before you retire and turn it up again before you wake. While you can easily turn your thermostat back at night and up again in the morning yourself, the convenience of a clock thermostat may be worth the $70.00 to $90.00 cost to you.

4. Federal Energy Administration, Office of Energy Conservation and Environment, <u>Tips for Energy Savers</u> (Washington, D. C.: U. S. Government Printing Office, May 1977), pages 12 - 13.

5. 104, 072

ENERGY CONSERVATION

1. 3 WAY BULBS

2. Should I use a 3 way bulb or 3 one-way bulbs?

3. Use "three-way" light bulbs properly for energy savings. The highest, or brightest, position on the three way switch should be used only when you need a lot of light, for instance, for reading. Use the middle step for general room illumination and use the lowest lighting level for night safety.

4. Consolidated Edison Company of New York, Inc., Energy Saver 5: How To Achieve Good Lighting and Save Money, Too.

5. 104

1. TIMING, THERMOSTATS

2. How much can I save using a timing thermostat at a 5^{o} or 10^{o} heating setback at night?

3. There is a myth that says you won't save energy by turning down your thermostat at night because it takes so much energy to warm the building in the morning. But this is not true. Depending on your geographical location, the amount of energy you can save will range from 9 to 15 percent of what you used before adopting this energy conserving habit. For example, in the New York Metropolitan area, the heating cost savings with an 8 hour nightime setback of 5^{o}F. can result in an 8% savings or of 10^{o}F. can result in a 12% savings.

4. United States Department of Energy, Energy Savings Through Automatic Thermostat Controls (Washington, D. C.: U. S. Government Printing Office, September 1977).

5. 104, 072

ENERGY CONSERVATION

1. WINDOW EFFECTIVENESS, TYPES

2. Which are better, storm windows or windows made of insulating glass?

3. Storm windows are more efficient than insulating (factory-sealed double-pane) glass, although the latter is often preferred because there is nothing to put on in the fall and take off in the spring, and there are two less glass surfaces to be cleaned. The storm window is superior because it provides a separate seal of the cracks around the window, and also because the air space between two layers of glass is greater, and the air space is an insulator.

4. Henry R. Spies et al, 350 Ways to Save Energy (and Money) In Your Home and Car (New York: Crown Publishers, Inc., 1974), page 37.

5. 031, 104

INSULATION

1. WHAT IS INSULATION

2. What is insulation? How does insulation work?

3. Thermal insulation (as distinct from acoustical or electrical insulation) are those materials or combinations of materials which, when properly applied, retard the flow of heat energy by conductive, convective, and radiative transfer modes. Such materials may be fibrous, particulate, film or sheet, block or monolithic, open or closed cell, or composites thereof, which may be chemically or mechanically bound or supported.

4. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., ASHRAE Handbook & Product Directory: 1977 Fundamentals (New York: ASHRAE, 1977), page 19.1.

5. Insulation Package

1. AEROLITE FOAM - SPECIFICATIONS

2. Aerolite foam - ureaformaldehyde?

3. R - value = 4.88/inch at 32^{o}F. - K = .205
   Shrinkage = unknown
   Vapor transmission - 3.36 at 50% R.H.

   Fire - resistant

   no - toxic fumes
   do not use in attic

4. American SPE Corporation, Northern Kentucky Industrial Park, 8025 Dixie Highway, Florence, Ky. 41042, Telephone 1-800 - 354-9816

5. Insulation package

INSULATION

1. BASEMENT - FIRST FLOOR

2. Should I insulate between the basement and the 1st floor?

3, There are two cases where it is good to insulate your floor:

   a) When you have an accessible crawl space that you cannot seal off in winter. For example; your house stands on piers.

   b) When you have a garage, porch or other cold, unheated space with heated rooms above it.

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Printing Office, October 1977), page 23.

1. BASEMENT WALLS

2. Should I insulate my basement walls?

3. If you have a basement that you use as a living or work space and that has air outlets, radiators, or baseboard units to heat, you may find that it will pay to add a layer of insulation to the inside of the walls that are above the ground down to about two feet below the ground.

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.:, U. S. Government Printing Office, October 1977), page 24.

INSULATION

1. BATT - BLANKETS - GLASS FIBER, ROCK, MINERAL WOOLS, CHARACTERISTICS

2. What are the characteristics of the various batt types of insulation?

3. R-value = 2.7 to 3.7 per inch (depends upon grade of material).

   Fire resistant
   Moisture resistant
   Requires vapor barrier towards heated area.

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Printing Office, April 1975), pages 43 - 44.

1. BORDEN'S INSULSPRAY

2. Insulspray, Borden's - Urea-formaldehyde?

3. K factor at 32°F. = .21 or R = 4.8
   R = 4.3 @ 72°F.

   Shrinkage - 1.6 - 3.8% linear/ft.

   Vapor transmission - averages - 26 perms

   Flame Spread = 15
   Smoke Developed = 5
   Fuel Contributed = 0

   Do not use in attic

   Cost - .60 - .90/sq. ft.

4. Made by Borden Chemical Adhesives & Chemicals Division, Division of Borden Inc., 180 E. Broad Street, Columbus, Ohio 43215, (614) 225-4000.

5. Insulation Package

INSULATION

1. CELLIN - CELLULOSE

2. What are the characteristics of Cellin, Inc. insulation?

3. Cellin Spray:

Cellin Craft	Therm/lo-k	Cellin Pack	R-value/inch
3.7 wall only (blown in)	5.2 attic only	3.66 attic only (pour)	
UL listed:			
Flame Spread------30	----------25	----------30	
Smoke Developed--- 0	---------- 0	---------- 0	
Fuel Contributed-- 5	---------- 0	---------- 5	
		(vermin & rodent proof)	All meet or exceed ASTM C-739 & HHI-515C fire codes for buildings.

4. Cellin Manufacturing Inc., P. O. Box 224, 9610 Gunston Cove Road, Lorton, Va., 22079, phone: (703) 690-1195

5. Insulation Package

INSULATION

1. CELLULOSE CHARACTERISTICS

2. What is cellulose insulation?

3. Cellulose fiber insulation is made from wood pulp, often recycled paper, which has been treated to be moisture resistant and fire retardant. Though it will not burn by itself, it will burn if other combustible materials are involved. Extended exposure to water or moisture may cause some deterioration. The product must meet Federal Specifications. If it does, it will be clearly labelled.

4. Henry R. Spies et al, 350 Ways to Save Energy (and Money) In Your Home and Car (New York: Crown Publishers, Inc., 1974), pages 14 - 15.

U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Printing Office, April 1975), page 44.

5. Insulation Package

1. CELSIUS FOAM

2. What are the characteristics of Celsius foam insulation?

3.

	Ureaformaldehyde
R-value	4.3 per inch at 14°F. 4.2 per inch at 72°F.

Flame Spread =15
Smoke Density =50
Fuel Contributed = 5

There are no toxic fumes; Shrinkage is 1 - 2%; It is vermin and mold resistant and fire resistant; Do not put in attic.

4. Celsius Insulation Resources Inc., P. O. Box R, Weedsport, N. Y. 13166 (315) 834-6693

INSULATION

1. CHOOSING MATERIALS

2. Which insulation material should I use?

3. It is always best to select insulation on the basis of cost per resistance unit --- the so called "R" value, rather than on cost per inch. Durability and resistance to flame spread and vermin should also be considered. Two different kinds of insulation may have the same thickness, but the one with the highest "R" value will perform better.

4. U. S. Department of Commerce, National Bureau of Standards and the Federal Energy Administration, Office of Energy Conservation and Environment, Making the Most of Your Energy Dollars, by Madeleine Jacobs and Stephen R. Petersen (Washington, D. C.: U. S. Government Printing Office, June 1975), page 12.

5. Insulation Package

1. CRAWL SPACE

2. Should I insulate my crawl space? What should I use? How do I do it?

3. If your house (or part of it) sits on top of a crawl space that can be tightly sealed off from the outside air in the winter the cheapest and best place to insulate it is around the outside walls and on the adjacent ground inside the space:

Ask yourself the following two questions to decide whether to insulate:

a) Is there no insulation at all around the crawl space walls or under the floor?

b) Is your crawl space high enough to get in there to do the work?

If the answer to either of these questions is "No", don't insulate here.

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Printing Office, October 1977), page 22.

5. Insulation Package

INSULATION

1. DUCTS

2. Should ducts be insulated?

3. If the ducts for either your heating or your air conditioning system run exposed through your attic or garage (or any other space that is not heated or cooled) they should be insulated. Duct insulation comes generally in blankets 1" or 2" thick. Get the thicker variety, particularly if you've got rectangular ducts. If you are doing this job at all, it is worth it to do it right. For air conditioning ducts, make sure you get the kind of insulation that has a vapor barrier (the vapor barrier goes on the outside). Seal the joints of the insulation tightly with tape to avoid condensation. (Note: check for leaks in the duct and tape them tightly before insulating).

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Printing Office, october 1977), page 65.

5. Insulation Package

INSULATION

1. FUMES -- TOXIC

2. Which kind of insulation gives off toxic fumes when it burns?

3. Both polystyrene and polyurethane will give off large quantities of toxic smoke. In addition to this, polyurethane melts into a sticky gel as it burns. For these reasons, foamed plastics should never be used as exposed interior finish in a home.

4. Henry R. Spies et al., 350 Ways to Save Energy (and Money) In Your Home and Car (New York: Crown Publishers, Inc., 1974), page 15.

5. Insulation Package

1. GLASS FIBER - ROCK WOOL LOOSE FILL

2. What are the characteristics of glass fiber/rock wool insulation?

3. Mineral wool and glass fiber are essentially the same type of material, which is formed by melting rock, slag, or glass, and extruding it into fine fibers, which are then stuck together with resins into tufts, blankets, or batts. It is completely fireproof, since it cannot burn, and melts only at very high temperatures. It has no food value or attraction for vermin or insects, and does not deteriorate with time, but may settle slightly. The fine fibers of this product may become embedded in the skin during handling and cause itching and a rash.

4. Henry R. Spies et al., 350 Ways to Save Energy (and Money) In Your Home and Car (New York: Crown Publishers, Inc., 1974, page 14.

5. Insulation Package

INSULATION

1. <u>HOT WATER PIPES</u>

2. Should I insulate my hot water pipes? What do I use? Where do I get it?

3. Insulating hot water pipes should be done to reduce the amount of heat loss from the pipe surface. This will keep your hot water hotter.

   You may get specially made kits at any hardware store or building supply store.

4. Richard F. Dempewolff, "10 Worst Heat Thieves in Your Home - and How to Halt Them," <u>Popular Mechanics</u>, October 1976.

5. Insulation Package, 100

1. <u>HOT WATER TANK</u>

2. Should I insulate my hot water tank?

3. Add insulation around the water heater you now have if it is inadequately insulated, but be sure not to block off needed air vents. That would create a safety hazard, especially with oil and gas water heaters. When in doubt, get professional help. When properly done, you should save about $15.00 a year in energy costs.

4. Federal Energy Administration, Office of Energy Conservation and Environment, <u>Tips for Energy Savers</u> (Washington, D. C.: U. S. Government Printing Office, May 1977), page 18.

5. Insulation Package, 100

INSULATION

1. POLYURETHANE AND STYRENE (STYROFOAM) RIGID BOARD

2. What are the characteristics of polyurethane or styrene board?

3. Foamed plastics, commonly polystyrene and polyurethane, are available as rigid boards of various thickness and sizes. They may be cut easily with a saw or knife and attached with nails or adhesive. Both types act as a vapor barrier, eliminating the need for a separate foil or plastic barrier. Both will burn vigorously when other fuels are involved, giving off large quantities of toxic smoke. For these reasons foamed plastics should never be used as exposed interior finish in a home. Foamed plastics do not deteriorate with exposure to moisture, and have no attraction for insects or vermin. These products are the most efficient insulators per inch thickness.

4. Henry R. Spies et al., <u>350 Ways to Save Energy (and Money) In Your Home and Car</u> (New York: Crown Publishers, Inc., 1974), page 15.

5. Insulation Package

1. R-FACTOR (THERMAL RESISTANCE)

2. What does "R-Factor" mean?

3. The insulating value of most insulating materials is printed on the wrapper with the code letter "R", which stands for resistance value to the flow of heat. This value may be given for various thicknesses of the material and will vary according to the method in which it is installed (loose or in batts, for example). The higher the "R" value, the greater the material's resistance to the flow of heat.

   The optimum "R" value will depend on the climatic conditions and average heating costs in your area.

4. Henry R. Spies et al., <u>350 Ways to Save Energy (and Money) In Your Home and Car</u> (New York: Crown Publishers, Inc., 1974), page 13.

5. Insulation Package

INSULATION

1. R - VALUES - ALL TYPES

2. What are the R-values for various types of insulation?

3.

Material	R-Factor per inch thickness
(1) Batt type:	
Wood fiber	4.00
Cotton fiber	3.85
Mineral/glass wool	3.70
(2) Rigid type:	
Glass fiber	4.00
Corkboard	3.70
Polystyrene	4.20
Urethane	7.10
Formaldehyde foam	4.80
*Wood or cane fiber	2.86
*Roof deck sheathing	2.63
*Cellular glass	2.50
(3) Loose fill type:	
Mineral/glass wool	3.33
Cellulose	4.00
Perlite	3.00
*Sawdust	2.22
*Expanded vermiculite	2.08

*These materials are not recommended for residential use because their R-Factor is less than 3.00 per inch.

4. Northeast Utilities, Inc., Recommended Standards of Insulation and Ventilation for New Residential Structures, page 11.

5. Insulation Package

INSULATION

1. RAPCO FOAM - SPECIFICATIONS

2. What are the characteristics of Rapco Foam?

3. It is a urea-formaldehyde based foam:

R-value at 35°F. is 4.8 per inch or K=.21 at 35°F.
Shrinkage is 1.8 - 3%
Vapor Transmission -32 - 38 perms
Flame Spread 10
Smoke Density 35
Fuel Contribution 0

Made by Rapperswill Corp.; No toxic fumes; guaranteed 10 years if properly installed; Contractor must be licensed by manufacturer.

Costs: $.60 - .90/sq. ft. Do not use in attic.

4. Rapperswill Corporation, 305 East 40th Street, New York, N. Y. 10016
(212) 986-7030.

5. Insulation Package

INSULATION

1. SPECIFICATIONS (FLAMMABILITY) - WHAT DO THEY MEAN?

2. What do the fire retardancy classifications mean?

3. Insulation fire retardancy is measured in accordance with the ASTM E-84 "Method of Test for Surface Burning Characteristics of Building Materials." The tunnel test measures building materials according to three ratings:

   1. Flame Spread as visually measured along the 25 foot tunnel.

   2. Fuel Contributed as determined from the increase in temperature of a thermocouple.

   3. Smoke Density as determined from the decrease in the light transmission impinging on a photoelectric cell located at the vent end of the tunnel.

   For example, red oak flooring yields a flame spread of 100 while asbestos-cement board yields rating of 0.

   Flame Spread is the most important measurement as fire classifications are based on this rating as follows:

Class A	0-25
Class B	26-75
Class C	76-200
Class D	201-500
Class E	over 500

4. American Society of Heating, Refrigerating and Air-Conditioning Engineers, ASHRAE Handbook & Product Directory - 1976 Systems (New York: ASHRAE, 1976), page 41.3.

5. Insulation Package

INSULATION

1. TRI-POLYMER FOAM

2. What are the characteristics of Tri-polymer foam - Urea-resin?

3. K-Factor - .22 at 75° R-value = 4.48 per inch
Shrinkage .5 - 2%
Vapor transmission - 15.55 - 16.96
Flame Spread - 5
Smoke Density - 5
Fuel Contribution - 0
No toxic fumes
No active formaldehyde

4. C. P. Chemical Company, Inc., 25 Home Street, White Plains, New York 10606 (914) 428-2517.

5. Insulation Package

1. UREA (FORMALDEHYDE) FOAM

2. What is Urea (formaldehyde) foam insulation?

3. Only for walls; moisture resistant; vermin resistant; fire resistant; no toxic fumes; more expensive than other materials; quality of application to date has been very inconsistent; Choose a qualified contractor who will guarantee his work; It will settle only if not properly installed.

QUESTIONS TO ASK CONTRACTOR

a) R-value total (R-11, R-19) closest to R-19 as possible.
b) Moisture problems - condensation on walls - peeling paint.
c) Formaldehyde odor - What will he do?
d) Clean up - Will they repair, replace and clean?
e) Individual contract (include guarantee for materials and workmanship).

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Printing Office, October 1977), page 45.

5. Insulation Package (Questions to Ask Contractor).

INSULATION

1. WALL ADJACENT TO GARAGE

2. I have an unheated garage attached to my home. The walls adjacent are extremely cold. What can be done?

3. The wall is the second largest surface area of the home, next to the attic, that can lose a great deal of heat. For maximum savings, the wall should be insulated to an "R" factor of at least 13. If the wall is filled with mineral wool blankets for a total "R" value of 15, it will reduce heat loss from 18,750 Btuh to 4,725 Btuh. In addition, the surface temperature of the wall will be raised, which adds considerably to the comfort of the occupants.

4. Henry R. Spies et al., 350 Ways to Save Energy (and Money) In Your Home and Car (New York: Crown Publishers, Inc., 1974), pages 19 - 20.

5. Insulation Package, D-7

1. WALL - BEST TYPE

2. What type of insulation is best for the walls?

3. Some kinds of wall insulation cost more than others, and some kinds work better than others. Generally, you get what you pay for, if you spend more, you get better insulation.

   The least expensive is mineral fiber insulation. There are two kinds; rock wool and glass fiber. Either kind can be blown into the wall by means of a special machine. A slightly more expensive but more effective insulation is cellulosic fiber. This is another loose insulation that is blown in like mineral fiber.

   The most expensive and perhaps the most effective insulation is ureaformaldehyde foam (not urethane foam, urethane foam is not good in walls). Quality control problems with ureaformaldehyde foam require that you choose a qualified installer.

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Printing Office, October 1977), page 20.

5. Insulation Package, D-7

INSULATION

1. WALLS - COST SAVINGS

2. How much will wall insulation cost and how much will I save?

3. Costs range from 60¢ to 90¢ per sq. ft.
Savings could amount to 16 to 20% in utility costs.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), page 10.

5. Insulation Package, D-7.

1. WALLS - HOW TO DETERMINE IF THERE IS ANY INSULATION

2. How do I find out if I have wall insulation?

3. (a) Go into attic (unfinished) and look down at wall cavities.

   (b) Go to an outside wall and take off a light socket plate and look inside. If there is nothing there, then you have no wall insulation. If there is some there, then you do not need more.

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Printing Office, October 1977), page 19.

5. Insulation Package, D-7.

INSULATION

1. WALL - MOISTURE PROBLEMS

2. What about moisture problems with wall insulation?

3. Before you install insulation in closed cavities (such as wallspaces), consult an insulation specialist about possible moisture problems. If water vapor is allowed to condense in the insulated space, it will lower the performance of the insulation and could damage the structure. In general, moisture problems can be prevented with proper installation of vapor barriers and adequate ventilation, but high humidifier settings should be avoided.

4. U. S. Department of Commerce, National Bureau of Standards and the Federal Energy Administration, Office of Energy Conservation and Environment, Making the Most of Your Energy Dollars, by Madeleine Jacobs and Stephen R. Petersen (Washington, D. C.: U. S. Government Printing Office, June 1975), page 12.

5. Insulation, Package, D-7

INSULATION

1. WALLS - SHOULD I INSULATE

2. Should I insulate my walls?

3. Insulate exterior walls if you live in a climate that requires a good deal of heating and air conditioning and if there is space in the walls for blown in insulation. You will need to employ a contractor to do this job. R-values recommended for most wall insulation range from R-11 to R-13.

4. Federal Energy Administration, Office of Energy Conservation and iron-ment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), page 10.

5. Insulation Package, D-7

1. VAPOR BARRIER - DEFINITION & PLACEMENT

2. Where does the vapor barrier go? What is the barrier?

3. A vapor barrier acts to prevent moisture from getting into the insulating material and producing a heat conducting effect rather than an insulating air space. Usually made of craft paper, aluminum foil or polyethelyne plastic, the vapor barrier should always face the heated area.

4. LILCO - Energy Management Series.

5. 047

HEATING VENTILATING & AIR CONDITIONING (HVAC)

1. AIR CONDITIONING - CENTRAL - MAINTAINING EFFICIENCY

2. What should be done to maintain efficiency of Whole House Air Conditioning?

3. Once a year:
   - (If you have room air conditioners, many of these hints apply. Ask your dealer about what you can do to your room air conditioners).
   - You can do this yourself:
     - Clean or replace air filters - this is important, and if done every 30 to 60 days will save you far more money in fuel than the cost of the filters.
     - Clean the condenser coils of dust, grass clippings, etc.
   - Your Serviceman should:
     - Check oil bearings on fan and compressor if they are not sealed.
     - Measure electrical current drawn by compressor.
     - Check pulley belt tension.
     - Check for refrigerating fluid leaks and add fluid if needed.
     - Check electrical connections.
     - Re-adjust dampers if your air conditioner uses the same ducts as your heating system; different settings are usually required for summer cooling than for winter heating.
     - Flush evaporator drain line.

   Note: Your condenser is the part of your air conditioner that sits outside your house. It should be shaded; if it has to work in the sun it wastes a lot of fuel. When you shade it, make sure you don't obstruct the flow of air out and around it.

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Printing Office, October 1977), page 64.

5. 104

HEATING VENTILATING & AIR CONDITIONING (HVAC)

1. AIR CONDITIONERS ROOM-EER RATINGS & BUYING ONE

2. What should I consider when buying a room air conditioning unit?

3. When you go to buy a room air conditioning unit, check the EER - Energy Efficiency Ratio. The higher the EER number, the less electricity the unit will use to cool the same amount of air; you should consider your possible fuel savings when deciding how much to spend on your air conditioning unit. A unit which costs more to begin with may save enough money over the next summer to make it worth it.

   Typical EER's available range from 4 to 12; a unit with an EER of 4 will cost about 3 times as much to operate as one with an EER of 12.

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Printing Office, October 1977), pages 71-72.

5. 104, 020

1. ATTIC FANS - SIZE

2. How is an attic fan used? What size should I buy?

3. In a part of the country that has hot days and cool nights, using an attic fan in the evenings and closing the windows and curtains during the day, can replace air conditioning. The size of the fan you buy should be determined by the amount of space you want to cool. You can figure out the fan size you need by finding the volume of your house: Rounding off to the nearest foot, multiply the length of your house by its width, then multiply by its height (from the ground to just below the attic). This will give you the volume in cubic feet. The capacity of all fans is marked on the fan in CFM's - Cubic Feet of air moved per Minute. Divide the volume of your house by 10; this will give you the CFM rating of the fan you need to change the air in the house 6 times an hour.

   ______________ ÷ 10 = ______________
   Volume of house   CFM fan rating

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Printing Office, October 1977), page 70.

5. N-1.

HEATING VENTILATING & AIR CONDITIONING (HVAC)

1. AUTOMATIC DAMPERS

2. What about automatic dampers?

3. Consider buying a furnace that incorporates an automatic flue gas damper. This device reduces the loss of heat when the furnace is off.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), page 12.

5. 104

1. FURNACE SIZE

2. Can a furnace be too big?

3. Your furnace may be too big. If your house has been insulated since it was built then your furnace may be too big for your home. In general that means it is inefficient and would use less fuel overall if it were smaller. Here is how to tell: wait for one of the coldest nights of the year, and set your thermostat at 70°. Once the house temperature reaches 70°, if the furnace burner runs less than 40 minutes out of the next hour (time it only when it is running), your furnace is too big. A furnace that is too big turns on and off much more than it should, and that wastes energy. Call your service company - depending on your type of fuel burner, they may be able to cut down the size of your burner without replacing it.

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Printing Office, April 1975), page 67.

5. 104

HEATING VENTILATING & AIR CONDITIONING (HVAC)

1. HEATPIPE - RESIDENTIAL

2. What is a heatpipe?

3. This is a small pipe that is installed to sit in the stream of hot flue gases running from your furnace to your chimney. The pipe is very good at conducting heat, and it does just that, taking heat out of the flue gas and moving it a short distance - usually into a warm air duct.

   This device is not presently approved for use, but it is coming soon.

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Printing Office, April 1975), page 69.

5. 104

1. HEATING SYSTEM EFFICIENCY - GAS FURNACE

2. What efficiency should my gas furnace be running at?

3. Not lower than 75%

4. Energy, Mines and Resources Canada, Office of Energy Conservation, The Billpayer's Guide to Furnace Servicing (Ottawa: Information Canada, 1975), page 61.

5. F-1

1. HEATING SYSTEM EFFICIENCY - OIL FURNACE

2. What efficiency should my oil furnace be running at?

3. Not lower than 76%.

4. Energy, Mines and Resources Canada, Office of Energy Conservation, The Billpayer's Guide to Furnace Servicing (Ottawa: Information Canada, 1975), pages 42 - 43.

5. 101

HEATING VENTILATING & AIR CONDITIONING (HVAC)

1. <u>HEATING SYSTEMS - COAL FURNACE MAINTENANCE</u>

2. What should I do to maintain my coal furnace?

3. At the end of each heating season do the following:

   - Adjust and clean stoker.
   - Clean burner of all coal, ash and clinkers.
   - Oil the inside of the coal crew and hopper to prevent rust.

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, <u>In the Bank...Or Up the Chimney?</u> (Washington, D. C.: U. S. Government Printing Office, October 1977), page 63.

5. F-1

1. <u>HEATING SYSTEM - ELECTRIC FURNACE MAINTENANCE</u>

2. What should be done to maintain an electric furnace?

3. Very little maintenance is required. Check the manufacturer's specifications.

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, <u>In the Bank...Or Up the Chimney?</u> (Washington, D. C.: U. S. Government Printing Office, October 1977), page 63.

5. F-1

HEATING VENTILATING & AIR CONDITIONING (HVAC)

1. HEATING SYSTEM - FORCED HOT AIR - MAINTENANCE

2. What should be done to maintain a forced hot air heating system?

3. Once a year a serviceman should do the following:

   - Check blower operation.
   - Oil the blower motor if it doesn't have sealed bearings.
   - Check for duct leaks where duct is accessible.

   You can do this yourself:

   - Clean or replace air filters - this is important, easy to do and is something that needs to be done more often than it pays to have a serviceman do it. Every 30 to 60 days during the heating season you should clean or replace (depending on whether they're disposable) the air filters near the furnace in your system. Ask your serviceman how to do it, buy a supply, and stick to a schedule - you can save a lot of fuel this way.
   - Clean the fan blade that moves the air through your system; it gets dirty easily and won't move the air well unless it's clean. Do this every year.
   - Keep all registers clean, vacuum them every few weeks. Warm air coming out of the registers should have a free path unobstructed by curtains or furniture.

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Printing Office, October 1977), pages 63-64.

5. F-1

HEATING VENTILATING & AIR CONDITIONING (HVAC)

1. HEATING SYSTEMS - GAS FURNACE MAINTENANCE

2. What should I do to maintain my gas furnace?

3. Every three years:

   - Check operation of main gas valve, pressure regulator, and safety control valve.
   - Adjust primary air supply nozzle for proper combustion.
   - Clean thermostat contacts and adjust for proper operation.

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Printing Office, October 1977), page 63.

5. F-1

1. HEATING SYSTEM - HOT WATER MAINTENANCE

2. What should be done to maintain efficiency in a hot water heating system?

3. Your hot water heating system serviceman should:

   - Check pump operation.
   - Check operation of flow control valve.
   - Check for piping leaks.
   - Check operation of radiator valves.
   - Drain and flush the boiler.
   - Oil pump motor.

   You can do this yourself:

   - Bleed air from the system. Over time, a certain amount of air will creep into the pipes in your system. It will find its way to the radiators at the top of your house, and wherever there is air, it keeps out hot water. There is usually a small valve at the top of each radiator. Once or twice a year open the valve at each radiator. Hold a bucket under it, and keep the valve open until the water comes out. Watch out, the water is hot.
   - Draining and flushing the boiler is also something you can do yourself. Ask your serviceman to show you how.

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Printing Office, October 1977), page 63.

5. F-1

HEATING VENTILATING & AIR CONDITIONING (HVAC)

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1. HEATING SYSTEM - OIL BURNER MAINTENANCE

2. What should I do to maintain my oil burner?

3. Oil burner -- Every year:

   - Adjust and clean burner unit.
   - Adjust fuel - to - air ratio for maximum efficiency.
   - Check for oil leaks.
   - Check electrical connections, especially on safety devices.
   - Clean heating elements and surfaces.
   - Adjust dampers and draft regulator.
   - Change oil filters.
   - Change air filter.
   - Change oil burner nozzle.
   - Check oil pump.
   - Clean house thermostat contacts and adjust.

   There are several tests servicemen can use to check oil furnace efficiency:

   - Draft test to see if heat is being lost up the chimney or if draft is not enough to properly burn your oil.
   - Smoke test to see if your oil is being burned cleanly and completely.
   - CO_2 test to see if fuel is being burned completely.
   - Stack temperature test to see if stack gases are too hot or not hot enough.

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Printing Office, October 1977), page 63.

5. F-1, 101

HEATING VENTILATION & AIR CONDITIONING (HVAC)

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1. HEATING SYSTEM - STEAM, MAINTENANCE

2. What should be done to maintain efficiency in a steam heat system?

3. With steam heat, if your serviceman checks your burner, (see Furnace Maintenance A38-41) and the water system in your boiler, most of his work is done. There are two things you can do to save energy, though:

   - Insulate steam pipes that are running through spaces you don't want to heat.
   - Every three weeks during the heating season, drain a bucket of water out of your boiler (your serviceman will show you how) - this keeps sediment off the bottom of the boiler. If the sediment is allowed to stay there, it will actually insulate your boiler from the flame in your burner and a lot of heat will go up the chimney that would have heated your home.

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Pinting Office, October 1977), page 64.

5. F-1

1. HOME HEATING FUELS - TYPES OF OIL

2. What are the types of home heating oil?

3. Fuel oil for home heating is sold in two grades:

   No. 1 - (which looks like kerosene) has a heating value of 136,000 Btu per gallon. This fuel is primarily burned in vaporizing (pot-type) burners.

   No. 2 fuel oil is heavier and contains about 140,000 Btu per gallon, and is used in pressure-type or gun burners.

   Both fuels are relatively safe to handle and can be stored in indoor tanks.

4. Henry R. Spies et al., 350 Ways to Save Energy (and Money) In Your Home and Car (New York: Crown Publishers, Inc., 1974), pages 66-67.

5. 104

HEATING VENTILATING & AIR CONDITIONING (HVAC)

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1. HOME HEATING SYSTEMS - SYSTEM EFFICIENCY

2. What are the heating efficiencies of different kinds of home heating systems?

3. OVERALL HEATING EFFICIENCY

TYPE OF FUEL	METHOD OF BURNING	ASSUMED OVERALL EFFICIENCY
Bituminous Coal	Stoker-Fired	65%
Oil	Units designed for oil burning with exception of vaporizing-type without fan	80%
Oil	Vaporizing-type units without fan and units converted to oil burning	70%
Gas	Any properly designed burner	80%
Electric (in room)*	Ceiling cable, baseboards	100%
Electric (central)*	Ducted furnace, boiler	90%

*While electrical current is not a fuel, it is sometimes used to supply heat and for this reason is included in the table for comparison purposes.

4. Henry R. Spies et al., 350 Ways to Save Energy (and Money) In Your Home and Car (New York: Crown Publishers, Inc., 1974), page 66.

5. F-1, 101, 104

HEATING VENTILATING & AIR CONDITIONING (HVAC)

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1. HOT WATER - ENERGY CONSUMPTION

2. How much energy do we use to heat domestic hot water?

3. It accounts for 15% of all the energy used in the average home and 3% of all energy used in the United States.

4. Consolidated Edison Company of New York, Inc., Energy Saver 6: How to Get the Most For Your Water Heating Dollar.

5. 104, 100

HEATING VENTILATING & AIR CONDITIONING (HVAC)

1. HOT WATER HEATER - LOCATION EFFICIENCY

2. What factors should I consider when deciding where to install a new hot water heater?

3. Locate your hot water heater as close to the point of greatest use as possible. Long pipe runs waste heat by dissipation. If you cannot avoid long pipe runs, insulate the pipe, particularly pipes leading to the dishwasher, which must have sufficient hot water to sterilize your dishes and silverware. Insulating wrapping for water pipes is inexpensive and easy to install.

4. Consolidated Edison Company of New York, Inc., Energy Saver 6: How to Get the Most For Your Water Heating Dollar.

5. 104, 100

1. HOT WATER - HEATER MAINTENANCE

2. What should be done to maintain the efficiency of hot water heaters?

3. Once a year a serviceman should do the following:

   - Adjust damper (for gas or oil)
   - Adjust burner and clean burner surfaces (for oil)
   - Check electrodes (for electric)
   - De-lime tank

   You can do this yourself:

   - Once or twice a year, drain a bucket of water out of the bottom of the heater tank - sometimes it's full of sediment. The sediment insulates the water in the tank from the burner flame - that wastes energy.

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Printing Office, October 1977), page 65.

5. 100, 104

HEATING VENTILATING & AIR CONDITIONING (HVAC)

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1. HOT WATER HEATER - SIZE DETERMINATION

2. How large a hot water heater do I need for my family?

3. Minimum hot water needs for a family of two persons with one bathroom, laundry tubs and an automatic clothes washer...............30 gallons.

   For each additional person, add 3.5 gallons
   For each additional bathroom, add 3.5 gallons
   For an automatic dishwasher, add 5 gallons

   THE SIZE OF WATER HEATER FOR YOUR FAMILY IS ______________________
   (based on above information)

4. Consolidated Edison Company of New York, Inc., Energy Saver 6: How to Get the Most For Your Water Heating Dollar.

5. 104

HEATING VENTILATING & AIR CONDITIONING (HVAC)

1. HOT WATER HEATER - TEMPERATURE

2. How high should my hot water heater thermostat be set?

3. This is IMPORTANT -- Don't set your water heater any higher than you need to - your heater burns fuel keeping your water hot when you are not using it - the higher you set it, the more it burns. If you have a dishwasher, 140° is high enough - if not, 120° is plenty. Depending on the type of fuel you use, this simple setback will save you $5.00 to $45.00 a year. (You say your heater says HIGH, MED., LOW? Call your dealer and ask him which setting means 140° or 120° degrees).

   Note: settings over 140° can shorten the life of water heaters, especially those that are glass lined.

4. U. S. Department of Housing and Urban Development, Office of Policy Development and Research, Division of Energy, Building Technology, and Standards, In the Bank...Or Up the Chimney? (Washington, D. C.: U. S. Government Printing Office, October 1977), page 65.

5. 100, 104

1. OIL BURNER - EFFICIENCY LEVEL

2. How much combustion efficiency should I expect?

3. An efficiency of 80% or above is excellent. This means 80% of the heat received from the oil goes into the ho[illegible]hile only 20% is lost to the atmosphere.

   75% to 79% is good

   70% to 74% is fair

   Below 70% is poor - If the efficiency is below 70% the burner should be readjusted. If an efficiency of 70% or better cannot be achieved or if adjustment increases the smoke number significantly, the burner should be replaced. The savings in fuel cost will offset the cost of the burner over a period of time.

4. U. S. Environmental Protection Agency, Office of Public Affairs, Get the Most From Your Heating Oil Dollar (Washington, D. C.: U. S. Government Printing Office, 1976).

5. 101, 104

HEATING VENTILATING & AIR CONDITIONING (HVAC)

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1. OIL BURNERS - PRESSURE TYPE (GUN BURNER)

2. How does a pressure type or gun burner work?
What problems does it have?

3. The most common burner is the pressure type or gun burner, which contains a nozzle through which the oil is injected under high pressure. Most service problems arise in connection with this nozzle, which has an opening so small that impurities in the oil can lodge in it and seriously affect the way in which the oil spray is formed. A spark ignites the oil spray in the presence of a swirl of air and once ignited, the flame continues without further need for the spark.

4. Henry R. Spies et al., 350 Ways to Save Energy (and Money) In Your Home and Car (New York: Crown Publishers, Inc., 1974), page 67.

5. 104, F-1, 101

1. OIL BURNER - SERVICING SAVINGS

2. How much money can I save by having my oil burning equipment serviced annually?

3. The amount a homeowner could save will vary depending on the geographical location, present condition of the heating equipment, the price of fuel, and other factors.

For example: a homeowner burning 1300 gallons of oil per year in a very inefficient heating system could save $130.00 in fuel costs at a price of 40¢ per gallon with proper servicing. This is a 25% savings in the total fuel bill as the efficiency of the oil burner is increased from 60% to 80%.

4. U. S. Environmental Protection Agency, Office of Public Affairs, Get the Most From Your Heating Oil Dollar (Washington, D. C.: U. S. Government Printing Office, 1976).

5. 101, 104

HEATING VENTILATING & AIR CONDITIONING (HVAC)

1. OIL BURNER - TESTING MEASUREMENTS

2. What should the values of CO_2, net stack temperature, smoke number, and stack draft be?

3. A new oil burner with a properly matched furnace or boiler should operate with a minimum of 10% CO_2 at a maximum smoke No. of 1. The following table provides a general range for a typical (gun-type) oil burner:

CO_2 (%)	11	Excellent
	9	Average
	6	Poor
Smoke Spot Number	0	Excellent
	1	Excellent
	2	Good
	3	Average for untuned burners
	4	Poor
	5+	Unacceptable
Net Stack* Temperature	400 to 600	Average for original equipment**
	600 to 700	Average for replacement burner**
Stack Draft (A measure of inches of water on gauge)	0.04 to 0.06	Average for non-forced draft units. For forced units and other types, follow recommendation of manufacturer.

*Net Stack Temperature is actual stack temperature minus furnace room temperature.

**Higher temperatures require adjustment.

4. U. S. Environmental Protection Agency, Office of Public Affairs, Get the Most From Your Heating Oil Dollar (Washington, D. C.: U. S. Government Printing Office, 1976).

5. 101

HEATING VENTILATING & AIR CONDITIONING (HVAC)

1. <u>OIL BURNER - TESTING - WHO DOES IT</u>

2. If my service technician does not measure CO_2, smoke number, stack temperature, and draft, what should I do?

3. Ask the company to send someone who will test your system. If they do not make these tests call:

   On Long Island: The Oil Heat Institute of Long Island (516) 935-2400. They will put you in contact with a company that will perform these tests for you.

   Otherwise: The National Oil Fuel Institute, Inc.
   1707 H Street, N. W.
   Washington, D. C. 20006
   202 331-1198. They will put you in contact with the appropriate local heating oil marketing and equipment manufacturers' association, who will be happy to locate a company for you.

4. Center for Energy Policy and Research, New York Institute of Technology, <u>Referral Service.</u>

5. 101

HOME APPLIANCES

1. ELECTRIC BLANKETS

2. Do I save energy by using my electric blanket?

3. Basically, the decision is between the use of about 175 to 200 watts on an intermittent basis and the much larger energy savings that result from lowering the entire house temperature and applying heat directly to the bed.

4. Henry R. Spies et al., 350 Ways to Save Energy (and Money) In Your Home and Car (New York: Crown Publishers, Inc., 1974), page 54.

5. 104

1. "INSTANT ON" T.V.

2. Do "instant on" T. V.'s use more energy?

3. YES! They use energy even when the screen is dark.

   To eliminate this waste; plug the set into an outlet that is controlled by a wall switch and use this switch to turn the set on and off; or have your TV service man install an additional on-off switch on the set itself or in the cord to the wall outlet.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), page 27.

5. 104

HOME APPLIANCES

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1. MICROWAVE OVENS

2. Do microwave ovens use less energy?

3. The only way one is likely to make a significant energy saving is to use the microwave oven almost exclusively (most owners) use their ovens as supplemental cookers. A microwave oven does use less energy than conventional ovens on comparable cooking tasks. Since you would use less water with the microwave oven it might be more efficient than a range top burner in cooking fresh vegetables for example. But the microwave oven does not always save energy. Heating up soups or sauces on the range-top could use about the same amount of energy as doing it in the microwave oven. To help save energy, use the refrigerator to defrost food not the microwave oven. That is a needless waste of energy.

4. "Microwave Ovens", Consumer Reports, June 1976, pages 316 - 317.

5. 085

1. MICROWAVE OVENS--EFFICIENCY

2. How efficient are microwave ovens compared to conventional ranges?

3. The efficiency of the microwave cooking system in converting energy into microwave energy, which is then absorbed by the food, is about 45%. However, because only the food is heated, and water or air is not needed to transmit the heat to the food, it may be much more efficient than surface or oven cooking.

4. Henry R. Spies et al., 350 Ways to Save Energy (and Money) In Your Home and Car (New York: Crown Publishers, Inc., 1974), page 114.

5. 085

HOME APPLIANCES

1. MICROWAVE OVENS -- HOW THEY WORK

2. How does a microwave oven work?

3. An electronic cooking unit, whether built into a conventional appearing range or installed as a separate counter-top appliance, cooks food by using high frequency radio waves -- about the same as radar -- in order to violently shake water molecules, which generate heat. Of course, these ovens will only heat items that contain moisture. They will not heat dishes, pans and so on. The presence of metal shields the food from the radio waves, so foil and metal should not be used.

4. Henry R. Spies et al., 350 Ways to Save Energy (and Money) In Your Home and Car (New York: Crown Publishers, Inc., 1974), page 114.

5. 104

1. SMALL APPLIANCES VS. A RANGE

2. Are small cooking appliances more efficient than using the range?

3. The various single purpose cooking appliances common to a household, such as toasters, coffee makers, waffle irons, and so on, are usually just as efficient, if not more so than the conventional range, because they are specifically designed for one purpose and can incorporate automatic controls and special features that cannot be built into the general purpose range or oven. The one possible exception to this statement is the tabletop oven or broiler (not microwave), which may be more efficient for small items or short cooking times, but it is not as well insulated as the range oven and will lose more heat to the room when used for long periods of time.

4. Henry R. Spies et al., 350 Ways to Save Energy (and Money) In Your Home and Car (New York: Crown Publishers, Inc., 1974), page 115.

5. 104

HOME APPLIANCES

1. SMALL APPLIANCES -- COSTS

2. How much, on the average, does it cost to run my appliances?

3.

Appliance	Average Costs
Refrigerator (single door)	
12 cu.ft. manual defrost	18¢ a day
Refrigerator/Freezer (two door)	
14 cu.ft. cycle defrost	31¢ a day
14 cu.ft. frostless	47¢ a day
18 cu.ft. frostless	47¢ a day
Freezer	
15 cu.ft. chest/manual defrost	34¢ a day
16 cu.ft. upright/manual defrost	44¢ a day
16 cu.ft. upright/frostless	60¢ a day
Dishwasher*	5¢ per use
Toaster	4 slices for 1¢
Coffee Maker	
Brew	1¢ per pot
Keep warm	6/10 of 1¢ per hour
Blender	47 uses for 1¢
Mixer (hand)	18 uses for 1¢
Television	
Color	3¢ per hour
Black & White	2¢ per hour
Light Bulb	
100 Watt	1.2 hours for 1¢
60 Watt	2 hours for 1¢
25 Watt	4.7 hours for 1¢
Room Air Conditioner**	13¢ per hour
Electric Blanket	9¢ per night
Clock	15¢ per month
Vacuum Cleaner	5¢ per hour
Dryer	26¢ per load
Iron	5¢ per hour
Washing Machine*	2¢ per load

HOME APPLIANCES

SMALL APPLIANCES -- COSTS (continued)

NOTE: THESE ARE ONLY AVERAGE COSTS AFTER THE FIRST 10kWh*** AND ARE BASED ON APRIL 1976 CON EDISON RATES AND FUEL CHARGES. YOUR ACTUAL COSTS WILL DEPEND ON THE SIZE AND EFFICIENCY OF YOUR APPLIANCE AND HOW YOU USE IT.

*Cost of heating hot water NOT included.

**A 10,000 btu unit with an energy efficiency ration (EER) of 8 would each cost about this much to operate on a 95° day with the compressor running continuously.

***All customers pay a minimum charge of $3.27 which includes the first 10 kWh.

4. Consolidated Edison Company of New York, Inc., Customer News, June 1976.

5. 104

ENERGY MANAGEMENT

1. ASSIGNING RESPONSIBILITIES

2. What should I do to assign responsibility?

3. Accomplishing any program requires, first, above all else, the commitment of people...yourselves as owners and managers...and the commitment and cooperation of operating people, maintenance people and building users.

Everyone involved must be committed to the concept of energy conservation in order to accomplish a successful program and to make a contribution to the national goal of energy independence. To initiate a program, an individual, or a committee, must be given top management's full support and be assigned the responsibility and accountability for planning and carrying it out.

4. Federal Energy Administration, An Energy Management Program for Commercial Building

5. 073, 074, 058

ENERGY MANGEMENT

1. BUILDING SURVEY

2. What is involved in doing a building survey?

3. After you have completed the documentation of past energy use, it is time for a personal tour. You should conduct a walk-through survey to determine the existing condition and uses of the building and the operation and performance of energy using systems. You may want to call in an outside consulting engineer for the survey. In any event, whoever performs it must be expert enough to recognize a possible source of wasted energy.

   Inspect each and every energy user. With regard to mechanical equipment, ask your maintenance engineer what its purpose is, how it operates, how frequently it runs, and what other equipment it depends on, or depends on it. From this you can determine where the opportunities for energy conservation exist. In many cases significant waste can be eliminated through repair of faulty equipment and improved maintenance and operating practices. These opportunities will not adversely affect the working environment and business equipment required by tenants. You will find that many options are available, some that require little change from current procedures, others involving modifications much broader in scope. You will also find there can be a world of difference between "on paper" building design and equipment performance and what you will see in actual practice. At this stage, you might also invite representatives of your utility companies and equipment manufacturers to visit your building. Ask utility representatives for their recommendations on how you might cut down on your energy use.

   This survey should result in a thorough report that details each and every energy-using fault of the building and its equipment and the opportunities and methods for correcting them.

4. Federal Energy Administration, An Energy Management Program for Commercial Buildings.

5. 073, 074, 058

ENERGY MANAGEMENT

1. PROGRAM IMPLEMENTATION

2. What should I do to implement these actions?

3. In order to implement the program, everyone involved must be informed about what is going on, what is to be done and how it affects them. You or your representatives should meet with tenants personally to explain what they must do to cooperate and how they will benefit. Also, use strategically placed signs reminding people to take certain energy-saving actions. You can help your maintenance and operating people improve their efficiency by providing them with technical guidance from numerous sources; equipment manufacturers' manuals; supplier-sponsored courses; education and training courses from local colleges or consulting engineering firms; and others.

4. Federal Energy Administration, An Energy Management Program for Commercial Buildings.

5. 073, 074, 058, 002

1. PROGRAM MONITORING

2. Do I need to monitor this program?
What is involved?

3. Implementing an energy conservation program is not a "One-shot deal". While certain initial actions must be taken, true effectiveness can be obtained only when the program is managed on a year-round basis. One way to monitor progress is to chart your monthly energy use for the past 12 months and mark your current year's monthly goal for energy use. Then keep track of your actual energy used and mark it on the chart on a month-by-month basis. You will be able to see how close you are to being on target each month. If changes are required in your plan to meet the goal, you can take corrective action during the year to obtain extra savings without interrupting service or affecting the comfort of your tenants.

4. Federal Energy Administration, An Energy Management Program for Commercial Buildings.

5. 073, 074, 058, 002

ENERGY MANAGEMENT

1. SAVINGS POSSIBLE

2. How much can energy management save?

3. Conservation programs undertaken during the past three years in thousands of commercial, institutional, and residential buildings have already saved 20 - 50% of fuel and the electricity used annually. It is possible to realize such savings in other kinds of buildings too. These energy management programs are realistic and beneficial. They can be helpful to you as well.

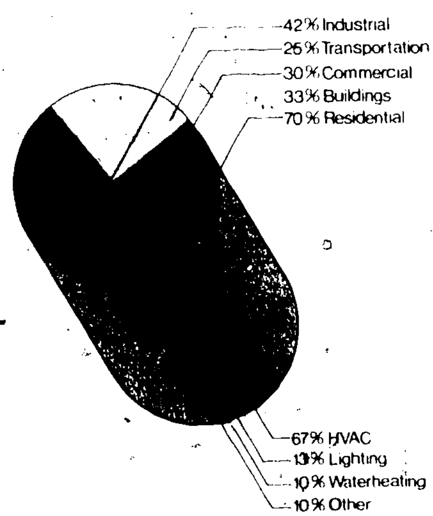
4. Federal Energy Administration, An Energy Management Program for Commercial Buildings.

5. 058, 073, 074

1. ENERGY USE

2. How is energy used in commercial buildings?

3.



4. Federal Energy Administration, An Energy Management Program for Commercial Buildings.

5. 058, 073, 074

SOLAR

1. <u>ABSORBED HEAT, USES (LOW-GRADE HEAT)</u>

2. What can the heat absorbed by the collectors be used for?

3. The heat can be used for numerous residential, commercial, industrial, and agricultural processes which require a fairly low grade of heat. For example, the heat absorbed by these collectors can heat buildings, dry laundry, heat water, cool buildings, produce low-temperature process steam, dry grain, desalinate seawater, heat swimming pools, dry lumber, melt snow, etc.

4. Sunworks Inc., <u>Solar Energy Q's and A's</u>, 3rd printing, 1975.

5. 025, 026, 061, 060, 062, A-9

1. <u>ABSORBER -- SELECTIVELY BLACKENED SURFACE</u>

2. What is a selectively blackened absorber?

3. The absorber is the component of the collector that gets hottest. It is blackened for maximum absorption of the sun's energy. Two types of black may be used: one is a flat black; the other, a selective black. Flat black paint, of the type that comes in a spray can, for instance, has long been used to blacken collector absorbers. It has an absorptivity in the solar radiation region of the spectrum of about .95 and an emissivity in the thermal radiation region of the spectrum of about .95; that is, it also re-radiates heat at a significant rate. A selectively blackened absorber has a absorptivity in the solar region of the spectrum of about .90 and an emissivity in the thermal region of the spectrum of about .10 or less. Thus, a selective surface improves the efficiency of the collector significantly because of its low emissivity. For example, when operating at a 100^{o} F. temperature difference between collector absorber and outside air, a collector using a selective surface and single glass cover has about 15 to 20 per cent higher daily efficiency than a collector using a flat black absorber surface and a double glass cover.

4. Sunworks Inc., <u>Solar Energy Q's and A's</u>, 3rd printing, 1975.

5. 025, 026, 060, 061, 062, A-9

SOLAR

1. AIR VS. LIQUID-PROS VS. CONS

2. What are the advantages and disadvantages of using air vs. water systems?

3. AIR

Advantages

Moderate cost.

No freezing problems.

Minor leaks of little consequence.

As air is used directly to heat the house, no temperature losses due to heat exchangers (devices which transfer heat from one fluid to another), when the system is used to space heat.

No boiling or pressure problems.

Disadvantages

Can only be used to heat homes; cannot presently be economically adapted to cooling.

Large air ducts needed.

Larger storage space needed for rocks.

Heat exchangers needed if system is used to heat water.

WATER OR LIQUID

Advantages

Holds and transfers heat well.

Water can be used as storage.

Can be used to both heat and cool homes.

Compact storage and small conduits.

Disadvantages

Leaking, freezing and corrosion can be problems.

Corrosion inhibitors needed with water when using steel or aluminum. There are liquids which are non-corrosive and nonelectrolytic; however, they are toxic and some of them are flammable.

A separate collector loop using a nonfreezing fluid and a heat exchanger or, alternatively, a draining water or inhibited water system, are required to prevent freezing. In warm regions, where freezing is infrequent, electric warmers can be used.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page 10.

5. 025, 026, 060, 061, 062, A-9

SOLAR

1. APPEARANCE, INTERIOR

2. Does the use of solar heating alter the appearance of the interior of the building in any way?

3. No. Since conventional means of distributing the heat are used, there is no way to detect from the interior of a building that it is solar heated.

4. Sunworks Inc., Solar energy Q's and A's, 3rd printing, 1975.

5. 025, 026, 061, 062, A-9

1. BACKUP SYSTEMS, THE BEST

2. What are the best back-up systems for solar house heating?

3. The best choice depends on the installation. For a new house, an over-sized water heater would be a good choice. For a large office building-a full sized furnace or boiler would be required. Heat pumps may also be used.

4. Sunworks Inc., Solar and energy Q's and A's, 3rd printing, 1975.

5. 025, 026, 060, 061, 062, A-9

SOLAR

1. COLLECTOR (ANGLE, ORIENTATION)

2. At what angle and orientation do the collectors work most efficiently?

3. The angle at which the collectors must be tilted to the sun depends on both the application and the latitude. In general, for space heating alone the optimum angle of inclination from the horizontal can be calculated by adding 15° to the local latitude. Thus, for a heating system installed at 42° N. latitude, the collectors should be tilted at an inclination of 57° from the horizontal. For a system that is to be used year round such as for domestic water heating and air-conditioning, the optimum inclination is equal to the local latitude. Collectors can also be mounted on a vertical south-facing wall. This minimizes the buildup of heat in the collectors during the summer when heating is not needed. However, a somewhat greater area of collector would be required for a vertical installation to perform equally to optimum collector tilts. Also this type of installation is not suitable for domestic water heating. The optimum orientation for flatplate solar collectors is slightly west of due south. However, the collectors can be orientated as much as 20° off south and still function fairly well. Any deviation from due south can be compensated for by increasing the collector area. Magnetic variations in different parts of the U. S. should be calculated accurately in order to locate true south.

4. Sunworks Inc., Solar Energy A's and A's, 3rd printing, 1975.

5. 025, 026, 061, 062, A-9

1. COLLECTOR ANGLE-SPACE HEATING & COOLING

2. Is there a difference in the angle for heating and cooling?

3. If your solar system is for heating and cooling, the most optimum angle is near the latitude. If the system is for cooling only, you should mount the collector at an angle about 10 to 15 degrees less than the latitude.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page 4.

5. 025, 026, 060, 061, 062, A-9

SOLAR

1. COLLECTOR ANGLE-SPACE HEATING ONLY

2. Does a solar collector have to be positioned at any certain angle?

3. The tilt of a collector can increase its ability to capture the sun's rays. During the winter season, the most optimum angle is the latitude of an area plus 10 to 15 degrees; in the summer it is the latitude minus 10 to 15 degrees. However, the tilt can be off as much as 10 degrees and not have a major adverse effect on the collector's capability. The collector, of course, must face South. If a solar system is designed for heating, the collector surface in most instances should be nearly perpendicular to the sun's rays in the middle of January, generally the coldest days of the year. This is usually an effective position for capturing the sun's rays. This perpendicular position is the sum of your latitude plus 15 degrees.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page 3.

5. 062, 061, 026, A-9, 025

1. COLLECTOR AREA NEEDED

2. How much collector area is needed to heat a structure?

3. The amount of collector area varies considerably with the climate, the efficiency of the collector, and the heating requirements of the building. In general, in the colder climates such as New England one would need a collector area equal to 30 to 40 percent of the total heated floor area of a well-insulated structure in order to carry about 75% of the space heating load. In warmer or sunnier climates, less collector area is needed.

4. Sunworks Inc., Solar Energy Q's and A's, 3rd printing, 1975.

5. 025, 026, 060, 061, 062, A-9

SOLAR

1. COLLECTOR - CONCENTRATING VS. FLAT PLATE

2. What is the difference between concentrating and flat plate collectors?

3. Concentrating collectors can only collect direct solar radiation, so they are not much good on cloudy days. Flat plate collectors do not have this limitation and can pick up diffused radiation. The extra cost of the reflector must be weighed against the Btu's on sunny days only.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page 4.

5. 025, 026, 061, 062, A-9

1. COLLECTOR - DEFINITION

2. What is a solar collector?

3. It is a device for intercepting the sun's rays and converting them directly to some conveniently transportable form of energy. A solar heat collector absorbs the sun's energy and converts it to heat. A photovoltaic collector uses the sun's rays to produce electricity.

4. Sunworks Inc., Solar Energy Q's and A's, 3rd printing, 1975.

5. 025, 026, 060, 061, 062, A-9

1. COLLECTOR - EFFICIENCY

2. What is meant by the efficiency of a collector?

3. The consumer is likely to hear a lot about the efficiency of a collector, and by this is meant the ability of the collector to capture the sun's power. For instance, if it is said that a collector has a 50% efficiency, that means that under certain conditions, the collector captures 50% of the total energy hitting the surface of the collector.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page 4.

5. 025, 026, 060, 061, 062, A-9

SOLAR

1. COLLECTOR-FLAT PLATE (OPERATION)

2. How does a flat-plate solar-heat collector work?

3. A fluid such as water or air passes through the collector, picks up the sun's heat from the hot absorber surface and transports that heat away from the collector. The heated fluid can be used directly or it can give up its heat to a storage container.

3. Sunworks Inc., Solar energy Q's and A's, 3rd printing, 1975.

4. 025, 026, 060, 061, 062, A-9

1. COLLECTOR FLUID-FREEZING

2. What prevents the liquid in the collectors from freezing at night?

3. The system can be designed so that the heat transport fluid drains into a container where it won't freeze. Or, anti-freeze can be added to the fluid so it can remain in the collectors during the night.

4. Sunworks Inc., Solar energy Q's and A's, 3rd printing, 1975.

5. 025, 026, 061, 060, 062, A-9

1. COLLECTOR LOCATION

2. Do the collectors have to be mounted on a roof?

3. No. Although they are most commonly mounted on the roof, collectors can be placed on a wall of a building or on a separate structure or on the ground.

4. Sunworks Inc., Solar energy Q's and A's, 3rd printing, 1975.

5. 025, 026, 061, 060, 062, A-9

SOLAR

1. COLLECTOR-MIRRORS OR LENSES, USE OF

2. Are mirrors or lenses used to concentrate the sun's rays in this type of collector?

3. No. Mirrors or lenses are used only in concentrating collectors. Concentrating collectors can achieve higher temperatures than flat-plate collectors but can use only direct solar radiation. The direct rays of the sun may be considered parallel and thus easily focused. Such collectors are not efficient absorbers for incident solar radiation that is reflected from the atmosphere and the earth's cloud cover. This radiation is non-parallel, i.e., diffuse. Thus, concentrating collectors work effectively in areas which have a good deal of direct solar radiation, such as the Southwest. However, in many parts of the United States, a large portion of the total solar radiation is diffuse. (In parts of New England, for example, as much as 40 percent of the winter radiation is diffuse). In contrast to concentrating collectors, flat-plate collectors can utilize both direct and diffuse radiation.

4. Sunworks Inc., Solar energy Q's and A's, 3rd printing, 1975.

5. 025, 026, 060, 061, 062, A-9

1. COLLECTOR-ORIENTATION (POSITION)

2. What position must the solar collector be oriented?

3. The ideal position of the collector for the greatest annual and seasonal energy recovery is facing due South. However, a variation of as much as 15° in either direction will not significantly reduce the efficiency of the collector.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page 4.

5. 025, 026, 061, 062, A-9

SOLAR

1. COLLECTOR - PRINCIPAL COMPONENTS

2. What are the principal components of the flat-plate solar-heat collector?

3. The collector consists of a copper absorber plate covered by glass. Below the glass is an air space, then a selectively blackened absorber plate. In the liquid-type collector, tubes are imbedded in the absorber plate. These tubes carry the liquid to be heated. In the air-type collector, air passes through a duct attached to the rear of the absorber. Behind the assembly is a layer of insulation and a metal casing.

4. Sunworks Inc., Solar energy Q's and A's, 3rd printing, 1975.

5. 025, 026, 060, 061, 062, A-9

1. COLLECTOR-QUALITY DETERMINATION

2. Is there any way of determining the quality of a solar collector?

3. Determining the quality of a collector is a very complex process and one which only a qualified engineer should undertake.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page 4.

5. 025, 026, 060, 061, 062, A-9

SOLAR

1. COLLECTORS & SHADE

2. Of what concern is the possible shading of the collectors?

3. Obviously, the collectors cannot function properly if they are in shadow most of the day. For most applications it is desirable that the collectors have an unobstructed view of the sun for at least six hours; ideally this would occur three hours on either side of solar noon. When planning a solar installation, a careful check should be made to determine whether or not the collectors would be shaded from the low December sun by nearby terrain, buildings (including the building to which they will be attached), evergreens, other rows of collectors, and the like.

4. Sunworks Inc., <u>Solar energy Q's and A's</u>, 3rd printing, 1975.

5. 025, 026, 060, 061, 062, A-9

1. COLLECTORS AND SNOW

2. What happens if a heavy snow blankets the collectors?

3. In the latitudes where it snows frequently, the collectors will generally be inclined at a sharp angle (50° or more) which will help keep snow from accumulating. If it does stick, snow is still sufficiently transparent to sunlight for depths less than six inches, and the sun will penetrate to the collector, warm it sufficiently to melt the layer of snow closest to the glass, and help it to slide off. If a deep blanket of snow falls, hot water can be circulated through the collectors from the storage tank to melt the snow and cause it to slide off.

4. Sunworks Inc., <u>Solar energy Q's and A's</u>, 3rd printing, 1975.

5. 025, 026, 060, 061, 062, A-9

SOLAR

1. COLLECTOR, SUN TRACKING

2. Can collectors be mounted to follow the sun?

3. Yes, but the framework and mechanism for tracking the sun must, at this time, be provided by the purchaser. Although sun-tracking does boost the efficiency of the collector, this type of installation may require more roof or ground surface area, more maintenance and is more expensive than fixed mountings. The collectors can be mounted to follow the sun on one or two axes. In a one axis mounting, the collector can rotate about a vertical (north-south) axes or about a horizontal (east-west) axis. The most desirable axes of rotation depends on the application and the latitude. The most effective form of sun-tracking is the polar mount which rotates in both the north-south and east-west axis. Polar mounting, or heliostatic mounting as it is sometimes called, enables the collectors to receive the maximum solar radiation - 30 to 40% more sunshine than the fixed mounting allows - and can improve the total output of the collector by as much as 70%. In some cases, this increased output can justify the additional cost of the mounting and tracking equipment and its maintenance.

4. Sunworks Inc., Solar Energy Q's and A's, 3rd printing, 1975.

5. 025, 026, 060, 061, 062, A-9

1. COLLECTOR TEMPERATURES

2. How hot does the collector get?

3. The temperature attained by the collector depends both on the amounts of solar energy striking it at a given time and on the rate at which heat is being transported from the collector. In general, on a clear day it is possible to attain temperatures 100° - 150° F. above the outside air temperature. Thus, on a hot summer day, temperatures above the boiling point of water can be produced. During periods when there is no flow through the collectors they can attain temperatures of 400° F.

4. Sunworks Inc., Solar energy Q's and A's, 3rd printing, 1975.

5. 025, 026, 060, 061, 062, A-9

SOLAR

1. COLLECTORS-TYPES & QUALITIES OF MATERIAL

2. Which type of collector is the best; aluminum, copper or stainless steel?

3. Copper is more expensive, but it can be used with most potable waters without inhibitors. Steel and aluminum are more economical, but inhibitors must be added to prevent corrosion in most systems. Copper will hold up over a long time without inhibitors, while steel and aluminum will fail quickly unless they have special coatings. In inhibited water, all three will last indefinitely as long as the inhibition is maintained. All three will hold up indefinitely in suitable non-aqueous, nonfreezing, heat transfer fluids.

Steel and aluminum must be electrically isolated from each other and from copper to avoid galvanic corrosion. Isolation is obtained by using insulated rubber or plastic connections to join dissimilar metals.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page 5.

5. 025, 026, 060, 061, 062, A-9

1. COMMERCIAL BUILDING USES

2. Is solar space heating and hot water feasible for commercial buildings? How much will it provide - What is the cost and payback?

3. Yes, solar energy systems are available for commercial buildings. For a 10,000 square foot building in the New York, New Jersey and Connecticut Metropolitan area, 3,330 sq. ft. of collectors and a 5,000 gallon energy storage tank will provide 71% of the space heating and hot water energy needs. For a building in this area it is possible to save 2,988 gallons of oil annually which is equivalent to $1,195.00 at 40¢/gallon, or 78,500 kwh of electricity annually, which is equivalent to $3,530.00 at 5¢/kwh. The cost of the solar system will be in the range of $33,000 - $99,000.00. Hence depending upon the initial cost of the system, the payback period can be anywhere between 10 - 30 years.

4. U. S. Energy Research and Development Administration, Division of Solar Energy, Solar Energy for Space Heating & Hot Water (Washington, D. C.: U. S. Government Printing Office, May 1976), pages 6 - 13.

5. 061, 062, 060, 025, 020, A-9

SOLAR

1. COMPONENTS -- MAJOR HEATING

2. What are the major components of a solar heating system?

3. A solar heating system is made up of collectors, a heat storage container, a heat distribution system, and an auxiliary heater. It also includes various heat exchangers, controls, pumps, and piping.

4. Sunworks, Inc., Solar energy Q's and A's, 3rd printing, 1975.

5. 025, 026, 060, 061, 062, A-9

1. CONSIDERING SOLAR - WHAT TO LOOK FOR

2. Why should I consider a solar heating system for my home?

3. There are four reasons why you should consider installing such a system in your home:

   a) You will have long-term savings

   b) Your home may have a higher resale value as conventional energy prices increase

   c) You will conserve energy and

   d) Your system will be ecologically safe and clean.

   Depending on your location, about 55% [illegible] the energy needed to run your home will be used for space heating, about 15% for hot water. If some of the non-renewable fossil fuels used to generate that energy could be put to other uses, our oil and gas supplies will last longer and provide more time to develop other energy sources.

4. U. S. Department of Housing and Urban Development, Solar Energy and Your Home (Washington, D. C.: U. S. Government Printing Office, June 1977), page 4.

5. 025, 026, 060, 061, 062, A-9, 098

SOLAR

1. COOLING

2. Can solar energy cool as well as heat buildings?

3. Yes, the collectors can provide sufficient heat to run liquid absorption cooling units. At present, solar cooling is in a more developmental stage than solar heating. A number of solar cooling experiments have been successfully conducted but the only equipment currently commercially available for solar cooling is for installation above a 20 ton cooling requirement. Since the average house has a cooling requirement of three to five tons, only larger buildings or clustered housing can be cooled at present with solar-powered absorption systems. Smaller residential-sized liquid absorption units will probably become available once sufficient demand has been demonstrated.

4. Sunworks Inc., Solar energy Q's and A's, 3rd printing, 1975

5. 025, 026, 060, 061, 062, A-9

1. COST VS. CONVENTIONAL

2. Why is solar heating more expensive than conventional heating systems?

3. There are two main reasons. First, the cost of the solar collectors, the heat storage container, and the necessary piping and controls must be added to the cost of the conventional system which serves as the back-up. Second, because the solar energy industry is in its infancy and production volumes are low, the cost of the equipment is higher than it will be as volume increases. Still, the cost of equipment is paid back in operating savings in a relatively short time - which will be getting shorter as conventional fuel costs increase.

4. Sunworks Inc., Solar energy Q's and A's, 3rd printing, 1975.

5. 025, 026, 060, 061, 062, A-9

SOLAR

1. COSTS -- HOW MUCH FOR HOME HEATING

2. How much does a solar heating system for a house cost?

3. The initial cost of a solar heating system is presently somewhat more than 2.5 times that of an oil-fired hot water system and three or four times as much as an electric resistance heating system. The lower operating cost is obviously the attractive feature of the solar energy system since the only cost involved is that of the fuel for the back-up system and the electricity to run the pumps and fan. The monthly operating cost depends heavily on the design of the specific system and on the prevailing cost of the fuel for the auxiliary heater. In general, when compared with electric heating the operating savings of a solar heating s[illegible] pay back the original cost of the solar equipment in 4 to [illegible]e payback time is somewhat longer when compared with oil heat[illegible]pment between 8 to 10 years. These figures are based on $0.0[illegible]kw[illegible] electricity and $0.40/gal for fuel oil and a fuel cost escalation rate of 10 percent a year.

4. Sunworks Inc., Solar energy Q's and A's, 3rd printing, 1975.

5. 025, 026, 060, 061, 062, A-9

1. DESIGN CONSIDERATIONS

2. Why aren't solar systems designed for 100% of anticipated heating demand?

3. For cost effective reasons, most active solar systems are not designed to handle all the anticipated demand. If, for instance, a solar system were designed to handle 100% of the heating load during the middle of the winter, the collector and storage system would have to be large enough to provide energy for extended periods when the sun doesn't shine. As these expanded units would only be used during limited periods, the extra cost normally isn't justified by the savings in fuel cost.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page 9.

5. 025, 026, 020, 061, 062, A-9

SOLAR

1. DIFFICULTIES -- OPERATIONS

2. Is it difficult to operate a solar heating system?

3. No! The system is completely automatic. The occupant merely sets the thermostat to a desired setting as with conventional heating systems.

4. Sunworks Inc., Solar Energy Q's and A's, 3rd printing, 1975.

5. 025, 026, 060, 061, 062, A-9

1. ECONOMICS

2. Space heating and domestic hot water savings, cost payback, collector space?

3. Between 50 - 80% of the yearly heating and hot water requirements can be supplied by solar energy. For a 1500 sq. ft. house in the New York, New Jersey and Connecticut Metropolitan area, [illegible]00 sq. ft. of collectors and a 750 gallon storage tank will provide 72% of the heating and hot water energy needs. For a house in this area it is possible to save 612 gallons of oil annually which is equivalent to $245.00 at 40¢/gallon, or 16,000 kwh of electricity annually which is equivalent to $720.00 at 5¢/kwh. The cost of the solar system will be in the range of $5,000.00 - $15,000.00. Hence depending upon the initial price of the system, the payback period can be anywhere from 8 - 24 years, however, you must remember that the increased prices of oil, natural gas and electricity will make this an even more feasible endeavor.

4. U. S. Energy Research and Development Administration, Division of Solar Energy, Solar Energy for Space Heating & Hot Water (Washington, D. C.: U. S. Government Printing Office, May 1976), pages 6 - 13.

5. 025, 026, 060, 061, 062, A-9, 098, 097

SOLAR

1. ENGINEERS, CONTACT

2. How can I contact a reliable solar engineer?

3. One of your best bets is to call a local engineering university and ask to speak to one of the professors about solar energy. Tell the professor you want to hire an advisor who is knowledgeable in the area. Generally, these instructors have a good idea of who is good in a local community. Failing that, contact one of the local engineering societies (such as the American Institute of Architects, the Society of Mechanical Engineers, or the American Society of Heating, Refrigeration, and Air Conditioning Engineers) and ask for a list of engineers who are knowledgeable about solar. When you make contact with those who are on the list, ask for references as to their previous work in the field.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page 27.

5. 025, 026, 060, 061, 062, A-9

1. EQUIPMENT - APPLICATION ECONOMICS

2. What is the most economical application of solar energy equipment?

3. Nearly all applications are economical in that conventional fuels are saved by using solar energy. However, the initial cost of solar equipment is high in relation to conventionally fueled equipment. Thus the economic attractiveness of using solar energy is viewed in terms of how many years are required to pay back the extra cost of the solar equipment with fuel savings. The payback period depends upon the application. If solar energy can be used year round, such as for domestic water heating, then the payback time is shorter than if it were used only half the year, such as for space heating. In fact, domestic water heating is one of the most attractive applications of solar energy because it has a short payback time and does [illegible] collector area. If fuel costs continue to increase [illegible] ods will be even shorter.

4. Sunworks Inc., Solar Energy [illegible] ing, 1975.

5. 025, 026, 060, 061, 062, A-[illegible] 098

SOLAR

1. EQUIPMENT EXISTING BUILDING INSTALLATION

2. Can solar energy equipment be installed in an existing building?

3. Yes! The nature of the building determines how the solar energy system will be installed and how much it will cost. The simplest installation is one that provides only domestic hot water. The collector area for domestic water heating for an average residence is on the order of one sq ft. per gallon of hot water required per day. In certain localities having a high percentage of cloud cover two or even three sq. ft. of collectors may be required per gallon of hot water per day. The average adult in the United States uses 20 gallons of hot water per day. The collectors for a small area such as this can usually be installed quite easily, and, in many cases, the existing domestic water heater can be used to serve as an auxiliary heater. The installation of solar energy equipment to heat and/or cool existing buildings is more complex.

If the roof area, orientation, and inclination meet the earlier stated criteria, the collectors can be mounted on the roof or even made part of the roof. If the roof orientation and slope are not acceptable, other methods of mounting the collectors must be devised. They might, for instance be made into a fence mounted on a garage or mounted vertically on a South wall. Space must also be provided for the heat storage container which in standard residential installations could be a 1500 gallon tank, roughly five feet in diameter by 10 feet long. This might be placed in a garage, a basement or even be buried in the ground. In most cases the existing furnace or boiler can be used as the source of auxiliary heat. If the boiler or furnace is in poor condition and needs replacement, then an oversized domestic water heater can be used as the replacement. This auxiliary heater must be sized to handle the total domestic hot water and space heating load for the building. The existing heat distribution system can be used if it is a forced air system sized for air conditioning, although some modifications will have to be made to the fan/coil unit. If the existing system is sized for forced warm air only, it is too small for effective solar heating and should be replaced with larger ducts. If the existing heat distribution system is hot water/baseboard radiation, it cannot be used unless the baseboard radiation area is increased approximately three to four times, which would probably be undesirable architecturally as well as economically. If the existing heat distribution system is hot water radiant, solar heating can be tied in very easily. If the existing system utilizes a heat pump then solar energy can effectively augment the performance of the heat pump.

4. Sunworks Inc., <u>Solar energy Q's and A's</u>, 3rd printing, 1975.

5. 025, 026, 060, 061, 062, A-9

SOLAR

1. GRANTS OR LOANS

2. Are there any grants or loans available for residential sector?

3. Individually-owned solar projects are not expected to provide as much information or impetus to the developing solar industry as projects by builder/developers and local housing authorities. For this reason, the Department of Housing and Urban Development has restricted awards to builder/developer projects with no pre-identified owners. To receive information on this program, write:

Solar Energy Program
HUD
Room 8158
Washington, D. C. 20410

4. U. S. Energy Research and Development Administration, Office of Public Affairs, I've Got a Question About Using Solar Energy (Washington, D. C.: U. S. Government Printing Office, 1976), page 4.

5. 025, 026, 060, 061, 062, A-9

1. HEAT PUMP

2. Can a heat pump be used in conjunction with a solar home heating system?

3. Yes! Some manufacturers are combining solar systems with heat pumps for the purpose of reducing electricity costs. A heat pump is a device that has the capacity to extract heat from either cool air or cool liquid and increase the temperature to a useful level for heating.

One key advantage to the utilization of solar with heat pumps is that solar can be allowed to operate more effectively. The efficiency of a solar system increases as the temperature of the fluid pumped through the collector decreases. Therefore, a solar collector is able to be operated at a lower temperature when used with a heat pump system and thus will collect more of the sun's energy for use than a non-heat pump system.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page 11.

5. 025, 026, 060, 061, 062, A-9, 098, 097

SOLAR

1. HEAT STORAGE

2. How long can heat from the collectors be stored during a spell of cloudy weather?

3. If desired, a solar heat collection and storage system can be designed to provide total solar heating, even over long cloudy spells. Several such solar-heated houses have been built which operated without auxiliary heating. However, at present energy costs, it is more economical to provide a back-up to the solar heating system that utilizes a conventional source of energy rather than to provide the extra amount of collector area and heat storage needed to carry 100% of the heating load. (If conventional energy costs continue to climb, however, the system that provides 100% solar heating may become the most economical.) A standard solar installation, sized to meet 75% of the heating requirements for an average house, might furnish heat for about one and one-half days of severe cold weather and possibly three to five days of cloudy weather with more mild winter temperatures.

4. Sunworks Inc., Solar energy Q's and A's, 3rd printing, 1975.

5. 025, 026, 060, 061, 062, A-9

1. HISTORY OF DEVELOPMENT

2. Why hasn't solar energy been more developed?

3. There are many reasons, but a primary one is economics. Until recently it was just not economical for a home owner to install a solar unit when there were cheap sources of conventional energy around.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page v.

5. 025, 026, 060, 061, A-9

SOLAR

1. HOME APPRECIATION

2. Supposing I move out of the house in a year or two, can I count on appreciation?

3. It depends on two basic factors: if it looks good and it saves sufficient energy purchases. You should be able to prove whether it works or not in cases of retrofit simply by saving your energy bills, and comparing conventional fuel usage with past bill statements. In cases of new homes, comparisons of operating costs for solar versus conventional homes can be helpful, but not conclusive because of large differences in heat use by different families even in identical homes. Year-to-year differences may also be large, so a call to your energy supplier (gas or electric company or oil supplier) can be helpful in establishing what the relative energy use should have been. As to eye appeal, that's something else. If it looks good to you and your neighbors, the odds for appreciation are in your favor. But remember, it's the buyer's eye that counts the most.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page 27.

5. 025, 026, 060, 061, 062, A-9

1. HOME [illegible] REQUIREMENTS -- PERCENTAGE OF,

2. What p[illegible] a house's heating requirements would be met by a typical [illegible] of solar heating equipment?

3. A typical system would generally be designed to meet between 60 and 80 percent of the annual space heating and domestic water heating requirements of a house. However, as the cost of conventional fuels continues to rise, it will become more economical to design for a larger percentage of solar heating.

4. Sunworks Inc., Solar energy Q's and A's, 3rd printing, 1975.

5. 025, 026, 060, 061, 062, A-9

SOLAR

1. HOT WATER SIZING -- RULE OF THUMB

2. Is there a general rule of thumb for sizing the collectors for domestic hot water systems?

3. For hot water systems, the general rule of thumb for the size of the collector is about one sq. ft. for every gallon of water required each day. Not counting dishwashing and washing machines, the average family uses about 15 gallons of hot water per person, and so with a family of four, a typical hot water installation would be about 60 sq. ft. This would take care of 50% to 80% of your total hot water needs depending upon climate with your conventional system supplying the remainder. A system could be designed, of course, to handle nearly all hot water needs.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page 9.

5. 025, 026, 060, 061, 062, A-9

1. HOW THEY WORK

2. How do Solar Energy Systems work?

3. Radiation is absorbed by a collector, placed in storage, with or without the assistance of a transfer medium, and distributed to the point of use-your living space. The performance of each operation is maintained and monitored by either automatic or manual controls. An auxiliary heater provides backup for times when the solar system is not working.

4. U. S. Department of Housing and Urban Development, Solar Energy and Your Home (Washington, D. C.: U. S. Government Printing Office, June 1977), page 5.

5. 025, 026, 060, 061, 062, A-9

SOLAR

1. HUMIDIFIER

2. Will I need a humidifier with my solar system?

3. Fundamentally, a solar system replaces "conventional" energy with solar energy. It does not necessarily have any effect upon the need for a humidifier. Many solar systems use a hot water tank for energy storage and the hot water tank may be located within the structure. Generally, if this is the case, the tank should be covered and sealed so that water vapor (humidity) does not escape from the tank into your house in the summertime when it is not wanted. An uncovered tank would help humidify the air in your house in the winter but the "price" paid because of excessive humidity in the summer is generally too high.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page 27.

5. 025, 026, 060, 061, 062, A-9, 098, 097

1. INSTALLATION AND MAINTENANCE -- WHO HANDLES?

2. Who handles installation and maintenance?

3. A local plumber or heating contractor. A detailed installation manual is provided with each order.

4. Sunworks Inc., Solar energy Q's and A's, 3rd printing, 1975.

5. 025, 026, 060, 061, 062, A-9

SOLAR

1. PURCHASING (BUYING)

2. Should I buy now or later when improvements in solar technology are sure to take place?

3. There is no doubt that later solar systems will have improvements over present models, and there will not be as much risk for the buyer as there is today. However, costs for tomorrow's solar systems may go higher, and you lose all the money you could have saved from not using expensive conventional fuels. There is something to be said, too, about being a pioneer.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page 27.

5. 025, 026, 060, 061, 062, A-9

1. SPACE -- EXTRA

2. If I plan on a heating system, should I allow for extra space for storage and collector so that I can later adapt to a cooling unit?

3. Ask your engineering consultant what these extra costs amount to for your particular design. If you are building a new home, and plan to live in it for some time, it will probably be easier to plan now for a cooling system, rather than retrofit later.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page 27.

5. 025, 026, 060, 061, 062, A-9

SOLAR

1. SPACE REQUIREMENTS

2. How do you determine collector space requirements?

3. Here are a few approximate space needs for various systems: For hot water systems, the general rule of thumb is 1 sq. ft. of collector area for every gallon of water required per day. In other words, for a family that uses 80 gallons a day, an 80 sq. ft. collector will be needed for the solar heater to furnish about 3/4 of the hot water in a sunny climate.

For swimming pools, the rough estimate is 1 sq. ft. of collector for every two sq. ft. in the pool. If a pool is 600 sq. ft. you will need about a 300 sq. ft. collector. A transparent pool cover-heater is the same area as the pool.

There are many variables to take into consideration to determine the approximate space needs for a solar heating system, but as a rough calculation, estimate 1 sq. ft. of collector for every 2½ to 4 sq. ft. of house. So if you have a well built, 1500 sq. ft. house in a cold, sunny climate, about 500 sq. ft. of collector can supply 2/3 to 3/4 of the annual heat requirements. As the efficiencies of collectors increase in the future, the size of the collector necessary will decrease. Approximate space needed for storage is as follows: For rock systems, about ½ cubic foot of rock storage for every sq. ft. of collector; for water, about 1 to 2 gallons (0.13 to 0.25 cubic ft.) of storage for every sq. ft. of collector; for salt (when commercialized), about 1 cubic foot of storage for every 9 sq. ft. of collector.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page 12.

5. 025, 026, 060, 061, 062, A-9, 098, 097

SOLAR

1. STRUCTURE SIZE LIMITS

2. Is there any limit to the size structure that can be solar heated?

3. No! Single family residences to high-rise office buildings to sprawling factory buildings can be solar heated.

4. Sunworks Inc., Solar energy Q's and A's, 3rd printing, 1975.

5. 025, 026, 060, 061, 062, A-9

1. SWIMMING POOLS

2. Can I use solar energy to heat my swimming pool? How much will I save? What are the collector requirements?

3. Yes, you can use solar heaters for swimming pools. The swimming pool itself acts as the storage area for heat. A minimum of ½ to 3/4 of the pool's surface area in solar panels is the recommended rule of thumb for sizing a swimming pool solar heating system. (i.e. 800 sq. ft. pool needs 400 - 600 sq. ft. of panel area).

   South facing - minimum 50% of pool area
   West facing - minimum 75% of pool area
   Flat roof - minimum 75% of pool area

   For summer heating, adjust collectors with the inclination equal to latitude minus 10 - 15°. Northern exposures are not acceptable and eastern exposures are about 50% effective and therefore marginally economical.

4. Section 13 collectors/systems - passive & active Fafco Solar Heat Exchangers for swimming pools.

5. 025, 026, 060, 061, 062, A-9, A-6, A-5

SOLAR

1. SWIMMING POOL HEATING

2. Is solar pool heating feasible?

3. Yes! Many such systems are already in use in this country. Generally, the initial cost of solar pool heating equipment is rather high in comparison with conventional equipment, particularly if the owner wishes to maintain a high pool temperature (80° to 85° F.) during the early spring and late fall. If water temperature requirements are reduced, solar pool heating equipment costs can likewise be reduced. Solar equipment can also be used to augment existing pool heaters.

4. Sunworks Inc., Solar energy Q's and A's, 3rd printing, 1975.

5. 025, 026, 060, 061, 062, A-9

1. SWIMMING POOL SYSTEM - SEPARATE TYPE

2. What type of collector system should I use?

3. If a separate collector is used, it should either be of the draining type or otherwise able to withstand freezing. Even though the night temperature of the air may be 40°F. or more, the collector could go below freezing due to nocturnal radiation. This process, nocturnal radiation, can also be used to cool the pool in summer months if the water becomes uncomfortably warm.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page 10.

5. 025, 026, 060, 061, 062, A-9

SOLAR

1. USEABLE SUNLIGHT - DETERMINING

2. How do I determine the amount of useable sunlight?

3. This calculation is determined by the average amount of insolation falling during a particular period in your area per square foot, the size of your collector, the efficiency of your system, and the portion of the collected solar heat that can be used. (Heat has to be thrown away during some periods.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page 16.

5. 025, 026, 060, 061, 062, A-9

1. WEATHER DATA NEEDED

2. What weather data is necessary to calculate the anticipated Btu return?

3. - Monthly solar insolation data.
   - Monthly average ambient temperature.
   - Monthly average wind velocities.
   - Heating degree / day data and the base for calculating degree days.
   - Cooling degree data and the base used in calculating degree days.
   - Unusual weather conditions, overcast, rain, hail, dust conditions.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page 16.

5. 025, 026, 060, 061, 062, A-9

SOLAR

1. WHO DESIGNS THEM

2. Who designs the systems that will use heat from the collectors for the desired application?

3. Solar installations are relatively new to heating contractors at this stage of market development. If you are interested in undertaking a project involving solar heating or other special applications (other than domestic water heating which can probably be sized and installed according to the manufacturer's information), you should retain a qualified architect or mechanical engineer to provide system designs and construction drawings sufficiently detailed to obtain contractor estimates and any local building permits required.

4. Sunworks Inc., Solar energy Q's and A's, 3rd printing, 1975.

5. 025, 026, 060, 061, 062, A-9

ALTERNATE ENERGY SOURCES

1. ANIMAL WASTE CONVERSION

2. Can energy be obtained from animal waste? How much?

3. YES! From the process of obtaining oil from animal wastes. A Bureau of Mines experiment has obtained 80 gallons of oil per ton from cow manure. In comparison, average oil shale yields 25 gallons of oil per ton of ore.

4. Energy Glossary, State of Maryland, Energy Policy Office.

1. COMPRESSED - AIR STORAGE

2. What is compressed air storage?

3. Compressed air storage is a technique intended to increase the fuel efficiency of gas turbines. A major part of the power produced by a gas turbine is used to compress air that is injected into the combustion chamber. If compressed air is available from an external source, the electrical output of a gas turbine can be increased by a factor of 2 to 3 with the same quantity of fossil fuel.

4. U. S. Energy Research and Development Administration, Office of Public Affairs, Energy Conversion, Storage, and Transmission (Washington, D. C.: U. S. Government Printing Office, May 1976).

5. 076, 038

ALTERNATE ENERGY SOURCES

1. ENERGY RECOVERY - ANIMAL WASTES

2. Can energy be recovered from animal wastes?

3. YES! Energy recovery is not limited to municipal wastes alone. The Bureau of Mines (in the Interior Department) has been developing processes that convert animal wastes (primarily cattle manure) into fuel oil or methane gas but only a few prototype systems have been built by private enterprise. It is estimated that more than 1.2 billion barrels of oil could be produced each year from cattle wastes alone.

4. League of Women Voters Education Fund, Energy 13 - Solid Waste: Energy to Burn (Washington, D. C.: LWVEF, October 1974), Publication #529.

1. FLYWHEELS

2. What about flywheels?

3. Large flywheels have been used to store energy for use in providing uninterrupted power in such equipment as computer installations, helicopter hoists, buses and large power shovels. Flywheel energy storage technology is currently undergoing a revolution and new high-strength materials and construction techniques are being developed that would reduce the danger of flywheels breaking at the high speeds required.

4. U. S. Energy Research and Development Administration, Office of Public Affairs, Energy Conversion, Storage, and Transmission (Washington, D. C.: U. S. Government Printing Office, May 1976).

5. 076, 038

ALTERNATE ENERGY SOURCES

1. FUEL CELL

2. What is a fuel cell?

3. Electricity can be generated when hydrogen and oxygen are chemically combined to produce water. This is the simplest type of fuel cell, which is a kind of battery in which one or both of the electrodes (or terminal components) is replenishable. The fuel cell offers many advantages for certain special applications. But it is not yet economical as a method of generating large amounts of power.

4. U. S. Energy Research and Development Administration, Office of Public Affairs, Energy Conversion, Storage, and Transmission (Washington, D. C.: U. S. Government Printing Office, May 1976).

5. 065, 076

1. GEOTHERMAL - DEFINITION OF

2. What is geothermal energy?

3. It is the natural steam, hot water, and very hot rock inside the earth that is near enough to the surface to be tapped for generating electricity and other uses such as heating buildings.

4. Edison Electric Institute in cooperation with the Electric Power Research Institute, Geothermal Energy, 1976.

5. 036

ALTERNATE ENERGY SOURCES

1. GEOTHERMAL - ELECTRICITY FROM
2. How much electric power are we generating from geothermal sources today?
3. About 1/5 of 1% of U. S. electricity is from geothermal sources, all of which comes from a steam field at the Geysers in Northern California.
4. Edison Electric Institute in cooperation with the Electric Power Research Institute, Geothermal Energy, 1976.
5. 036

1. GEOTHERMAL - FORMS & IMPORTANCE OF
2. How important are the various forms of geothermal energy?
3. Natural steam which is so easy to use, represents less than 1% of the geothermal potential. Hot water accounts for less than 10%. Geopressured water, which contains dissolved methane gas as well as hot water, represents about 20%. Hot rock represents about 69 or 70% of total geothermal potential.
4. Edison Electric Institute in cooperation with the Electric Power Research Institute, Geothermal Energy, 1976.
5. 036

ALTERNATE ENERGY SOURCES

1. GEOTHERMAL - FUTURE OF

2. Why aren't we getting more energy from hot water, geopressure, and hot rock?

3. We are not sure of the economics of extracting energy from hot water and geopressure systems, and new technology is required for hot rock systems. The future of these geothermal sources will depend on how successful we are in bringing the cost of producing electricity from them down to compete with other fuels. We are also looking at them as direct sources of heat.

4. Edison Electric Institute in cooperation with the Electric Power Research Institute, Geothermal Energy, 1976.

5. 036

1. GEOTHERMAL - POLLUTION PROBLEM FROM

2. Are there any other problems besides economics and basic technology?

3. YES! There is a pollution problem with contaminants in some steam and hot water systems, but that can be handled. New research appears to be solving the "plugging" problems caused by salts and other contaminants.

4. Edison Electric Institute in cooperation with the Electric Power Research Institute, Geothermal Energy, 1976.

5. 036

ALTERNATE ENERGY SOURCES

1. GEOTHERMAL - POTENTIAL OF

2. Why haven't we exploited more of the potential?

3. The Geysers is the only place in America where we have found dry steam that can be commercially developed. Geothermal steam is very economical because it is just piped from the ground into turbines. Geothermal hot water systems are more complex and maintenance is costly because water is so full of dissolved minerals.

4. Edison Electric Institute in cooperation with the Electric Power Research Institute, Geothermal Energy, 1976.

5. 036

1. GEOTHERMAL - RESEARCH

2. How much research is being conducted?

3. The U. S. Energy Research and Development Administration (ERDA) is spending about $400 million over the next five or six years. The electric utilities are together planning to invest some $2 billion in commercial geothermal development over the next decade if the basic technical problems are resolved and the economics are competitive.

4. Edison Electric Institute in cooperation with the Electric Power Research Institute, Geothermal Energy, 1976.

5. 036

ALTERNATE ENERGY SOURCES

1. GEOTHERMAL - RESOURCES OF

2. How much geothermal energy do we have in the United States?

3. The U. S. Geological Survey estimates there is enough geothermal at depths we can reach beneath the earth's surface to generate electricity at present rates for the next hundred years. But we won't get even a fraction of that potential unless we solve some very complex economic and technological problems.

4. Edison Electric Institute in cooperation with the Electric Power Research Institute, Geothermal Energy, 1976.

5. 036

1. GEOTHERMAL - WHERE FOUND

2. Is geothermal energy found all over the nation?

3. If you go deep enough, there is hot rock all over the world. But within reach of present drilling methods and within the bounds of anticipated economics, useable geothermal areas are concentrated in the western states, Alaska, Hawaii, and along the Gulf Coast.

4. Edison Electric Institute in cooperation with the Electric Power Research Institute, Geothermal Energy, 1976.

5. 036

ALTERNATE ENERGY SOURCES

1. HYDROGEN ECONOMY

2. What is a hydrogen economy?

3. The hydrogen economy, a highly sophisticated and novel systems approach to the whole problem of energy conversion, distribution and storage is based on the use of hydrogen (which has been separated from water electrically at central production centers) as an energy source to be piped to local storage or usage areas. Such a system would require the replacement of a large fraction of our present extensive electrical distribution networks. Also the cost of producing hydrogen is greater than that of generating electricity by current methods.

4. U. S. Energy Research and Development Administration, Office of Public Affairs, Energy Conversion, Storage, and Transmission (Washington, D. C.: U. S. Government Printing Office, May 1976.

5. 076

1. MAGNETOHYDRODYNAMICS (MHD)

2. What is Magnetohydrodynamics (MHD)?

3. For almost a century, one of the objects of energy conversion research has been the generation of electricity by causing a conducting gas or plasma to flow through a magnetic field. The principle of magnetohydrodynamics is similar to that of an ordinary electrical generator except that the moving plasma replaces the conducting wire. While MHD systems offer the potential advantage of higher efficiences, it has not yet been established that they are practical for commercial use and competitive from an economic standpoint. The high temperature requires developing exceptional materials.

4. U. S. Energy Research and Development Administration, Office of Public Affairs, Energy Conversion, Storage, and Transmission (Washington, D. C.: U. S. Government Printing Office, May 1976).

5. 076

ALTERNATE ENERGY SOURCES

1. PUMP STORAGE

2. What is pump storage?

3. In pumped storage the basic idea is to use a portion of the electricity generated by a steam electric plant (either fossil or nuclear) during periods of slack demand to pump quantities of water up to a higher level reservoir. Subsequently, during periods of peak demand, this water is allowed to generate electricity as it flows to a lower level, for example, in a hydroelectric installation to augment the capacity of the steam plant. Thus a power plant with pumped storage capability can meet specified peak loads and still be smaller than a plant capable of meeting such loads without storage facilities.

4. U. S. Energy Research and Development Administration, Office of Public Affairs, Energy Conversion, Storage, and Transmission (Washington, D. C.: U. S. Government Printing Office, May 1976).

5. 076, 038

ALTERNATE ENERGY SOURCES

1. SYNTHETIC FUELS - FROM COAL

2. What kinds of fuels can be made from coal?

3. Several. An almost pure solid fuel can be produced by dissolving coal in a solvent and then refining out the impurities. By another process, clean burning gas can be made that will fire boilers and turbines in electric generating plants. And by still another process, synthetic petroleum can be manufactured.

4. Edison Electric Institute in cooperation with the Electric Power Research Institute, Clean Energy From Coal, 1976.

5. 075, 014

WIND POWER

1. ELECTRICITY - STORAGE

2. How is the electricity stored?

3. Energy storage systems proposed for use with wind energy systems include electrochemical storage batteries (the only well-established system commonly used with wind generators today), flywheels, compressed air in underground caverns, hydrogen, and pumped hydraulic storage.

4. Marshal F. Merriam, "Wind Energy for Human Needs," Technology Review, January 1977, page 36.

5. B-1

1. ENVIRONMENTAL IMPACT

2. Are there any environmental impacts associated with wind machines? If so, what are they?

3. The environmental impact of a wind machine's use is so small as to be virtually non-existent. Indeed, one can hardly imagine a primary energy source with less environmental impacts. The main impact will be that associated with the mining and processing of the materials, especially metals, used in construction. This will, of course, be present in any power generating scheme.

   Blade noise should be minor and large machines will be located far from human concentrations. Bird kills by impacting turning blades has not been noted to date, however, it should be negligible compared to other sources of bird mortality. When compared to the ecological disturbances associated with hydro, nuclear and fossil fuel sources, wind energy is absolutely clean.

4. Marshal F. Merriam, "Wind Energy for Human Needs," Technology Review, January 1977, page 35.

5. B-1

WIND POWER

1. MAGNITUDE - POTENTIAL

2. What is the magnitude of the wind energy resource?

3. The present state of knowledge of the magnitude of the wind energy resource is very unsatisfactory. Most wind measurements are made at airports, close to the ground; they have only limited relevance to wind energy programs. Local topography influences the wind greatly, so that regional wind surveys, although useful, have only the sort of relevance that geological survey mapping has to finding minerals. Winds vary considerably from year to year.

4. Marshal F. Merriam, "Wind Energy for Human Needs," Technology Review, January 1977, page 30.

5. B-1

1. OTHER USES

2. Can wind be used for other things besides making electricity?

3. Yes! Wind power is used for water pumping in small volumes with medium and high lifts for livestock, people, and minor irrigation in sparsely populated, dry areas. This is a traditional application, and commercially built multivane fans are now in use.

4. Marshal F. Merriam, "Wind Energy for Human Needs," Technology Review, January 1977, pages 37 - 38.

5. B-1

WIND POWER

1. RATED SPEED

2. What is meant by the term "rated speed"?

3. The m.p.h. at which the windmill is just able to drive the generator to its full rated power is called the rated speed.

4. Marshal F. Merriam, "Wind Energy for Human Needs," Technology Review, January 1977, page 32.

5. B-1

1. RESEARCH

2. Who is doing research on wind power?
What is being done?

3. The Energy Research and Development Administration (ERDA) is currently studying wind systems. One of the most important current projects is a 100 kilowatt experimental wind turbine generator built for ERDA by the National Aeronautics and Space Administration near Sandusky, Ohio. This is a propeller-type machine which could generate enough electricity for 30 average size homes. ERDA is also developing other windmill types including one that, instead of a propeller, uses the vertical axis turbine system, which resembles the lower section of an egg beater.

4. Energy Research and Development Administration, Office of Public Affairs, Energy From the Winds (Washington, D. C.: U. S. Government Printing Office, April 1976), pages 3 - 5.

5. B-1

WIND POWER

1. SITE DETERMINATION

2. How do I determine if there is sufficient wind to build a windmill?

3. To evaluate a site for power production, a long interval of wind measurements (several years) is desirable. The power in the wind at any instant depends on the cube of the wind velocity, so the average value of the velocity cubed is the figure needed to assess the power in the wind averaged over time.

4. Marshal F. Merriam, "Wind Energy for Human Needs," Technology Review, January 1977, page 33.

5. B-1

1. TOO MUCH WIND

2. How does one avoid destroying the generator by delivering more mechanical power than the generator can handle on an extremely windy day?

3. Wind machines have a feathering mechanism, or some other decoupling system to avoid delivering more mechanical power than the generator can handle.

4. Marshal F. Merriam, "Wind Energy for Human Needs," Technology Review, January 1977, page 32.

5. B-1

WIND POWER

1. WINDMILL - DUTCH TYPE

2. What about the Dutch type windmill fan?

3. The Dutch type windmill is obsolete today. It is hopelesssly expensive to build and maintain.

   The multivane fan and the thin-bladed propeller have replaced it as the machines of widest use. All are horizontal-axis devices, distinguished by the geometrical form of their wind-catching surfaces.

4. Marshal F. Merriam, "Wind Energy for Human Needs," Technology Review, January 1977, page 29.

5. B-1

1. WIND MILL - MULTIVANE TYPE

2. What about the multivane fan?

3. The multivane fan - the familiar "farm windmill" of the American Midwest and West was invented in the U. S. in the second half of the 19th century and has spread throughout the world. There is no sign of their becoming obsolete. It is best suited for pumping groundwater in small quantities with moderate to large lifts. This wind machine is a horizontal-axis device, distinguished by the geometrical form of its wind catching surfaces. The moderate rotation speeds of the multivane fan simplify mechanical design and contribute to low maintenance and extreme longevity in the installed machine.

   The largest sized, manufactured (30 ft. in diameter) gives an output of approximately 4 horsepower in a 15 mph wind, but fractional horsepower outputs are much more common.

4. Marshal F. Merriam, "Wind Energy for Human Needs," Technology Review, January 1977, page 29.

5. B-1

WIND POWER

1. WIND MILL - THIN BLADED PROPELLER TYPE

2. What about the thin bladed propeller type of windmill?

3. This wind machine is a horizontal-axis device, distinguished by the geometrical form of its wind catching surface.

The thin bladed propeller has two or three thin blades rotating at high speed. Such propellers have much higher aerodynamic efficiency than fans with wide blades and they use materials more efficiently.

The high aerodynamic efficiency is only present at high blade speeds, which means that rotational speeds are also high, especially in smaller units.

High rotational speeds are very appropriate for driving electrical generators and until recently all wind powered electric generators were of this type.

4. Marshal F. Merriam, "Wind Energy for Human Needs," Technology Review, January 1977, page 29.

5. B-1

NUCLEAR

1. EXPLODE ATOM BOMB

2. Can a Nuclear Power Plant explode like an Atomic Bomb?

3. No! It is impossible for nuclear power plants to explode like a nuclear weapon. The laws of physics do not permit this because the fuel contains only a small fraction (3 - 5%) of the special type of uranium (called uranium - 235) that must be used in weapons.

4. U. S. Nuclear Regulatory Commission, Reactor Safety Study: An Assessment of Accident Risks in U. S. Commercial Nuclear Power Plants - Executive Summary (Springfield: National Technical Information Service, October 1975), page 5.

5. 057

NUCLEAR

1. NUCLEAR ACCIDENT INSURANCE (PRICE - ANDERSON ACT)

2. Is there any insurance coverage for a nuclear accident?

3. YES! In the case of damage by a nuclear accident, the operator of the nuclear facility is covered for damage by liability insurance from insurance pools established by the private insurance companies, and further, by government-backed insurance provided through the Price-Anderson Act.

4. American Nuclear Society, Nuclear Power and the Environment, Questions & Answers (Hinsdale: American Nuclear Society, September 1974), page 20.

1. NUCLEAR POWER - COST VS. CONVENTIONAL

2. Is nuclear power cheaper than a fossil fuel plant?

   a) What are the comparative costs per kilowatt hour?

   b) What are the construction costs of the various types of plants?

3. a) The electric utility industry reported that the average total cost of electric power from various fuel sources during the first 9 months of 1975 were as follows:

   12.50 mills/kilowatt hour for nuclear
   17.14 mills/kilowatt hour for coal
   33.38 mills/kilowatt hour for oil

   b) The initial cost of building a nuclear power plant is higher than that of a coal or oil burning plant of similar size. The estimated cost for building a 1000 MWe generating plant are as follows:

Type of Plant	Cost (millions)
Nuclear	$650
Coal	$600
Oil	$390

4. U. S. Energy Research and Development Administration, Office of Public Affairs, The Economics of Nuclear Power (Washington, D. C.: U. S. Government Printing Office, March 1976), pages 3-4.

NUCLEAR

1. NUCLEAR STATUS OUTSIDE U. S.

2. Are there other nations going nuclear like the U. S.?

3. YES! The following is a breakdown of plant commitments in 41 countries:

	1976		1975		1974	
	Net MWe	Reactors	Net MWe	Reactors	Net MWe	Reactors
Operable	35,882	112	29,175	102	24,293	96
Under Construction	85,182	117	59,767	85	50,097	77
On Order	53,787	58	54,462	70	56,112	73
Planned	168,504	167	150,874	169	90,073	102
Totals	343,355	454	294,278	426	220,575	348

4. Atomic Industrial Forum, Inc., Public Affairs and Information Program, INFO News Release - Nuclear Power - Plant Commitments Outside the U. S. Climb 17% in year (Washington, D. C.: AIF, June 1976), page 2.

1. NUCLEAR WASTE PRODUCTS

2. a) What are the nuclear wastes?
   b) What happens to them?
   c) What about storage?

3. a) Nuclear waste consists of unusable fission products created during the operation of the reactor and the contaminated equipment and clothing from routine power plant and reprocessing operations. More than 90% of the fission products are stable or non-radioactive.
   b) Of the radioactive products, some decay in a few seconds while others decay more slowly, ranging in time up to thousands of years.
   c) The highly radioactive wasted solutions are contained in large underground storage tanks at reprocessing plants, where they may be stored for several years. Federal regulations require that the wastes be converted to a stable solid form within five years of their generation and then be shipped to a federal waste repository.

4. American Nuclear Society, Nuclear Power and the Environment, Questions and Answers (Hinsdale: American Nuclear Society, September 1974), pages 23-24.

5. 090, 092, 087, 039

NUCLEAR

1. NUCLEAR WASTE REPROCESSING

2. Are they reprocessing nuclear wastes? Why is it done? Where will it be done?

3. YES! Spent fuel is reprocessed to recover the valuable fissionable materials that it contains. Recovery of the uranium reduces the cost of power production (by approximately 5%), conserves a natural resource and reduces the amount of mining necessary to replace it. (20%).

   In reprocessing, sealed metal tubes (½ diameter) containing pellets of uranium dioxide are chopped into small segments. The fuel pellets are dissolved in strong acid, and the fuel and fission products chemically separated.

   In the U. S. there are two commercial and four government plants in operation. There are 13 other reprocessing plants in the world, principally in Europe.

4. American Nuclear Society, Nuclear Power and the Environment, Questions and Answers (Hinsdale: American Nuclear Society, September 1974), page 24.

5. 090, 092

1. NUMBER OF REACTORS - U. S.

2. How many nuclear plants are there in the U. S.?

3. 60 operable making up 8.1% of total U. S. installed electric generating capacity.

   There are 238 either operable, planned, or being built as of June 30, 1976.

4. Prentice-Hall, Inc., Energy Controls (Englewood Cliffs: Prentice-Hall, Inc., 1976), Report Bulletin #31, 8/6/76, page 4.

NUCLEAR

1. RADIATION - RELEASED - AIR

2. How much radiation is released into the air by a nuclear power plant?

3. The contribution from operating nuclear power plants is less than 0.01 millirem per year, compared to 130 millirem per year received by the average American from the natural environment. Thus, the contribution from presently operating and future nuclear power plants is an insignificant part of the total exposure.

4. American Nuclear Society, Nuclear Power and the Environment, Questions and Answers (Hinsdale: American Nuclear Society, September 1974), page 13.

1. RASMUSSEN REPORT

2. What is the Rasmussen Report?

3. In 1975, a reactor safety study was completed under the direction of Professor Norman C. Rasmussen of the Massachusetts Institute of Technology under the sponsorship of the Nuclear Regulatory Commission. The study consumed $4 million and 70 man years of effort. It compared (1) the risks of nuclear accidents from the 100 power plants that were assumed to be operating by about 1980 with (2) natural and man made events to which society is already exposed.

4. U. S. Energy Research and Development Administration, Office of Public Affairs, How Probable Is A Nuclear Plant Accident? (Washington, D. C.: U. S. Government Printing Office, September 1976).

NUCLEAR

1. U. S. URANIUM RESERVES

2. How much uranium is there in the U. S.?

3. 1974 -

Price per lb.	Reserves in thousands of tons of Uranium Oxide
$ 8/lb and under	277
$ 9 - 10/lb	340
$11 - 15/lb	520
$15 - 30/lb	140

4. American Nuclear Society, Nuclear Power and the Environment, Questions and Answers (Hinsdale: American Nuclear Society, September 1974), page 484.

1. URANIUM CONVERSION

2. What is conversion of uranium?

3. The chemical processing of uranium concentrates into uranium hexaflouride gas.

4. Energy Glossary, State of Maryland Energy Policy Office.

NATURAL GAS

1. Mcf - THOUSAND CUBIC FEET

2. What is meant by "mcf"?

3. An mcf is a thousand cubic feet, the standard measure for gas. Each mcf represents the amount of gas needed to fill a space 10 feet long by 10 feet wide by 10 feet high at standard temperature and pressure. A typical home using gas only to power the stove might use a half an mcf per month. A house heated by gas could use 30 mcf or more in a month. (Sometimes people think the "m" in mcf means mcf million. Actually, it comes from the Latin word milia.)

4. Steven Rattner, "All Your Queries on Natural Gas When You Are Too Cold To Ask," New York Times, February 12, 1977, pages 27-28.

1. NATURAL GAS - DEFINITION

2. What is natural gas?

3. For one thing, it is not gasoline, although the two are distantly related. Gasoline is refined from crude oil to run cars, while natural gas is mostly a chemical called methane that heats homes and is used by industry. Both natural gas and petroleum are hydrocarbons, which is a scientific term for any compound made up entirely of hydrogen and carbon. The difference is in the raio of the two elements. For example; methane has four hydrogen atoms for each carbon atom.

   In its native form, natural gas is colorless and odorless, the smell is added later so it can be easily detected.

4. Steven Rattner, "All Your Queries on Natural Gas When You Are Too Cold To Ask," New York Times, February 12, 1977, pages 27-28.

NATURAL GAS

1. NATURAL GAS - HOW IT WORKS

2. How does it work?

3. When natural gas burns, the molecules break up into atoms of carbon and hydrogen. Both combine with oxygen floating in the air - the carbon, to form carbon dioxide and the hydrogen, to produce water. As the bonds between the atoms are broken, heat is released. For each 1,000 cubic feet, about 1,000 British thermal units (Btu's) or 252,000 calories are produced.

4. Steven Rattner, "All Your Queries on Natural Gas When You Are Too Cold To Ask," New York Times, February 12, 1977, pages 27-28.

1. NATURAL GAS IMPORTS

2. If we are so short of gas, why can't we just import some?

3. Gas is not like oil; it can not be put in a tin can and carried around the way oil can. To import it, it must be liquefied by chilling it to 260 degrees below zero Farenheit.

4. Steven Rattner, "All Your Queries on Natural Gas When You Are Too Cold To Ask," New York Times, February 12, 1977, pages 27-28.

NATURAL GAS

1. NATURAL GAS LOCATION

2. Where do we find natural gas?

3. Many millions of years ago, dead organic matter, plants and animals, drifted to the bottom of great ancient seas. As time passed, sediment buried the organic matter and a combination of great pressure and heat pressed the material into some of our most important energy products, coal, oil and natural gas.

   Then the seas dried up. Today, oil and gas are often found together in underground reservoirs beneath Texas, Saudi Arabia and thousands of other places. Some oil and gas lies within a few feet of the earth's surface; in other cases, wells as deep as 30,000 feet are drilled. In general, the deeper you drill, the more likely gas will be found. This is because the greater pressure produced lighter hydrocarbons.

4. Steven Rattner, "All Your Queries on Natural Gas When You Are Too Cold To Ask," New York Times, February 12, 1977, pages 27-28.

1. NATURAL GAS - PIPELINES

2. How is gas transported today?
   What makes the gas move?

3. From the first major pipeline, a 25 mile wooden pipeline completed in Rochester in 1872, a system of nearly a million miles of line has grown up. Slightly more than a quarter of the total consists of the great trunk lines, some with diameters up to four feet, while the bulk comprises the distribution lines.

   Whirring compressor stations along the route shove the gas through the line at pressures up to 1,000 pounds per sq. inch and at speeds of about 15 miles per hour. At that rate, gas leaving Texas on a Monday morning will arrive in New York City on Friday afternoon.

4. Steven Rattner, "All Your Queries on Natural Gas When You Are Too Cold To Ask," New York Times, February 12, 1977, pages 27-28.

NATURAL GAS

1. NATURAL GAS - PRODUCERS

2. (a) Who produces natural gas?

   (b) How much do we have?

3. (a) Mostly the major oil companies. The Exxon Corporation is the nation's largest producer and 18 of the top 20 producers are oil companies.

   (b) About 230 trillion cubic feet, but our reserves have been declining steadily since the late 1960's. The Soviet Union has the most (800 trillion cubic feet) and Iran is second. The United States is still the world's largest producer and Texas is the biggest producer within the country.

4. Steven Rattner, "All Your Queries on Natural Gas When You Are Too Cold To Ask," New York Times, February 12, 1977, pages 27-28.

1. NATURAL GAS PRODUCTION DECLINE REASONS

2. (a) Why has production been declining?

   (b) If we have so many trillion feet, why can't we just produce more?

3. (a) Some say that the system of Federal price controls, which has left gas prices below the cost of such alternative fuels as oil, has encouraged oil and gas companies not to explore and not to develop their reserves.

   (b) Gas comes out of its underground home at its own pace, much the same as air rushes from a balloon, faster at first, then slower. Production can be accelerated somewhat but that risks damaging the field by preventing recovery of as much gas as there is down there. That is part of the reason why United States production has been declining for three years.

4. Steven Rattner, "All Your Queries on Natural Gas When You Are Too Cold To Ask," New York Times, February 12, 1977.

NATURAL GAS

1. NATURAL GAS RESERVES, U. S.

2. How much natural gas is there in the U. S.?

3. As of 2/14/74:

Measured Recoverable Reserves In Trillion Cubic Feet

Lower	-48	190 on shore
Alaska	-	28 on shore
Lower	-48	46 on shore
Alaska	-	2 off shore
Total		266

Undiscovered Recoverable Resources

Lower	-48	500-1000
Alaska		105- 210
Lower	-48	225- 450
Alaska		170- 340
Total		1000-2000

See definition reserves vs. resources

4. Ford Foundation, Energy Policy Project, A Time To Choose (Cambridge: Ballinger Publishing Co., 1974), page 482.

1. NATURAL GAS RESERVES, 1973, WORLD

2. How much natural gas is there and who has it?

3. In 1973: 2,133.1 Trillion cubic feet.

#1 Sino-Soviet Bloc	715.5	
#2 Middle East	626.1	
#3 U. S.	249.9	= 12% of world reserves

4. U. S. Department of the Interior, Energy Perspectives (Washington, D. C.: U. S. Government Printing Office, February 1975), page 19.

NATURAL GAS

1. <u>NATURAL GAS SUPPLIES, U. S. 1975</u>

2. How much natural gas is there?

3. 108.4 TCF for interstate systems in 1975 dropped 12.1 - TCF over 1974.

4. Prentice-Hall, Inc., <u>Energy Controls</u> (Englewood Cliffs: Prentice-Hall, Inc., 1976), Report Bulletin #22 - 6/4/76, page 5.

NATURAL GAS

1. NATURAL GAS - WHO CONTROLS IT?
2. Who controls this gas?
3. Usually the pipeline companies who apportion the available supplies among their customers. Some retail utilities, such as the National Fuel Gas Company, maintain their own storage.
4. Steven Rattner, "All Your Queries on Natural Gas When You Are Too Cold To Ask," New York Times, February 12, 1977, pages 27-28.

1. PILOT LIGHTS - CONSUMPTION
2. How much energy do gas pilot lights use?
3. Pilot lights consume a staggering 42% of the total gas used in gas stoves and 9% used in gas furnaces.
4. "Snuggling Up for Winter," Newsweek, October 11, 1976, page

NATURAL GAS

1. SHUT-IN WELL

2. (a) What is a "shut-in" well?

   (b) What about the charge that gas is being held back from the market?

3. (a) Critics of the industry contend that there are wells in the Southwest and elsewhere that have been drilled but are capped by their owners in anticipation of higher prices. A number of gas producers concede that there are reserves that could be developed quickly, but deny that they are part of a conspiracy to force prices up.

   (b) Gas is stored, but it is done by the companies to help meet high winter demand. Typically, gas is stored in an underground area geologically similar to where gas is found. Gas can also be stored in depleted wells or in underground salt caverns. In one case, gas is even stored in an abandoned coal mine.

4. Steven Rattner, "All Your Queries on Natural Gas When You Are Too Cold To Ask," New York Times, February 12, 1977, pages 27-28.

CRUDE OIL

1. CRUDE OIL, ALASKAN

2. How much Alaskan oil will be coming thru the pipeline?

3. About 2.4 million barrels/day by 1985.

4. Federal Energy Administration, National Energy Outlook 1976 (Washington, D. C.: U. S. Government Printing Office, Febraury 1976), page xxviii.

1. CRUDE OIL CONSUMPTION, MIDDLE COAST STATES

2. How much oil do the states of the middle coast consume a day?

3. New York, New Jersey, Delaware, Virginia & Maryland use 3.3 million barrels of oil a day or about 19% of total American consumption.

4. N. Y. Times 3/22/76, by William D. Smith.

1. CRUDE OIL EXPORTS

2. Does the U. S. export any crude oil?

3. YES! In 1974: .462 quads = 231,000 barrels a day

4. U. S. Department of the Interior, Energy Perspectives (Washington, D. C.: U. S. Government Printing Office, February 1975), page 69.

CRUDE OIL

1. CRUDE OIL IMPORTS, DOLLAR COSTS

2. How much do crude oil imports cost the U. S.?

3. 1975 - $ 27 billion per year
or
$125.00 per person

1970 - $ 3 billion per year
or
$ 15.00 per person

4. Federal Energy Administration, National Energy Outlook 1976 (Washington, D. C.: U. S. Government Printing Office, February 1976), page xxiii.

1. CRUDE OIL IMPORTS, OPEC PERCENTAGE

2. What percentage of crude oil imports come from OPEC?

3. The Arab OPEC share of petroleum import rose to 37% from 22% before the embargo. And all of OPEC is now contributing 82% of our import needs compared to 70% prior to the embargo.

4. Energy Situation, July 1976, Federal Energy Administration, Page 1.

CRUDE OIL

1. CRUDE OIL PRODUCTION VS. CONSUMPTION - WORLD

2. How much crude oil is produced and consumed by the entire world - each day?

3. In 1973: Total World Production - 57.7 mbpd
   Total World Consumption - 56.6 mbpd

4. U. S. Department of the Interior, Energy Perspectives (Washington, D. C.: U. S. Government Printing Office, February 1975), page 13.

5. 103

1. CRUDE OIL RESERVES - U. S. AND WORLD

2. How much crude oil is there and where is it located? Known proven reserves-

3. As of 1/1/75: (in billions of barrels)

U. S.	34.2
Western Europe	20.1
Africa	57.9
Middle East	326.0
Far East	20.6
Sino-Soviet Bloc	65.3
W. Hemisphere	32.0
	556.1 billion barrels

4. U. S. Department of the Interior, Energy Perspectives 2 (Washington, D.C.: U. S. Government Printing Office, June 1976), page 13.

5. 103

COAL

1. COAL - FUTURE SUPPLY

2. How big a factor is coal in our future energy supply?

3. It is vital. Coal represents 4/5 of the known fuel reserves in the United States and that includes all the oil in Alaska and off our coast.

4. Edison Electric Institute in cooperation with the Electric Power Research Institute, Clean Energy From Coal, 1976.

5. 075

1. COAL - RECOVERABLE RESERVES - U. S. AND WORLD

2. How much coal is there and where is it? (Recoverable Reserves)

3. In 1973 - Total: 668 billion short tons

#1	Sino-Soviet Bloc	-	307 b.s.t.
#2	U. S. A.	-	217 b.s.t.
#3	Western	-	72 b.s.t.
#4	Far East & Oceania	-	46 b.s.t.
#5	Africa	-	17 b.s.t.
#6	Other Western Hemisphere Countries	-	9 b.s.t.

4. U. S. Department of the Interior, Energy Perspectives (Washington, D. C.: U. S. Government Printing Office, February 1975), page 25.

COAL

1. COAL RESOURCES - U. S.

2. How much coal is there in the U. S.?

3. As of 1/1/72 - in trillion short tons:

Estimated Identified Resources 0-3000 ft.	
Bituminous coal & lignite	1.56
Anthracite coal	.02
Total	1.58

of which .20 trillion short tons is economically recoverable.

4. Ford Foundation, Energy Policy Project, A Time To Choose (Cambridge: Ballinger Publishing Co., 1974), page 481.

5. 075

1. COAL USAGE

2. (a) How much coal does the U. S. use now?

   (b) Why aren't we using more?

3. (a) Only about 19% of the nation's energy comes from coal.

   (b) Early on, the prices of gas and oil were essentially the same as the prices of coal in many areas. Now the capital cost of power plants fired by gas and oil is lower than a comparable coal fired plant, and oil and gas fired plants are much simpler and more convenient to operate. Now that the premium fuels are becoming unavailable, it is necessary to shift back to coal. Environmental problems and lack of coal handling facilities make this transition difficult in many situations.

4. Edison Electric Institute in cooperation with the Electric Power Research Institute, Clean Energy From Coal, 1976.

5. 075

ENERGY STATISTICS

1. DOMESTIC ENERGY CONSUMPTION/ECONOMIC SECTOR

2. What is the domestic energy consumption by the Economic Sector?

3. Commercial & Residential----20.2%
Industrial------------------25.4%
Transportation--------------25.6%
Electricity generation------28.8%

1976 Total Quads------------74.2

4. Federal Energy Administration, Energy in Focus, Basic Data (Washington, D. C.: U. S. Government Printing Office, 1977), page 3.

5. 103

1. DOMESTIC ENERGY CONSUMPTION PER CAPITA BY SOURCE

2. What is the domestic energy consumption per capita by source?

3. Total (barrels of oils equivalent)-----59.3
Petroleum (barrels of oils)------------29.5
Natural Gas (thousands of cubic ft)----92.5
Coal (short tons)---------------------- 2.8

1976 Total Quads-----------------------74.2

4. Federal Energy Administration, Energy in Focus, Basic Data (Washington, D. C.: U. S. Government Printing Office, 1977), page 4.

5. 103

ENERGY STATISTICS

1. <u>DOMESTIC ENERGY PRODUCTION IN THE U. S., TOTAL</u>

2. What is the total domestic energy production in the U. S.?

3. Crude Oil------------------28.8%
   Coal------------------------26.4%
   Natural Gas (marketed)------36.3%
   Hydroelectric--------------- 5.1%
   Nuclear Power--------------- 3.4%

   1976 Total Quads------------59.8

4. Federal Energy Administration, <u>Energy in Focus, Basic Data</u> (Washington, D. C.: U. S. Government Printing Office, 1977), page 4.

5. 103

ENERGY STATISTICS

1. ELECTRICITY GENERATION BY SOURCE - 1976

2. Which energy source provides the most electricity generation?

3. 1976

	kWh (millions)	Percent
Coal	943,879	46.3
Oil	319,518	15.7
Gas	294,419	14.5
Nuclear	191,108	9.4
Hydro	283,680	13.9
Other	3,883	0.2
Total Net Production	2,036,487	

4. Federal Energy Administration, Energy in Focus, Basic Data (Washington, D. C.: U. S. Government Printing Office, 1977), page 10.

5. 103

1. ELECTRICITY, POWER PLANT COST COMPARISONS

2. What is the cheapest way to produce electricity in various power plants?

3. At a 40% capacity factor, coal fired plants operate at lower than average total costs than do nuclear, oil fired, or gas turbines.
At 55% capacity factor, or greater, nuclear power is the lowest in cost.

4. U. S. Department of the Interior, Energy Perspectives (Washington, D. C.: U. S. Government Printing Office, February 1975), page 79.

ENERGY STATISTICS

1. ENERGY CONSUMPTION OF CONCORDE VS. OTHER AIRCRAFTS

2. What is the fuel consumption of the Concorde compared to other aircrafts?

3. Comparison of Economic Factors

Here is a brief comparison of key economic factors among Concorde supersonic and conventional jets for a 3,000 - mile trip, according to 1976 federal statistics.

	Concorde	Boeing 707	Boeing 747	DC-10
Passenger capacity	100	145	375	250
Fuel (gals.) used on trip	20,857	13,071	24,285	14,000
Miles per gal. per passenger	16	33	50	50

4. Newsday, 7/11/77, Page 7.

5. 103

1. ENERGY CONSUMPTION PATTERNS - U. S.

2. How much do we consume?

3. 1976 - 74.2 Quads total of fossil fuels.

	Quads
Crude Oil	35.1
Natural Gas	20.3
Coal	13.7
Nuclear	2.0
Hydro Power	3.1
	74.2

4. Federal Energy Administration, Energy in Focus, Basic Data (Washington, D. C.: U. S. Government Printing Office, 1977), page 3.

5. 103

ENERGY STATISTICS

1. ENERGY CONSUMPTION, RESIDENTIAL %'s

2. How much energy does the residential sector in the U. S. consume and for what?

3. Space Heating and cooling - 70%
   Hot Water - 20%
   Lighting, cooking, refrig., and operating appliances - 10%

4. Federal Energy Administration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), page 6.

1. ENERGY CONSUMPTION, U. S. - 1974 FIGURES

2. How much did we consume in 1974?

3. 1974 - 68.9 quads total of fossil fuels

Crude Oil	-	33.49 quads
Natural gas	-	22.237 quads
Coal	-	13.169 quads
		68.896 quads

   (a quad is one quadrillion btu or 10^{15} btu)

4. Bureau of the Census, Department of Commerce, The U. S. Fact Book-1976, The Statistical Abstract of the U. S. (New York: Grosset & Dunlap, 1976), page 531.

ENERGY STATISTICS

1. ENERGY CONSUMPTION, WORLD

2. How much energy does the world consume a year?

3. In 1972: 233.9 quadrillion Btu increasing about 3.3% per year.

4. U. S. Department of the Interior, Energy Perspectives (Washington, D. C.: U. S. Government Printing Office, February 1975), page 8.

1. ENERGY PRODUCTION, U. S. - FOSSIL FUELS

2. How much energy was produced in the U. S. by fossil fuels in 1974?

3. 1974 - 56.483 quads, total of fossil fuels

Oil - 17.492 quads - 8.8 mbpd
Gas - 23.951 quads -
Coal- 14.590 quads -

By 1985 - Oil production from existing on-shore reserves will drop to 2.4 mbpd due to depletion of older wells -
By 1985 - Alaska will produce about 2.4 mbpd.

By 1985 - O.C.S. could produce 2.3 mbpd.

4. Bureau of the Census, Department of Commerce, The U. S. Fact Book - 1976, The Statistical Abstract of the U. S. (New York: Grosset & Dunlap, 1976), page 530.

ENERGY STATISTICS

1. IMPORTS, PETROLEUM (U. S.)

2. How much oil do we import?

3. 1976

   Total Imports: 7.3Mbbl/day
   Percent of Demand: 42.0%
   OPEC Imports: 67.?% of total imports
   Payments for Imports (millions of dollars): 34,653

4. Federal Energy Administration, Energy in Focus, Basic Data (Washington, D. C.: U. S. Government Printing Office, 1977), page 6.

1. INDUSTRIAL CONSUMERS, TOP 5 INDUSTRIES

2. Which industries use the most energy? In 1974?

3. In 1974 - Top 5!

   1. Chemical & Allied products
   2. Primary Metals Industries
   3. Petroleum & Coal products
   4. Stone, Glass, Clay products
   5. Paper & Allied products

4. Prentice - Hall, Inc., Energy Controls (Englewood Cliffs: Prentice-Hall, Inc., 1976), Report Bulletin #12, 3/26/76, page 1.

ENERGY STATISTICS

1. NAVAL FUEL RESERVES FOR COMMERCIAL USE

2. How much oil will we receive from the naval reserves at - Elk Hills - Teapot Dome - ?

3. When full - scale production is reached, it will equal about 4% of the oil we now import or about 350,000 barrels per day.

4. Prentice-Hall Inc., Energy Controls (Englewood Cliffs: Prentice-Hall, Inc., 1976), Report Bulletin #14, 4/9/76, page 3.

1. NUMBER OF WELLS DRILLED

2. What is the number of wells that were drilled in 1976?

3. Oil-------------17,024
   Gas------------- 9,057
   Dry-------------13,682
   Total-----------39,763

4. Federal Energy Administration, Energy in Focus, Basic Data (Washington D. C.: U. S. Government Printing Office, 1977), page 7.

ENERGY STATISTICS

1. PERCENTAGE OF ENERGY CONSUMPTION IN U. S. BY FUEL TYPE

2. What is the percentage of energy consumption by fuel type in the U. S.?

3. Petroleum----------------47.3%
   Coal--------------------18.4%
   Natural Gas (dry)---------27.4%
   Hydroelectric power------- 4.1%
   Nuclear power------------ 2.8%

   1976 - Total Quads--------74.2

4. Federal Energy Administration, Energy in Focus, Basic Data (Washington, D. C.: U. S. Government Printing Office, 1977), page 3.

5. 103

1. PETROLEUM PRODUCT CONSUMPTION %

2. Which petroleum products are consumed the most?

3. In 1973 -

   #1 Gasoline-----------------39 %
   #2 All Others---------------20.9%
   #3 Distillate---------------18. %
   #4 Residual Fuel------------16.3%
   #5 Jet Fuel----------------- 5.8%

4. U. S. Department of the Interior, Energy Perspectives (Washington, D. C.: U. S. Government Printing Office, February 1975), page 91.

ENERGY STATISTICS

1. PRICE COMPARISONS OF CRUDE OIL, MOTOR GASOLINE, NATURAL GAS AND OIL

2. What are the prices for crude oil, motor gasoline, natural gas and coal? 1973 & 1976?

3.

CRUDE OIL

	Average value at wellhead of domestic crude	CIF value all imported crude	Average value of domestic and imported crude
	(Actual 1975 dollars per barrel)		
1973	3.89	4.08	3.94
1976	8.18	13.21	10.54

MOTOR GASOLINE

1973	38.8	
1976	58.7	Average retail prices per gallon of regular gasoline.

NATURAL GAS

	Value of gas at wellhead	Value of gas consumed
1973	21.6	66.5
1975	44.5	109.5

(Average value per thousand cubic feet in cents based on actual and constant 1975 dollars)

COAL

1973	8.53	
1976	20.00	(Average price per ton FOB mine in actual & constant 1975 dollars)

4. Federal Energy Administration, Energy in Focus, Basic Data (Washington, D. C.: U. S. Government Printing Office, 1977), pages 11 - 12.

5. 103

ENERGY STATISTICS

1. OCS - ATLANTIC PRODUCTION CAPACITY - CRUDE OIL

2. How much crude oil can the Atlantic Outer Continental Shelf produce daily?

3. Maximum production could amount to about 250,000 barrels a day if the maximum estimated recoverable reserves are discovered.

4. N. Y. Times 8/22/76, William D. Smith.

1. OCS - ATLANTIC - CRUDE OIL RESERVES

2. How much crude oil is in the Outer Continental Shelf of the Atlantic coast?

3. 400 million to 1.4 billion barrels.

4. New York Times - 8/22/76, William D. Smith.

1. OCS - ATLANTIC, NATURAL GAS PRODUCTION CAPACITY %

2. How much natural gas can the Atlantic Outer Continental Shelf produce daily?

3. Top estimates of the area's reserves could supply the East coast with as much as 10% of its demand.

4. N. Y. Times 8/22/76, William D. Smith.

ENERGY STATISTICS

1. <u>OCS - ATLANTIC - NATURAL GAS RESERVES</u>
2. How much natural gas is in the OCS of the Atlantic Coast?
3. 2.6 trillion to 9.4 trillion cubic feet.
4. <u>N. Y. Times</u> 8/22/76, William D. Smith.

1. <u>REFINERY - CAPACITY, U. S.</u>
2. At what capacity are the U. S. petroleum refineries operating?
3. As of March, 1976 - 94%
4. <u>U. S. News & World Report</u>, September 13, 1976, page 80, USDOC.

1. <u>REFINERIES - LOCATION - U. S.</u>
2. Where are most U. S. refineries located?
3. Expanding existing U. S. refineries is expected to be less controversial than siting new ones. Most domestic refineries are located near oil fields in California, Texas, and Louisiana.
4. League of Women Voters Education Fund, <u>Energy 4 - Refineries: Fuel Supply Bottleneck</u>, (Washington, D. C.: LWVEF, March 1974) Publication #472.

ENERGY STATISTICS

1. ~~REFINERIES - PRODUCTS PRODUCED - U. S.~~

2. What do refineries produce from crude oil?

3. Modern refineries convert crude oil into a myriad of products including gasoline, diesel fuel, jet and aviation fuel, various grades of heating oils, lubricants, paint solvents, asphalt and liquified petroleum gas. Most refineries also process natural gas to make liquified natural gas and petrochemical feedstocks used for manufacturing rubber, plastics and synthetic fiber. Each refinery has its own product mix depending on the market it supplies and on which of the 8 types of crude oil (of varying density and viscosity) it uses.

   The dominant U. S. refinery product is gasoline, followed by heating oil and diesel fuel. Production of each is varied to adjust to seasonal demand. For example, out of a given barrel of crude oil a higher percentage of gasoline than heating oil will be refined in the early summer montns. By late summer, refineries usually shift production ratios to produce more heating oil.

4. League of Women Voters Education Fund, Energy 4 - Refineries: Fuel Supply Bottleneck, (Washington, D. C.: LWVEF, March 1974), Publication #472.

1. RESERVES VS. RESOURCES

2. What are reserves and resources? How do they differ?

3. Oil production estimates result from assessments of oil resources, which fall into 3 categories:

   *1. Proven Reserves
   *2. Indicated & Inferred Resources
   *3. Undiscovered Recoverable Resources

   *See Glossary

4. Federal Energy Administration, Energy in Focus, Basic Data (Washington, D. C.: U. S. Government Printing Office, 1977), page 68.

5. 103

ENERGY STATISTICS

1. SHALE OIL RESERVES - U. S.

2. How much shale oil is there in the U. S.

3. 1972 in billion bbls - by oil yield:

Oil Shale Yield	Identified Deposits	Undiscovered Resources
25-100 gallons per ton	418	900
10-25 gallons per ton	1600	25,000
5-10 gallons per ton	2200	138,000

4. Ford Foundation, Energy Policy Project, A Time To Choose (Cambridge: Ballinger Publishing Co., 1974), page 483.

TRANSPORTATION

1. AIR CONDITIONING AND MILES PER GALLON

2. How much more gasoline do I use running my car air conditioning?

3. AVOID UNNECESSARY USE OF AIR CONDITIONING EQUIPMENT.
When in use, it reduces fuel economy by as much as 2½ miles per gallon.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Don't Be Fuelish - Tips for the Motorist, (Washington, D. C.: The Advertising Council, 1975).

5. 043, 102

1. AUTO AIR CONDITIONING

2. How much does the car's air conditioning affect mileage?

3. Use car air-conditioners sparingly. Cooling equipment cuts gas mileage 1 to 3 miles a gallon and adds up to $30.00 to your annual gasoline bill, even if you use it only half the time. On an average, air conditioning reduces fuel economy 10%, and almost 20% in stop and go traffic.
Example: If you get 15 miles per gallon average then by using A/C

Average	Stop & Go
15 MPG	15 MPG
X.10 loss	X.20 loss
13.5 New MPG	12.0 New MPG

4. Federal Energy Administration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D.C.: U. S. Government Printing Office, May 1977), page 37.

5. 043. 102

TRANSPORTATION

1. AUTO CONSUMPTION (%)

2. What percentage of the U. S. energy consumption is by cars?
   How much of the oil?

3. Passenger automobiles consume about 14% of all the energy and about 31% of all the petroleum used in the United States.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Don't Be Fuelish - Tips for the Motorist, (Washington, D. C.

5. 043, 102

1. BRAKING & MILES PER GALLON

2. Can excessive braking effect Miles Per Gallon?

3. Yes! BREAK GAS-WASTING HABITS. For instance, don't pump the accelerator or race the engine when your car is not in motion. It wastes gasoline. And use the brake pedal rather than the accelerator to hold your car in place on a hill.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Don't Be Fuelish - Tips for the Motorist, (Washington, D. C.:

5. 043, 102

1. CITY BUSES - MPG

2. What sort of mileage do city buses get?
   Are they energy efficient?

3. An innercity bus gets 6 miles per gallon or the equivalent of 282 passenger miles per gallon when filled to capacity (47 riders).

4. United States Congress, Office of Technology Assessment, Energy, The Economy, and Mass Transit (Washington, D. C.: U. S. Government Printing Office, December 1975), page 21.

5. 043, 102

TRANSPORTATION

1. ELECTRIC AUTOS

2. How do electric cars work?

3. The vehicles use battery - electric energy to run a motor which propels the car. Theoretically, ~~the~~ motor can be fully engaged as soon as the switch is turned on. In practice, however, a multispeed transmission provides the flexibility of operation that best fits the modern traffic pattern as well as helping to obtain improved vehicle performance.

4. Energy Research and Development Administration, Office of Conservation, Division of Transportation, Experimental Electric Vehicle (Washington, D. C.: U. S. Government Printing Office, January 1976)

5. 043, 102, 077

1. EPA CITY MILEAGE TEST

2. What is the EPA City milage test?

3. This test simulates a 7.5 mile stop and go trip with a speed range of 0 to 56 MPH, and an average speed of 20 MPH. The trip takes 23 minutes and has 18 stops. Eighteen percent of the trip is spent idling, such as would be expected in the city at traffic lights or in rush-hour traffic. Two kinds of engine starts are used. One is a cold start, which is similar to starting a car in the morning after it has been parked all night.

4. U. S. Environmental Protection Agency and the Federal Energy Administration, 1977 Gas Mileage Guide (Washington, D. C.: U. S. Government Printing Office, January 1977), page 8.

5. 043, 102

TRANSPORTATION

1. EPA - HIGHWAY MILAGE TEST

2. What is the EPA highway mileage test?

3. This test simulates a 10 mile, non-stop trip that begins with the vehicle warmed up. The trip has an average speed of about 50 MPH and lasts 13 minutes. The speed during the test ranges from 0 to 60 MPH. If your highway driving speed averages faster than the test's average of 50 MPH, you should expect to achieve poorer fuel economy than the highway fuel economy estimate in this guide. The amount of this decrease is approximately 10 to 15% for every 10 MPH above 50 MPH.

4. U. S. Environmental Protection Agency and the Federal Energy Administration, 1977 Gas Mileage Guide (Washington, D. C.: U. S. Government Printing Office, January 1977), page 8.

5. 043, 102

1. GAS TREATMENTS & MPG

2. Do gas treatments effect my mpg? How?

3. Many motorists swear by fuel additives. However, the fact that none of the major auto makers recommend their use is a powerful argument against them. There is no evidence that they contribute to increased fuel economy. Obviously, fuel additives burn, but they offer a costly method of increasing the supply in the tank.

4. Henry R. Spies et al., 350 Ways to Save Energy (and Money) In Your Home and Car (New York: Crown Publishers, Inc., 1974), page 184.

5. 043, 102

TRANSPORTATION

1. GASOLINE COST PER CAR (RULE OF THUMB)

2. How much does it cost me for gas?

3. If your average cost of gas is 60¢ per gal. and your car gets 12 mpg, your fuel cost for 10,000 miles of driving is $500.00. If you drive 20,000 miles a year your annual fuel cost will be twice this figure, or $1,000.00. If you own a car that gets 20 mpg, your annual fuel cost for 10,000 miles at 60¢ per gallon is $300.00.

FUEL COSTS PER TEN THOUSAND MILES

Combined City/Highway MPG	Cents per Gallon								
	45	50	52	54	56	58	60	65	70
10	$450	$500	$520	$540	$560	$580	$600	$650	$700
11	409	455	473	491	509	527	545	591	636
12	375	417	433	450	467	483	500	542	583
13	346	385	400	415	431	446	462	500	538
14	321	357	371	386	400	414	429	464	500
15	300	333	347	360	373	387	400	433	467
16	281	313	325	338	350	363	375	406	438
17	265	294	306	318	329	341	353	382	412
18	250	278	289	300	311	322	333	361	389
19	237	263	274	284	295	305	316	342	368
20	225	250	260	270	280	290	300	325	350
22	205	227	236	245	255	264	273	295	318
24	188	208	217	225	233	242	250	271	292
26	173	192	200	208	215	223	231	250	269
28	161	179	186	193	200	207	214	232	250
30	150	167	173	180	187	193	200	217	233
32	141	156	163	169	175	181	188	203	219
34	132	147	153	159	165	171	176	191	206
36	125	139	144	150	156	161	167	181	194

Example: If your average cost of gasoline is 60 cents per gallon and your car gets 12 MPG, your fuel cost for 10,000 miles of driving is $500. If you drive 20,000 miles a year, your *annual* fuel cost will be twice this figure, or $1,000. If you own a car that gets 20 MPG, your annual fuel cost for 10,000 miles at 60 cents per gallon is $300.

4. U. S. Environmental Protection Agency and the Federal Energy Administration, 1976 Gas Mileage Guide (Washington, D. C.: U. S. Government Printing Office, January 1976), page 5.

5. 043, 102

TRANSPORTATION

1. <u>IDLING VS. RESTARTING</u>

2. Do I use more gas idling my car or turning it off and restarting it?

3. AVOID EXCESSIVE IDLING. The average American car consumes a cup of gasoline every 6 minutes when idling. When you stop the car, don't idle the engine for more than a minute. If you are waiting for someone, turn off the engine. It takes less gasoline to restart the car than it does to idle it.

4. Federal Energy Administration, Office of Energy Conservation and Environment, <u>Don't Be Fuelish - Tips for the Motorist</u>, (Washington, D. C.:

5. 043, 102

1. <u>INCREASING MPG's</u>

2. How can I get better mpg from my car?

3. The most important single element in determining fuel economy of a particular car is the driving technique of the individual behind the wheel. One authority declares that a careful driver should be able to get at least 30% better mileage than an average driver, and 50% better mileage than a poor one.

4. Federal Energy Administration, Office of Energy Conservation and Environment, <u>Tips for Energy Savers</u> (Washington, D. C.: U. S. Government Printing Office, May 1977), page 33.

5. 043, 102

1. <u>L.I.R.R.</u>

Are commuter railroads
2. ~~Is the LIRR~~ energy efficient? ~~Are other area railroads~~?

3. Commuter rail cars receive 250 passenger miles per gallon of fuel or equivalent with 125 passengers.

4. U. S. Congress Office of Technology Assessment, <u>Energy, The Economy, and Mass Transit</u> (Washington, D. C.: U. S. Government Printing Office, December 1975), page 21.

TRANSPORTATION

1. MILEAGE - FACTORS INFLUENCING

2. What physical features of an automobile influence mileage factors?

3. Vehicle weight and engine size are the most important items affecting overall fuel consumption. Generally speaking, in city driving, a 5,000 pound car will require twice as much gasoline to run as a 2,500 pound car. Optional equipment not only adds weight to the car but also requires power from the engine and thus requires fuel to operate. For example, using an air conditioner can reduce gas mileage by more than 10% in city driving.

4. U. S. Environmental Protection Agency and the Federal Energy Administration, <u>1976 Gas Mileage Guide</u> (Washington, D. C.: U. S. Government Printing Office, January 1976), page 5.

5. 043, 102

1. MILEAGE - SPEED

2. At what speed do I get the best fuel economy?

3. The best fuel economy occurs at speeds between 30 and 40 miles per hour with no stops and no rapid speed changes.

4. U. S. Environmental Protection Agency and the Federal Energy Administration, <u>1976 Gas Mileage Guide</u> (Washington, D. C.: U. S. Government Printing Office, January 1976), page 5.

5. 043, 102

1. MILEAGE - TIRES

2. How can my tires affect the gas mileage?

3. Using radial tires, instead of conventional or bias-ply tires can result in a 3% improvement in gas mileage. Improper front end alignment and tires inflated below the recommended pressure will reduce gas mileage.

4. U. S. Environmental Protection Agency and the Federal Energy Administration, <u>1976 Gas Mileage Guide</u> (Washington, D. C.: U. S. Government Printing Office, January 1976), page 5.

5. 043, 102

TRANSPORTATION

1. MILEAGE - ~~TUNE~~UPS

2. How much can I save by keeping my car well tuned?

3. A tuned car will average 6% better mileage than an untuned one. A properly maintained car also helps reduce air pollution.

4. U. S. Environmental Protection Agency and the Federal Energy Administration, 1976 Gas Mileage Guide (Washington, D. C.: U. S. Government Printing Office, January 1976), page 5.

5. 043, 102

1. MILEAGE - ACCELERATION

2. How can rapid acceleration affect gas mileage?

3. Rapid acceleration can reduce fuel economy by 15% over moderate acceleration.

4. U. S. Environmental Protection Agency and the Federal Energy Administration, 1976 Gas Mileage Guide (Washington, D. C.: U. S. Government Printing Office, January 1976), page 5.

5. 043, 102

1. MILES AND GALLONS CONSUMED

2. How many cars are there? Average miles traveled? Average auto miles per gallon? Gallons of gas used per car a year?

3. In the 50 states, there are an estimated 100,000,000 registered automobiles. The average car travels approximately 10,000 miles per year and consumes well over 700 gallons of gasoline. The average fuel economy is less than 13.7 miles per gallon.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Don't Be Fuelish - Tips for the Motorist (Washington, D. C.:

5. 043, 102

TRANSPORTATION

1. MILES PER GALLON RATINGS REQUIREMENTS

2. What will be the miles per gallon standards imposed by the Government by 1978 - 1985?

3. Average - 1978 (18.5) MPG - Highway & Local
   - 1985 (27.5) MPG

4. Wall Street Journal, July 27, 1976, Page 12.

5. 043, 021, 102

1. MOTOR OILS & MILES PER GALLON

2. Does motor oil effect Miles Per Gallon?

3. YES! Change oil and oil filter at recommended intervals. Dirty oil can seriously damage engine parts and cause friction and wear that rob gas mileage. A worn engine that burns oil will require more frequent tuning and get progessively poorer gas mileage. Use a good quality multi-grade (multi-viscosity) oil having an API SAE rating on the container. Multi-grade 10W-30 and 10W-40 oils help reduce internal engine friction and give better gasoline mileage than single grade SAE 30 oils. Do not use an oil of higher viscosity than recommended in your owner's manual, since heavier oils tend to increase friction and decrease miles per-gallon efficiency. A lower viscosity oil such as 5W-30 is recommended for winter months in the northern states.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Don't Be Fuelish - Tips for the Motorist (Washington, D. C.:

5. 043, 102

TRANSPORTATION

1. OCTANE & MILES PER GALLON

2. Does the octane rating of the gasoline effect my miles per gallon?

3. Use gasoline of the proper octane rating. Using too low an octane rating for your car will produce a "ping" which, if sustained, will damage the engine. Using too high an octane rating wastes money and will not produce more power or improve fuel economy.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Don't Be Fuelish - Tips for the Motorist (Washington, D. C.

5. 043, 102

1. RADIAL TIRES & MILES PER GALLON

2. Do radial tires help miles per gallon?

3. YES! Consider buying radial tires. Radial tires will give you from 0.5 to 1 more miles per gallon. Their initial high cost is usually paid for in fuel savings and longer tread life. Warning: Do not mix radial tires with conventional tires.
Goodyear claims an average annual fuel savings of 3 to 5% over an extended period.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Don't Be Fuelish - Tips for the Motorist (Washington, D. C.

5. 043, 102

TRANSPORTATION

1. SUBWAYS - EFFICIENCY

2. [redacted] the [redacted] subways energy efficient?

3. Inter-city passenger trains receive 270-360 passenger miles per gallon of fuel or equivalent with 540-720 passengers.

4. United States Congress, Office of Technology Assessment, Energy, The Economy, and Mass Transit (Washington, D. C.: U. S. Government Printing Office, December 1975), page 21.

1. TUNEUP & MILES PER GALLON

2. How much do tuneups help? How often should I get them?

3. GET A TUNE-UP! Keep your car engine tuned according to the specifications given in your owner's manual. If your manual is lost, then follow this plan:

   Every 10,000 miles a major tuneup should be done. That means: Install new spark plugs, ignition points, and condenser. Clean or replace the positive crankcase ventilating (PCV) valve, remove gum or sludge from the hoses. Check all electrical ignition circuits and connections for voltage drop and resistance. Clean, tighten and replace them as necessary. Inspect the choke for proper operation. Set the timing to the manufacturer's specifications. Check the ignition advance mechanism (mechanical and vacuum). Remove foreign matter from the exhaust gas recirculatory valve and hoses and check the controls following the manufacturer's specifications. Check the exhaust system for blockage. Replace air and fuel leaks at carburetor, fuel pump, gas line and gas tank. About 5,000 miles after the major tuneup, a minor tuneup should be performed. This may involve cleaning the plugs, and adjusting points and timing as necessary.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Don't Be Fuelish - Tips for the Motorist (Washington, D. C.

5. 043, 102

TRANSPORTATION

1. VACUUM GAUGE

2. Will a vacuum gauge increase my mpg? How does it work?

3. It will not increase fuel economy in a direct sense, but if the driver will heed its simple indications it can have an excellent effect on gas mileage. A vacuum gauge measures air pressure in the intake manifold in inches of mercury and gives us some graphic clues about overall engine performance. The vacuum in the intake manifold decreases as the carburetor butterfly valve opens, which happens when the driver's foot presses the accelerator pedal. The vacuum also decreases with engine loads, as when an auto climbs a hill maintaining the same speed as it did on level ground. In general then, a high vacuum gauge reading indicates good economy, while a low reading means higher fuel consumption.

4. Henry R. Spies et al., 350 Ways to Save Energy (and Money) In Your Home and Car (New York: Crown Publishers, Inc., 1974), page 176.

5. 043, 102

1. WHEEL ALIGNMENT & MILES PER GALLON

2. Does wheel alignment effect mileage?

3. Yes! Make sure your wheels are properly aligned. An annual check is in order. Improper front wheel toe-in alignment can increase fuel use by 0.3 miles per gallon.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Don't Be Fuelish - Tips for the Motorist (Washington, D. C.: U. S. Government Printing Office, 1975).

5. 043, 102

ENERGY POLICY

1. CRUDE OIL STORAGE FOR EMBARGO CONTINGENCY

2. Is there a plan to store crude oil in case of another embargo?

3. YES! By 1978 - Early Storage Reserve (ESR) -
150 m.b. of crude oil

By 1982 - Strategic Petroleum Reserve (SPR) -
1 billion barrels

$300 Million - 1976 fiscal year - to buy storage facilities

$550 Million - 1977 fiscal year - to buy first 50 million barrels (m.b.) at $11.00 per barrel

Stored in salt domes along Gulf Coast and limestone mines in south & mid-wes

CRUDE OIL STORAGE FOR EMBARGO CONTINGENCY

60 m.b. to be purchased in calendar 1977
90 m.b. to be purchased in calendar 1978

4. Prentice - Hall, Inc., Energy Controls (Englewood Cliffs: Prentice - Hall, Inc., 1976), Report Bulletin #17, 4/30/76, page 2.

ENERGY POLICY

1. EMBARGO CONTINGENCY PLANS (RATIONING)

2. Are there any plans for another embargo fuel allocation or rationing program?

In May 1976, according to Frank Zarb - the former FEA Administrator - these are the steps to be taken in the event of another oil embargo - in order:

a) Voluntary conservation

b) Mandatory allocation regulations

c) Drawdown for strategic storage reserves

d) Replace imports from other sources

e) Energy conservation & rationing plans

4. Prentice - Hall, Inc., Energy Controls (Englewood Cliffs. Prentice - Hall, Inc., 1976), Report Bulletin #22, 6/4/76, page 2.

ENVIRONMENT

1. CLEAN FUELS FROM COAL PRODUCTION

2. How much of these clean fuels is being manufactured?

3. Very little, because the cost of clean coal fuels is much higher than conventional fuels. For example, electricity made by burning high quality coal in a boiler and then cleaning up the stack gases will cost about 2.5 cents per kilowatt hour. For the consumer that works out to about 10¢ for enough energy to roast a big turkey in an electric oven. It would cost 18¢ to roast that turkey if the coal were converted into gas before burning it to generate electricity even using the best process available today.

4. Edison Electric Institute in cooperation with the Electric Power Research Institute, Clean Energy From Coal, 1976.

1. CLEAN FUEL FROM COAL

2. How is clean fuel made from coal?

3. Depending on the kind of coal we start with, there are a half dozen ways of making clean fuels. The simplest is just to wash it, to pulverize the coal and float out the clean fuel, leaving ashforming rock and sulfur behind.

4. Edison Electric Institute in cooperation with the Electric Power Research Institute, Clean Energy From Coal, 1976.

ENVIRONMENT

1. <u>OCEAN OIL POLLUTION</u>

2. What sort of environmental hazards would new off-shore drilling cause in the Atlantic?

3. The Government argues that offshore drilling is far less of an environmental hazard than the only alternative, tanker shipments of foreign oil. A National Academy of Science study contends that offshore oil production accounts for only 1.3% of the petroleum pollution in the ocean while tankers contribute 34.9% and river and urban runoff 31.1%.

4. <u>New York Times</u> 8/22/76, William D. Smith

1. <u>POLLUTION CONTROL - COAL BURNING</u>

2. How much do we control the pollution caused by burning coal?

3. This can be accomplished in two ways. We can burn coal and then take out out the pollutants before the hot gases go up the stack. Much of today's technology is devoted to this process, or we can remove the pollutants before the coal is burned. Removing pollutants before burning is what we are doing by making clean fuels from coal.

4. Edison Electric Institute in cooperation with the Electric Power Research Institute, <u>Clean Energy From Coal</u>, 1976.

ENVIRONMENT

1. POLLUTION REDUCTION - HOME HEATING

2. How much pollution reduction will result from proper maintenance of oil burning equipment?

3. In a recent study it was found that by identifying and replacing non-tuneable units, carbon monoxide (CO) was reduced by more than 65%, gaseous hydrocarbons (HC) were reduced by 87%, and filterable particulate was reduced by 17%. By tuning the remaining burners in addition to replacing nontuneable units the total reductions were as follows:

   Smoke was reduced by 59%
   CO was reduced by more than 81%
   HC was reduced by 90%
   Filterable particulate was reduced by 24%

4. U. S. Environmental Protection Agency, Office of Public Affairs, Get the Most From Your Heating Oil Dollar (Washington, D. C.: U. S. Government Printing Office, 1976).

1. RECYCLING - ALUMINUM - STEEL

2. How much energy can be saved by recycling vs. virgin ore use?

3. Recycling. In a report from the Oak Ridge National Laboratory, Eric Hirst concluded that the energy requirements for production from steel, aluminum and paper scrap are far lower than those for production from virgin materials. Reprocessing aluminum scrap, for example, consumes less than 5% of the energy needed to produce aluminum from bauxite; reprocessing steel scrap requires 25% of the energy used to make steel from virgin ores. Energy savings result because virgin materials used in manufacturing must first be extracted or harvested, refined, and then transported to the processor; while products made from scrap eliminate the extraction and refining steps and require only separation and transportation. EPA estimates that if all municipal wastes had been recovered in 1972, using available technologies, almost 170 trillion Btus of primary energy would have been saved that year. This is equivalent to 30 million barrels of oil. It is estimated that these figures will double by 1985, a significant growth rate if energy demand does not skyrocket. Environmentalists also point out that increased recycling has the additional benefit of conserving valuable non-renewable resources.

4. League of Woman Voters Education Fund, Energy 13 - Solid Waste: Energy to Burn (Washington, D. C.: LWVEV, October 1974), Publication #529.

ENVIRONMENT

1. REFILLABLE VS. NONREFILLABLE CONTAINERS

2. How much energy can be saved by using returnable containers vs. nonreturnable throwaways?

3. EPA says that use of a refillable bottle saves 50% of the energy that would have been needed to produce a non-refillable bottle or can and that a national policy requiring the use of returnable, refillable beverage containers would save 244 trillion Btus each year. Dr. Bruce Hannon of the Center for Advanced Computation at the University of Illinois adds that the "annual energy now diverted into supplying beer and soft drinks in throw-away cans and bottles would supply all of the electrical needs of Pittsburgh, Boston, Washington, D. C. and San Francisco for one year" (emphasis added).

4. League of Women Voters Education Fund, Energy 13 - Solid Waste: Energy to Burn (Washington, D. C.: LWVEF, October 1974), Publication # 529.

1. SOLID WASTE ENERGY RECOVERY TECHNIQUES

2. What about recovery from solid waste?

3. Using the combustible fraction of solid waste for fuel will conserve oil, gas, and coal as well as help to release local waste disposal problems. The most basic system, used in other countries for years, burns trash as a supplemental fuel in coal-fired boilers. Waste-burning in the U. S. has not been widespread, but the best known facility is an EPA-sponsored demonstration project in St. Louis where the Union Electric Company uses a combination of municipal waste (from which ferrous and non-ferrous metals have been salvaged) and coal to run boilers. It is estimated that use of solid waste cuts coal consumption at the plant by up to 15% and that one ton of trash can be converted into 900 kilowatts, of electricity. A second method of heat recovery, pyrolysis (burning in the virtual absence of air), converts the organic component of waste into oil or gas which is then burned. Although this system is still experimental (and some experts even question its feasibility), EPA demonstration projects are now under construction in Baltimore and San Diego to convert trash to combustible gas and oil. EPA's Office of Solid Waste Management Programs (OSWMP) says that if energy recovery from municipal wastes were practiced in every Standard Metropolitan Statistical Area (SMSA) in the country, 800 trillion Btus could be produced each year, or about 400,000 barrels of oil each day. According to OSWMP, this is roughly equivalent to 1% of all energy consumed in the U. S. in 1970.

4. League of Women Voters Education Fund Energy 13 - Solid Waste: Energy to Burn (Washington, D. C.: LWVEF, October 1974), Publication #529.

ENVIRONMENT

1. UNDERGROUND CABLE - ADVANTAGES

2. Beside the fact that underground cables are buried out of sight, what other advantages do they have?

3. They are much less vulnerable to vandalism and they are not affected by wind, hail and lightning.

4. Edison Electric Institute in cooperation with the Electric Power Research Institute, Underground Transmission, 1976.

5. 093

1. UNDERGROUND CABLES - DISADVANTAGES

2. What are the disadvantages?

3. The big drawback is their high cost. In addition, when a break does occur underground, it is harder to find. In addition, because they don't have air around them for cooling, underground lines cannot stand up to overloading as well as overhead lines do.

4. Edison Electric Institute in cooperation with the Electric Power Research Institute, Underground Transmission, 1976.

5. 093

ENVIRONMENT

1. UNDERGROUND CABLES - COST & INSTALLATION

2. Why do they cost so much more?

3. For one thing, digging or channelling is more expensive than installing overhead lines. And overhead lines don't require any insulation around them because the conducting wires are separated by several feet of air. Underground, the wires must be insulated from the ground and from each other.

4. Edison Electric Institute in cooperation with the Electric Power Research Institute, Underground Transmission, 1976.

5. 093

1. UNDERGROUND CABLES - COSTS VS. OVERHEAD LINES

2. Why don't all electric transmission lines go underground?

3. Because underground lines cost five to twenty times more to install than overhead lines.

4. Edison Electric Institute in cooperation with the Electric Power Research Institute, Underground Transmission, 1976.

5. 093

ENVIRONMENT

1. UNDERGROUND CABLE - INDUSTRY'S GOAL

2. What is the industry's goal for underground transmission?

3. We want to make the cost of installing and operating underground lines much lower. If we are successful in bringing expenses closer to what it costs for overhead lines, we expect to see a much larger share of new power lines going underground.

4. Edison Electric Institute in cooperation with the Electric Power Research Institute, Underground Transmission, 1976.

5. 093

1. UNDERGROUND CABLE INSULATION

2. Why should that be a problem? Insulated wires that run in houses don't cost much more than open wires.

3. That is true, but house wiring is low voltage. When the voltages are a thousand or more times higher, as they are in transmission lines, the insulation becomes formidable. It is the same idea as the difference between weather stripping a car or a submarine to keep water out. The car door is simple and cheap, but the submarine is complicated and expensive.

4. Edison Electric Institute in cooperation with the Electric Power Research Institute, Underground Transmission, 1976.

5. 093

ENVIRONMENT

1. UNDERGROUND CABLES - REDUCING COSTS & RESEARCH RESULTS

2. a) What are you doing to bring down these costs?

b) Has that program produced any results?

3.

a) We have a major test program coordinated by the Electric Power Research Institute to develop better, lower cost cables and new methods of installing them.

b) YES! We have tested new underground cables that may eventually be 15 to 50% cheaper than the traditional type. We have developed a simplified method of splicing cables that will reduce installation costs. And we have proven that underground cables can carry voltages previously thought possible only with overhead transmission lines.

4. Edison Electric Institute in cooperation with the Electric Power Research Institute, Underground Transmission, 1976.

5. 093

AGRIBUSINESS AND ENERGY

1. ENERGY & FARMING

2. How much of a role does energy play in farming?

3. Farming requires energy fuels for virtually all of its operations. Farm machinery, irrigation systems (primarily pumps), cow-milking equipment and crop-drying facilities use petroleum products such as gasoline, diesel fuel, liquified petroleum gas (LPG) and natural gas. At the same time, chemical fertilizers, herbicides and animal feeds are made with petroleum by-products known as petrochemical inorganics. (Hydrogen produced from a refinery's catalytic reforming unit is combined with nitrogen from the atmosphere to form ammonia, an ingredient of commercial fertilizer.) Fertilizer and feed are less direct users of energy fuels than are farm tractors and combines. But, Eric Hirst of the Oak Ridge National Laboratory, estimates that these indirect uses consume 56% of farming energy, with the remainder supplying direct fuel needs.

4. League of Women Voters Education Fund, Energy 6 - Agribusiness and Energy Use (Washington, D. C.: LWVEF, March 1974), Publication #476.

1. FOOD PRODUCTION & ENERGY

2. Examples - How much energy does it take to produce foods?

3. Eric Hirst of the Oak Ridge National Laboratory estimates for example, that:

   - It takes the equivalent of a half-glass of diesel fuel to put a glass of milk on the breakfast table.
   - It takes the equivalent of two pounds of coal to produce a one pound loaf of bread.
   - It takes the equivalent of three pounds of coal to produce a pound of hamburger.
   - It takes 6.4 Btus of primary energy (energy from basic fuels) to deliver one Btu of food value.

4. League of Women Voters Education Fund, Energy 6 - Agribusiness and Energy Use (Washington, D. C.: LWVEF, March 1974), Publication #476.

AGRIBUSINESS & ENERGY

1. FOOD PROCESSING & ENERGY

2. How much energy is used for food processing?

3. Food production involves a number of activities that go far beyond the growing of crops, including processing, transportation, trade and household functions. Processing alone (such as slaughtering, milling, refining, pre-cooking) uses about 32% of total energy consumed in food production; transportation, trade and household functions (freezing, refrigerating, cooking, etc.) consume about 50% of total energy. Actual farming, using about 18% of food production energy, uses more than 2,200 trillion Btus each year -- over 4% of the annual U. S. energy budget.

4. League of Women Voters Education Fund, Energy 6 - Agribusiness and Energy Use (Washington, D. C.: LWVEF, March 1974), Publication #476.

1. TRACTORS ENERGY EFFICIENCY

2. Which tractors are more efficient; diesel, gasoline or liquified petroleum gas-powered?

3. Diesel.

4. League of Women Voters Education Fund, Energy 6 - Agribusiness and Energy Use (Washington, D. C.: LWVEF, March 1974), Publication #476.

GLOSSARY

1. <u>ABSORBER, OR ABSORBER PLATE</u>

2. Absorber, or Absorber Plate?

3. A surface, usually blackened metal, in a solar collector which absorbs solar radiation.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, <u>Buying Solar</u>, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vi.

1. <u>ABSORPTANCE</u>

2. Absorptance?

3. The soaking up of heat in a solar collector. Measured as percent of total radiation available.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, <u>Buying Solar</u>, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vi.

1. <u>ACTIVE SOLAR SYSTEM</u>

2. Active Solar System?

3. Any system that needs mechanical means such as motors, pumps, valves, etc. to operate.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, <u>Buying Solar</u>, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vi.

GLOSSARY

1. ALTERNATING CURRENT (AC)

2. AC - Alternating current?

3. Alternating Current - (AC) An electric current whose direction is reversed at regular intervals. Electric power in the United States alternates with a frequency of 60 hertz, or cycles per second. Some European countries use 50 hertz.

4. Energy Glossary, State of Maryland, Energy Policy Office.

1. AMBIENT TEMPERATURE

2. Ambient Temperature?

3. Another way of saying how cold or how hot it is outdoors.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vi.

1. AMERICAN GAS ASSOCIATION (A.G.A.)

2. American Gas Association?

3. AGA - American Gas Association. The trade association of the private gas industry.

4. Energy Glossary, State of Maryland, Energy Policy Office.

GLOSSARY

1. AMERICAN PETROLEUM INSTITUTE (A.P.I.)

2. American Petroleum Institute?

3. Trade Association for producing companies, which publishes studies of U. S. petroleum production and reserves of crude oil, compiled for each oil field.

4. League of Women Voters Education Fund, Energy 3 - Those Elusive Figures: Oil (Washington, D. C.: LWVEF, February 1974), Publication #469.

1. AMPERE

2. Ampere?

3. A unit of measure for an electric current; the amount of current which flows in a circuit in which the electromotive force is one volt and the resistance is one ohm.

Energy Glossary, State of Maryland, Energy Policy Office.

1. ANTHRACITE

2. What is Anthracite coal?

3. Hard coal - with the highest Btu/lb content.

4. League of Women Voters Education Fund, Energy 8 - Tapping Our Coal Reserves (Washington, D. C.: LWVEF, April 1974), Publication #479.

GLOSSARY

1. BARRELS - GALLONS (U.S.)

2. How many gallons are in a barrel of crude oil?

3. barrels (bbls) - 1 barrel equals 42 gallons
Barrel (bbl). - A liquid measure of oil, usually crude oil, equal to 42 American gallons or about 306 pounds. One barrel equals 5.6 cubic feet or 0.159 cubic meters. For crude oil, 1 bbl is about 0.136 metric tons, 0.134 long tons, 0.150 short tons. The energy values of petroleum products per barrel are: crude petroleum 5.6 million Btu/bbl; residual fuel oil-6.129; distillate fuel oil-5.83; gasoline-5.25; jet fuel (kerosine type)-5.67; jet fuel (naphtha type)-5.36; kerosine-5.67; petroleum coke-6.02; and asphalt-6.64.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), page 43.

1. BASE LOAD

2. Base load of a utility?

3. Base Load - The minimum load of a utility (electric or gas) over a given period of time.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. BASE LOAD STATION

2. Base Load Station?

3. Base Load Station - (Gas) A station which is normally operated to take all or part of the base load of a system and which, consequently, operates essentially at a high load factor.

4. Energy Glossary, State of Maryland Energy Policy Office.

GLOSSARY

1. BIOCONVERSION

2. Bioconversion?

3. Utilization of agricultural or municipal wastes to provide fuel.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vi.

1. BITUMINOUS COAL

2. Bituminous coal?

3. "Soft" Coal - ranked 2nd in Btu per pound content - lower smoking, over 70% reserve located in Appalachia and midwestern states east of the Mississippi - contains over 1% sulfur.

4. League of Women Voters Education Fund, Energy 8 - Tapping Our Coal Reserves (Washington, D. C.: LWVEF, October 1974), Publication #479.

1. BLENDED FUEL OIL

2. Blended Fuel Oil?

3. Blended Fuel Oil - A mixture of residual and distillate Fuel Oils.

4. Energy Glossary, State of Maryland Energy Policy Office.

GLOSSARY

1. BREEDER RATIO

2. Breeder ratio?

3. The ratio of the number of fissionable atoms produced in a breeder reactor to the number of fissionable atoms consumed in the reactor.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. BRITISH THERMAL UNIT (Btu)

2. What is a British Thermal Unit (Btu)?

3. The quantity of heat necessary to raise the temperature of one pound of water one degree Fahrenheit. One Btu equals 252 calories, 778 foot pounds, 1055 joules and 0.293 watt hours.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. BUNKER "C" FUEL OIL OR #6

2. Bunker "C" Fuel Oil?

3. Bunker "C" Fuel Oil - A heavy residual fuel oil used in ships, industry and for large-scale heating installations. In industry it is often referred to as No. 6 fuel.

4. Energy Glossary, State of Maryland Energy Policy Office.

GLOSSARY

1. BUREAU OF MINES

2. Bureau of Mines?

3. Bureau of Mines (BoM) - A bureau of the Department of Interior established in 1910. It "...conducts research and administers regulatory programs necessary for performance of the governmental function to stimulate the private sector toward the production of an appropriate and substantial share of the national mineral and fuel needs in a manner that best protects the public."

4. Energy Glossary, State of Maryland Energy Policy Office.

1. C-VALUE (HEAT FLOW MEASUREMENT)

2. C Value?

3. A measure of the heat flow through a given thickness of material. If you know a material's K, to find its C, divide by the thickness; e.g., 3" thick insulation with a K of 0.30 has a C of 0.10. The lower the K or C, the higher the insulating value.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C: U. S. Government Printing Office, June 1976), page vii.

1. CATALYTIC CRACKING

2. Catalytic Cracking?

3. Catalytic Cracking - The conversion of high-boiling hydrocarbons into lower boiling substances by means of a catalyst. Feedstocks may range from naptha cuts to reduced crude oils.

4. Energy Glossary, State of Maryland Energy Policy Office.

GLOSSARY

1. CHAIN REACTION

2. Chain Reaction?

3. A nuclear reaction that stimulates its own repetition. In a fission chain reaction, a fissionable nucleus absorbs a neutron and fissions, releasing additional neutrons. These in turn can be absorbed by other fissionable nuclei, releasing still more neutrons. A fission chain reaction is self-sustaining when the number of neutrons released equals or exceeds the number of neutrons lost by absorption in nonfissionable material or by escape from the system.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. CHEMICAL ENERGY

2. Chemical Energy?

3. Energy stored in molecules, such as in fossil fuels.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), page 42.

1. COAL AUGERING

2. Coal Augering?

3. A surface mining method used when coal lies in high walls that were prepared for this operation or were left by stripping, or when the coal outcrops to the surface. The mining machines consist of large single and double augers which drill horizontally into the seams to extract the coal.

4. Energy Glossary, State of Maryland Energy Policy Office.

GLOSSARY

1. <u>COAL GAS</u>

2. Coal Gas?

3. Coal Gas - Manufactured gas made by distillation or carbonization of coal in a closed coal gas retort, coal oven or other vessel.

4. <u>Energy Glossary</u>, State of Maryland Energy Policy Office.

1. <u>COAL GASIFICATION</u>

2. [illegible] Gasification?

3. [illegible] Gasification - The conversion of coal to a gas suitable for use as a [illegible]l. Cf. Hygas, CO^2 - acceptor, Bi-gas, methanation, Lurgi A T G A S [illegible]rocesses.

4. <u>Energy Glossary</u>, State of Maryland Energy Policy Office.

1. <u>COAL GASIFICATION, UNDERGROUND</u>

2. Underground Coal Gasification?

3. The proposed process for producing synthetic gas from coal in natural, underground deposits. Western coal deposits 100 or more feet below the surface are the probable target for this technology.

4. <u>Energy Glossary</u>, State of Maryland Energy Policy Office.

GLOSSARY

1. <u>COAL LIQUEFACTION (HYDROGENATION)?</u>

2. Liquefaction (Hydrogenation)?

3. The conversion of coal into liquid hydrocarbons and related compounds of hydrogenation. Three projects in the Office of Coal Research include the Consol pilot plant for low-sulfur liquid fuels, the FMC Corp's project COED, and the P&M Corp. pilot plant project for low-ash/low-sulfur solvent refined coal.

4. <u>Energy Glossary</u>, State of Maryland Energy Policy Office.

1. <u>COAL OIL</u>

2. Coal Oil?

3. Oil obtained by the destructive distillation of bituminous coal. An archaic term for kerosine made from petroleum.

4. <u>Energy Glossary</u>, State of Maryland Energy Policy Office.

1. <u>COEFFICIENT OF PERFORMANCE (C.O.P.)</u>

2. Coefficient of Performance (C.O.P.)?

3. The ratio of the heat output of a heat pump to the equivalent heat of the electric input.

4. <u>Energy Glossary</u>, State of Maryland Energy Policy Office.

GLOSSARY

1. COKE

2. Coke?

3. Coke - A porous, solid residue resulting from the incomplete combustion of coal heated in a closed chamber, or oven, with a limited supply of air. Coke is largely carbon and is a desirable fuel in certain metallurgical industries.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. COLLECTOR TILT

2. Collector Tilt?

3. The angle measured from the horizontal at which a solar heat collector is tilted to face the sun for better performance.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vi.

1. COMBINATION UTILITY

2. Combination Utility?

3. Combination Utility - Utility which supplies both a gas and some other utility service. (electricity, water, traction, etc.)

4. Energy Glossary, State of Maryland Energy Policy Office.

GLOSSARY

1. CONCENTRATOR

2. Concentrator?

3. Reflector or lens designed to focus a large amount of sunshine into a small area, thus increasing the temperature.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vi.

1. CONDUCTIVITY

2. Conductivity?

3. The ease with which heat will flow through a material determined by the material's physical characteristics. Copper is an excellent conductor of heat; insulating materials are poor conductors.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vi.

1. CONVECTION

2. Convection?

3. When two surfaces - one hot, the other cold - are separated by a thin layer of air, moving air currents (called convection currents) are established that carry heat from the hot to the cold surface.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vi.

GLOSSARY

1. CONVERSION FACTORS - Btu

2. Conversion Factors - Btu?

3. 1 Quadrillion Btu = 500,000 barrels of petroleum 1 day for a year

= 40 million tons of bituminous coal

= 1 trillion cubic ft. of natural gas

= 100 billion KWH (based on a 10,000 BTU/KWH heat rate)

4. U. S. Department of the Interior, Energy Perspectives (Washington, D. C.: U. S. Government Printing Office, February 19[illegible]), page 2.

1. CONVERSIONS

2. What are the Btu equivalents of the following energy units?

3. Energy units translated into Btu's:

1 kilowatt hour = 3,413 Btu's
1 ton of coal = 25,000,000 Btu's
1 1lb crude oil = 5,800,000 Btu's
1 gallon of gasoline = 125,000 Btu's
1 gallon of No. 2 fuel oil = 140,000 Btu's
1 cubic foot of natural gas = 1,031 Btu's
1 Mcf natural gas = 1,031,000 Btu's
1 therm of gas (or other fuel) = 100,000 Btu's

4. Federal Energy Administration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), page 43.

GLOSSARY

1. COOLANT

2. Coolant?

3. Anything pumped through a nuclear reactor to cool it or absorb the heat it produces. Common coolants are water, air, helium, and liquid sodium metal.

4. U. S. Energy Research and Development Administration, Citizens' Workshops, Energy and the Environment (Washington, D. C.: U. S. Government Printing Office, 1975), page 28.

1. CRITICAL MASS

2. Critical Mass?

3. Critical Mass - the smallest amount of nuclear fuel, such as uranium, that will sustain a nuclear chain reaction of splitting atoms.

4. U. S. Energy Research and Development Administration, Citizens' Workshops, Energy and the Environment (Washington, D. C.: U. S. Government Printing Office, 1975), page 28.

1. CRUDE - CRUDE OIL

2. Crude Oil?

3. Crude Oil - A mixture of hydrocarbons that existed in natural underground reservoirs. It is liquid at atmospheric pressure after passing through surface separating processes and does not include natural gas products. It includes the initial liquid hydrocarbons produced from tar sands, gilsonite, and oil shale.

4. Energy Glossary, State of Maryland Energy Policy Office.

GLOSSARY

1. DEEP MINING

2. Deep Mining?

3. Deep Mining - The exploitation of coal or mineral deposits at depths exceeding about 1,000 feet. Coal is usually deep mined at not more than 1,500 feet. Mineral mines are deeper.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. DEGREE DAY COOLING (DDC)

2. Degree Day Cooling?

3. A measure of the need for air conditioning (cooling based on temperature and humidity.) Although cooling degree days are published for many weather stations, specific procedure has not been generally accepted.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. DEGREE DAY, HEATING (DDH)

2. Degree Day, Heating?

3. Degree Day, Heating - A measure of the coldness of the weather experienced, based on the extent to which the daily mean temperature falls below a reference temperature, (usually 65 degrees F.).

4. Energy Glossary, State of Maryland Energy Policy Office.

GLOSSARY

1. DEPLETION ALLOWANCE

2. Depletion Allowance?

3. A tax allowance extended to the owner of exhaustible resources based on an estimate of the permanent reduction in value caused by the removal of the resource.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. DIESEL FUEL

2. Diesel Fuel?

3. Fuel used for internal combustion of diesel engines; usually that fraction which distills after kerosene; similar to gas oil.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. DIRECT CURRENT (D.C.)

2. Direct Current?

3. (DC) - Electricity that flows continuously in one direction, as contrasted with alternating current.

4. Energy Glossary, State of Maryland Energy Policy Office.

GLOSSARY

1. DIRECT ENERGY CONVERSION

2. Direct Energy Conversion?

3. The process of changing any other form of energy into electricity without machinery that has moving parts. For example, a battery changes chemical energy into electricity by direct energy conversion.

4. U. S. Energy Research and Development Administration, Citizens' Workshops, Energy and the Environment (Washington, D. C.: U. S. Government Printing Office, 1975), page 28.

1. DISTILLATE FUEL OIL

2. Distillate Fuel Oil?

3. Any fuel oil, gas oil, or other petroleum oils, derived by refining or processing crude oil or unfinished oils, in whatever type of plant such refining or processing may occur, which has a boiling range at atmospheric pressure from 550 degrees to 1,200 degrees F.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. DRIFT MINE

2. Drift Mine?

3. A coal mine which is entered directly through a horizontal opening.

4. Energy Glossary, State of Maryland Energy Policy Office.

GLOSSARY

1. ELECTRICITY

2. Electricity?

3. Electricity - Energy derived from electrons in motion. Electrical energy can be generated by friction, induction, or chemical change. (Energy is the capacity to perform work.)

4. Federal Energy Administration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), page 42.

1. EMITTANCE

2. Emittance?

3. A measure of the heat re-radiated back from the solar collector. Measured as fraction of the energy which would be radiated by a totally black surface at the same temperature.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vi.

1. ENERGY

2. Energy?

3. The capability of doing work. There are several forms of energy, including kinetic, potential, thermal, and electromagnetic. One form of energy may be changed to another, such as burning coal to produce steam to drive a turbine which produces electricity. Except for some hydroelectric and nuclear power, most of the world's energy comes from energy in the form of fossil fuels, which are burned to produce heat.

4. Energy Glossary, State of Maryland Energy Policy Office.

GLOSSARY

1. ENERGY CONSUMPTION, TOTAL GROSS

2. Total Gross Energy Consumption?

3. Total energy inputs into the economy, including coal, petroleum, natural gas, and the electricity generated by hydroelectric, nuclear, and geothermal power plants. Gross consumption includes conversion losses by the electric power sector.

4. U. S. Department of the Interior, Energy Perspectives (Washington, D. C.: U. S. Government Printing Office, February 1975), page 209.

1. ENERGY CONSUMPTION, TOTAL NET

2. Total Net Energy Consumption?

3. Inputs into the final consuming sector, i.e., household and commercial, industrial, and transportation, and consisting of direct fuels and electricity distributed from the electric sector constitute the difference between net and gross energy.

4. U. S. Department of the Interior, Energy Perspectives (Washington, D. C.: U. S. Government Printing Office, February 1975), page 209.

1. ENVIRONMENTAL PROTECTION AGENCY (E.P.A.)

2. Environmental Protection Agency?

3. EPA - Environmental Protection Agency. A Federal agency created in 1970 to permit coordinated and effective governmental action for protection of the environment by the systematic abatement and control of pollution through integration of research, monitoring, standard setting and enforcement activities.

4. Energy Glossary, State of Maryland Energy Policy Office.

GLOSSARY

1. FEEDSTOCK

2. Feedstock?

3. Crude oil or a fraction thereof to be charged to any process equipment.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. FISSION

2. Fission?

3. The splitting of a heavy nucleus into two approximately equal parts (which are radioactive nuclei of lighter elements), accompanied by the release of a relatively large amount of energy and generally one or more neutrons. Fission can occur spontaneously, but usually is caused by nuclear absorption of neutrons or other particles.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. FLUE GAS

2. Flue Gas?

3. Gas from the combustion of fuel, the heating value of which has been substantially spent and which is, therefore, discarded to the flue or stack.

4. Energy Glossary, State of Maryland Energy Policy Office.

GLOSSARY

1. FLUID

2. Fluid?

3. Any substance such as air, water, or antifreeze used to capture heat in the collector.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vi.

1. FLY ASH

2. Fly Ash?

3. Fine solid particles of noncombustible ash carried out of the chimney with waste gases.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. FOSSIL FUELS

2. Fossil Fuels?

3. Fuels derived from the remains of carbonaceous fossils, including petroleum, natural gas, coal, oil shale (a fine-grained laminated sedimentary rock that contains an oil-yielding material called kerogen); and tar sands.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), page 42.

GLOSSARY

1. FUEL

2. Fuel?

3. Any substance that can be burned to produce heat. Sometimes includes materials that can be fissioned in a chain reaction to produce heat. The energy content of common fuels are as follows:

   1 Barrel of Crude Oil equals 5,800,000 Btu.
   1 Cubic Foot of Natural Gas equals 1,032 Btu.
   1 Ton of Coal equals 24,000,000 to 28,000,000 Btu.
   Two trillion Btu's per year are about equal to 1,000 barrels of crude oil per day.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. FUEL CELL

2. Fuel Cell?

3. A device similar to a battery in which fuels such as hydrogen gas or methane can be directly combined with oxygen to produce electricity and very little heat; the principal by-products of the process are water or carbon dioxide.

4. U. S. Energy Research and Development Administration, Citizens' Workshops, Energy and the Environment (Washington, D. C.: U. S. Government Printing Office, 1975), page 29.

1. FUSION

2. Fusion?

3. The formation of a heavier nucleus from two lighter ones, such as hydrogen isotopes, with the attendant release of energy.

4. Energy Glossary, State of Maryland Energy Policy Office.

GLOSSARY

1. GALLON
2. Gallon?
3. A unit of measure. A U. S. gallon contains 231 cu. in; 0.133 cubic feet, or 3.785 liters. It is 0.83 times the imperial gallon. One U. S. gallon of water weighs 8.3 pounds.
4. Energy Glossary, State of Maryland Energy Policy Office.

1. GALVANIC CORROSION
2. Galvanic Corrosion?
3. If you have this in your system, you have problems. This is caused when different metals are not isolated properly and a liquid comes in contact with both metals. The result is galvanic corrosion and repair bills.
4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vi.

GLOSSARY

1. GASEOUS DIFFUSION

2. Gaseous Diffusion?

3. A process by which natural uranium is enriched and becomes a better nuclear fuel.

4. U. S. Energy Research and Development Administration, Citizens' Workshops, Energy and the Environment (Washington, D. C.: U. S. Government Printing Office, 1975), page 29.

1. GASOLINE

2. Gasoline

3. Gasoline - A refined petroleum distillate, including naphtha, jet fuel or other petroleum oils (but not isoprene or dumene having a purity of 50 percent or more by weight, or benzene which meets the ASTM distillation standards for nitration grade) derived by refining or processing crude oil or unfinished oils, in whatever type of plant such refining or processing may occur, and having a boiling range at atmospheric pressure from 80 degrees to 400 degrees F.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. GEOTHERMAL ENERGY

2. Geothermal Energy?

3. Energy extracted from the heat of the earth's interior.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), page 42.

GLOSSARY

1. GEOTHERMAL STEAM
2. Geothermal Steam?
3. Steam drawn from deep within the earth. There are about 90 known places in the Continental United States where geothermal steam could be harnassed for power. These are in California, Idaho, Nevada, and Oregon.
4. Energy Glossary, State of Maryland Energy Policy Office.

1. GIGAWATT
2. Gigawatt?
3. Gigawatt - (GW) 1,000,000 kilowatts, 1,000 megawatts.
4. Energy Glossary, State of Maryland Energy Policy Office.

1. HALF-LIFE
2. Half-life of an element?
3. The time in which half the atoms of a particular radioactive substance disintegrate to another nuclear form. Measured half lives vary from millionths of a second to billions of years.
4. N. C. Mc Nerney and Dr. Thomas F. P. Sullivan, Energy Reference Handbook (Washington, D. C.: Government Institutes, Inc., 1974), page 90.

GLOSSARY

1. HEAT GAIN

2. Heat Gain?

3. The heat gain is the rate at which heat enters into or is generated within a space.

4. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., ASHRAE Handbook & Product Directory - 1977 Fundamentals (New York: ASHRAE, 1977), page 385.

1. HEAT LOSS

2. Heat Loss:

3. The heat loss is the rate at which heat escapes from a space.

4. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., ASHRAE Handbook & Product Directory - 1977 Fundamentals (New York: ASHRAE, 1977), page 385.

1. HELIOSTAT

2. Heliostat?

3. A mirror used to reflect the sun's rays into a solar collector or furnace.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vi.

GLOSSARY

1. HYBRID SOLAR SYSTEM

2. Hybrid Solar System?

3. A system that uses both active and passive methods to operate (e.g., a solar system which uses pumps to heat and nocturnal cooling to cool).

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vi.

1. HYDROELECTRIC PLANT

2. Hydroelectric Plant?

3. An electric power plant in which energy of falling water is converted into electricity by turning a turbine generator.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. HYDROPOWER ENERGY

2. What is Hydro-power?

3. Energy created by falling or moving water.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), page 42.

GLOSSARY

1. INSULATION

2. Insulation?

3. The rate of solar radiation received per unit area.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vi.

1. THERMAL CONDUCTIVITY (K - VALUE)

2. Thermal Conductivity?

3. The rate at which heat will flow through an inch thickness of material, in Btu per hour for one square foot of area for one degree Fahrenheit temperature difference. Conductivity is the reciprocal of the resistance per inch (k=1/R).

4. Northeast Utilities, Inc., Recommended Standards of Insulation and Ventilation for New Residential Structures, page 11.

1. KEROSINE (Kerosene)

2. Kerosine? (Kerosene)

3. Any jet fuel, diesel fuel, fuel oil or other petroleum oils derived by refining or processing crude oil or unfinished oils, in whatever type of plant such refining or processing may occur, which has a boiling at atmospheric pressure from 400 degrees to 550 degrees.

4. Energy Glossary, State of Maryland Energy Policy Office.

GLOSSARY

1. KILOWATT

2. Kilowatt (kW)?

3. Kilowatt (kW) - 1,000 watts. One kilowatt is the equivalent of about 1 1/3 horsepower.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), page 30.

1. KILOWATT - HOUR

2. Kilowatt-hour (kWh)?

3. Kilowatt-hour (kWh)=1,000 watt-hours. A unit of electrical energy equal to the energy delivered by the flow of one kilowatt of electrical power for one hour. (A 100-watt bulb burning for 10 hours will consume one kilowatt-hour of energy, or enough to lift a 150-pound person 20,000 feet into the air.) One barrel of oil equals 500 kWh.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), page 43.

GLOSSARY

1. KINETIC ENERGY

2. Kinetic Energy?

3. The energy of motion; the ability of an object to do work because of its motion.

4. Energy Glossary, State of Maryland Energy Policy Office

1. LIFE-CYCLE COSTING

2. Life cycle costing?

3. Life cycle costing is a method whereby the total costs of a product can be measured against the annual savings, showing the buyer approximately when his or her investment is paid for.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page 18.

1. LIGHT OIL

2. Light Oil?

3. Any of the products distilled or processed from crude oil up to, but not including, the first lubricating distillate.

4. Energy Glossary, State of Maryland Energy Policy Office.

GLOSSARY

1. LIQUIDS, NATURAL GASES -- PROPANE, BUTANE

2. Bottled gas, propane, LP-gas and Liquefied Petroleum Gas?

3. The same thing, and a close cousin of natural gas. All are actually propane, a hydrocarbon similar to methane.

   Propane, butane, methane, ethane and a few other "-ane's" are found together and separated later. The advantage of propane and butane is that they become liquids under a modest amount of pressure and can be transported easily. Disposable cigarette lighters, for example, are filled with butane.

4. Steven Rattner, "All Your Queries on Natural Gas When You Are Too Cold To Ask," New York Times, February 12, 1977, pages 27 - 28.

1. LANGLEY

2. Langley?

3. A unit of measurement of insolation. (One langley equals one gram-calorie per square centimeter.) The langley was named for American astronomer Samuel P. Langley.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vi.

1. LITER

2. Liter?

3. The primary standard of capacity in the metric system, equal to the volume of one kilogram of pure water at maximum density, at approximately 4 degrees C., and under normal atmospheric pressure. One liter = 0.264 gallons U.S.) 1.05 quarts or 2.11 pints.

4. Energy Glossary, State of Maryland Energy Policy Office.

GLOSSARY

1. MAGNETOHYDRODYNAMICS (MHD)

2. Magnetohydrodynamics (MHD)?

3. Process that uses a magnetic field to produce electricity directly from the hot smoke and gases we get from burning fuels like coal and oil.

4. U. S. Energy Research and Development Administration, Citizens' Workshops, Energy and the Environment (Washington, D. C.: U. S. Government Printing Office, 1975), page 29.

1. MEGAWATT

2. Megawatt (Mw)?

3. Megawatt (Mw) - One million watts, or 1,000 kilowatts.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), page 43.

1. METHANE (CH_4)

2. Methane (CH_4)?

3. The lightest in the paraffin series of hydrocarbons. It is colorless, odorless, and flammable. It forms the major portion of marsh gas and natural gas.

4. Energy Glossary, State of Maryland Energy Policy Office.

GLOSSARY

1. MIDDLE DISTILLATE

2. Middle Distillate?

3. One of the distillates obtained between kerosine and lubricating oil fractions in the refining processes. These include light fuel oils and diesel fuel.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. MCF (1,000 CUBIC FT)

2. MCF?

3. MCF - 1,000 cubic feet (of natural gas).

4. Federal Energy Administration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U. S. Government Printing Office, May 1977), page 43.

1. MODERATOR

2. Moderator?

3. A material, such as water and graphite, used in a nuclear reactor to slow the speed of neutrons produced when atoms split.

4. U. S. Energy Research and Development Administration, Citizens' Workshops, Energy and the Environment (Washington, D. C.: U. S. Government Printing Office, 1975), page 30.

GLOSSARY

1. NATURAL GAS

2. Natural Gas?

3. A naturally occurring mixture of hydrocarbons. Gases found in porous geologic formations beneath the earth's surface, often in association with petroleum. The principal constituent is methane.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. NATURAL GAS LIQUIDS

2. Natural Gas Liquids?

3. The hydrocarbon components: propane, butanes, and pentanes (also known as condensate), or a combination of them that are subject to recovery from raw gas liquids by processing in field separators, scrubbers, gas processing and reprocessing plants, or cycling plants. The propane and butane components are often referred to as liquefied petroleum gases or LPG.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. NATIONAL PETROLEUM COUNCIL (N.P.C.)

2. National Petroleum Council (N.P.C.)?

3. Officially established federal advisory board, most of whose members are presidents or board chairmen of major U. S. oil companies.

4. League of Women Voters Education Fund, Energy 3 - Those Elusive Figures: Oil (Washington, D. C.: LWVEF, February 1974), Publication #469.

GLOSSARY

1. NUCLEAR POWER PLANT

2. Nuclear Power Plant?

3. Any device, machine, or assembly that converts nuclear energy into some form of useful power, such as mechanical or electrical power.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. NUCLEAR REACTOR

2. Nuclear Reactor?

3. A device in which a fission chain reaction can be initiated, maintained and controlled. Its essential component is a core with fissionable fuel. It usually has a moderator, reflector, shielding coolant and control mechanisms. It is the basic machine of nuclear power.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. NUCLEAR REGULATORY COMMISSION (NRC)

2. NRC?

3. Nuclear Regulatory Commission (NRC) - The legislation creating ERDA divided the dual and contradictory functions of the Atomic Energy Commission, placing its R&D functions in ERDA's Office of Nuclear Energy and assigning its licensing and regulatory functions to an independent body, the Nuclear Regulatory Commission. Three co-equal offices were established by law under the 5-man commission: the Office of Nuclear Reactor Regulation to license, regulate, monitor, and test construction and operation of reactors, improve their safety, and evaluate transportation and storage of nuclear substances; the Office of Nuclear Materials Safety and Safeguards to license and regulate processing, transport, and handling of nuclear materials and protect them against theft and sabotage; and the Office of Nuclear Regulatory Research to recommend and carry out research the commission needs to perform its functions.

4. League of Women Voters Education Fund, Energy 16 - Who's In Charge In 1975 (Washington, D. C.: LWVEF, February 1975), Publication #553.

GLOSSARY

1. OCEAN THERMAL
2. Ocean Thermal?
3. Providing power by harnessing the temperature differences between the surface waters and the ocean depths
4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vi.

1. OIL GAS
2. Oil Gas?
3. A gas resulting from the thermal decomposition of petroleum oils, composed mainly of volatile hydrocarbons and hydrogen. The true heating value of oil gas may vary between 800 and 1,600 Btu per cubic foot depending on operating conditions and feedstock properties.
4. Energy Glossary, State of Maryland Energy Policy Office.

1. OUTER CONTINENTAL SHELF (O.C.S.)
2. O.C.S.?
3. The extension of the continental land mass into the oceans, under relatively shallow seas, as opposed to the deeper basins.
4. Energy Glossary, State of Maryland Energy Policy Office.

GLOSSARY

1. PERMEANCE -- (PERM)

2. Permeance?

3. The flow of vapor through a material. Permeance is measured in perms, the number of grains of water vapor that will pass through a square foot of material for vapor pressure difference of one inch of mercury. (For one inch thickness of the material, the term permeability is used.)

4. Northeast Utilities, Inc., Recommended Standards of Insulation and Ventilation for New Residential Structures, page 11.

1. PETROCHEMICALS

2. Petrochemicals?

3. Chemicals removed from crude oil at the refinery and used to make a wide range of products such as plastics, synthetic fibers, detergents, and drugs.

4. U. S. Energy Research and Development Administration, Citizens' Workshop Energy and the Environment (Washington, D. C.: U. S. Government Printing Office, 1975), page 30.

1. PETROLEUM

2. Petroleum?

3. An oily flammable bituminous liquid that may vary from almost colorless to black. Occurs in many places in the upper strata of the earth, is a complex mixture of hydrocarbons with small amounts of other substances, and is prepared for use as gasoline, naphtha,or other products by various refining processes.

4. Energy Glossary, State of Maryland Energy Policy Office.

GLOSSARY

1. <u>PHOTOVOLTAIC</u>

2. Photovoltaic?

3. Direct conversion of the sun's energy into electricity.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, <u>Buying Solar</u>, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vi.

1. <u>POLLUTION, THERMAL</u>

2. Thermal Pollution?

3. An increase in the temperature of water resulting from waste heat released by a thermal electric plant to the cooling water when the effects on other uses of the water are detrimental.

4. <u>Energy Glossary</u>, State of Maryland Energy Policy Office.

1. <u>POWER PLANT, THERMAL</u>

2. Thermal Power Plant?

3. Any electric power plant which operates by generating heat and converting the heat to electricity.

4. <u>Energy Glossary</u>, State of Maryland Energy Policy Office.

GLOSSARY

1. PYRANOMETER

2. Pyranometer?

3. An instrument for measuring solar radiation.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vi.

1. (R FACTOR) THERMAL RESISTANCE

2. "R-Factor"?

3. The resistance to the flow of heat. Insulations are rated by their resistance per inch of material times the number of inches of thickness.

4. Northeast Utilities, Inc., Recommended Standards of Insulation and Ventilation for New Residential Structures, page 11.

1. RADIATION

2. Radiation?

3. Any object that is warmer than its surroundings radiates heat waves (similar to light waves, but invisible) and, thus, emits heat energy.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vii.

GLOSSARY

1. REACTOR, THERMAL (NUCLEAR)

2. Thermal Reactor?

3. A nuclear reactor in which the fission process is propagated mainly by thermal neutrons, i.e. by neutrons that have been slowed down until they are in thermal equilibrium with the atoms of the moderator.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. RECOVERY, SECONDARY

2. Secondary recovery of oil?

3. Enhanced recovery of oil from existing fields.
   Includes - 1. Waterflooding and non-miscible gas - injection.
   2. Pressure maintenance.

4. Federal Energy Administration, National Energy Outlook 1976 (Washington, D. C.: U. S. Government Printing Office, February 1976), page 77.

1. RECOVERY, TERTIARY

2. Tertiary Recovery?

3. Not economical by pre-embargo prices - All thermal techniques:
   a) cyclic steam injection (steam sock, huff & puff)
   b) steam drive
   c) In SITU combustion (explosion - inject air to keep fire going).

   Improved water or gas drives:
   1. Surfactant (minceller slug, caustic, etc.)
   2. Miscible (CO_2, high pressure gas)
   3. Polymer

4. Federal Energy Administration, National Energy Outlook 1976 (Washington, D. C.: U. S. Government Printing Office,

GLOSSARY

1. REFINING

2. Refining?

3. The separation of crude oil into its component parts, and the manufacture of products needed for the market. Important processes in refining are distillation, cracking, chemical treating and solvent extraction.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. REM

2. REM?

3. The unit of dose of any ionizing radiation which produces the same biological effect as a unit of absorbed dose of ordinary x-rays. (acronym for roentgen equivalent man).

4. N. C. McNerney and Dr. Thomas F. P. Sullivan, Energy Reference Handbook (Washington, D. C.: Government Institutes, Inc., 1974), page 185.

1. RERADIATION

2. Reradiation?

3. After an object has received radiation or is otherwise heated, it often reradiates heat back. Generally speaking, matte black surfaces are good absorbers and emitters of thermal radiation while white and metallic surfaces are not.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vii.

GLOSSARY

1. RESERVES

2. Reserves?

3. Identified deposits known to be recoverable with current technology under present economic conditions.

4. U. S. Department of the Interior, Energy Perspectives (Washington, D. C.: U. S. Government Printing Office, February 1975), page 210.

1. RESERVES, INDICATED

2. Indicated Reserves?

3. Reserves based partly on specific measurements, samples, or production data, and partly from projections for a reasonable distance on geological evidence.

4. U. S. Department of the Interior, Energy Perspectives (Washington, D. C.: U. S. Government Printing Office, June 1976), page 210.

1. RESERVES, INFERRED

2. Inferred Reserves?

3. Reserves based upon broad geologic knowledge for which quantitative measurements are not available. Such reserves are estimated to be recoverable in the future as a result of extensions, revisions of estimates, and deeper drilling in known fields.

4. U. S. Department of the Interior, Energy Perspectives (Washington, D. C.: U. S. Government Printing Office, February 1975), page 210.

GLOSSARY

1. RESERVES, MEASURED

2. Measured Reserves?

3. Categories of Reserves
   1. Measured reserves. Identified resources from which an energy commodity can be economically extracted with existing technology, and whose location, quality, and quantity are known from geologic evidence supported by engineering evidence.

4. U. S. Department of the Interior, Energy Perspectives (Washington, D. C.: U. S. Government Printing Office, February 1975), page 210.

1. RESIDUAL FUEL OIL

2. Residual Fuel Oil?

3. Petroleum oil, which is any toppped crude of viscous residuum of crude or unfinished oils or one or more of petroleum oils.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. RESISTANCE HEAT

2. Resistance Heat?

3. Any type of equipment that converts electric energy directly to heat.

4. Minimum Specifications for the Installation of Residential and Electric Heating Equipment, January 1976, Rochester Gas & Electric.

GLOSSARY

1. RESOURCES

2. Resources?

3. Includes reserves as well as materials that have been identified, but cannot now be extracted because of economic or technological limitations, as well as economic or sub-economic materials that have not as yet been discovered. Recoverable resources are quantities of an energy commodity that may be reasonably expected to exist in favorable geologic settings, but that have not yet been identified by drilling. Exploration will permit the reclassification of such resources to the reserves category.

4. U. S. Department of the Interior, Energy Perspectives (Washington, D. C.: U. S. Government Printing Office, February 1975), page 210.

1. RESOURCES, UNDISCOVERED

2. Undiscovered Resources?

3. Listed as range of quantities since these are uncertain. They are based on historical and geological data.

   Statistical mean - 50-50 chance that the actual amount is above or below that quantity.

   95 Percent - 95% chance the actual amount is at least that quantity.

   5 Percent - 5% chance the actual amount is at least that quantity.

   As an example of this technique, the U. S. Geological Survey estimate for economically recoverable oil resources in the United States has a statistical mean of 89 billion barrels, a 95 percent point of 50 billion barrels, and a 5 percent point of 127 billion barrels.

4. Federal Energy Administration, National Energy Outlook 1976 (Washington, D. C.: U. S. Government Printing Office, February 1976), page 69.

GLOSSARY

1. <u>SEASONAL PERFORMANCE FACTOR (S.P.F.)</u>

2. Seasonal Performance Factor?

3. Seasonal Performance Factor (S.P.F.) The average of all the instantaneous (C.O.P.'s) including supplemental heat over an entire heating season. (C.O.P.'s - Coefficient of Performances)

4. <u>Minimum Specifications for the Installation of Residential and Electric Heating Equipment</u>, January 1976, Rochester Gas & Electric.

1. <u>SELECTIVE SURFACE</u>

2. Selective Surface?

3. A special coating sometimes applied to the absorber plate in a solar collector. The selective surface absorbs most of the incoming solar energy and reradiates very little of it.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, <u>Buying Solar</u>, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vii.

GLOSSARY

1. SOLAR CELL

2. Solar Cell?

3. A device, usually made of silicon, that converts sunlight directly into electrical energy.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vii.

1. (SOLAR) COLLECTOR

2. Collector, or Solar Collector?

3. A device for receiving solar radiation and converting it to heat in a fluid.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U.S. Government Printing Office, June 1976), page vi.

GLOSSARY

1. SOLAR COLLECTOR EFFICIENCY

2. Solar Collector Efficiency?

3. The fraction of incoming radiation captured by the collector. If your system captures half of the incoming radiation, you have a system that is 50% efficient. Efficiency is the capability of a collector to capture Btu's under various climatic conditions. Efficiency varies according to outside temperatures, whether skies are clear or cloudy, whether it is windy or not, and, of course, the quality of the collector. There's no way a collector can be 100% efficient; that is, to capture all the Btu's that fall on the collector; 55% is good under desirable weather conditions.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vi.

1. SOLAR CONSTANT

2. Solar Constant?

3. The average amount of solar radiation reaching the earth's atmosphere per minute. This is just under 2 langleys, or 2 gram-calories per square centimeter. This is equivalent to 442.4 $Btu/hr/ft^2$, 1395 $watts/m^2$ or .1395 $watts/cm^2$.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vii.

1. SOLAR ENERGY

2. Solar Energy?

3. The energy transmitted from the sun which is in the form of electromagnetic-radiation. Although the earth receives about 1/2 of one billionth of the total solar energy output, this amount is equal to about 420 trillion kilowatt hours annually.

4. Energy Glossary, State of Maryland Energy Policy Office.

GLOSSARY

1. SOLAR FURNACE

2. Solar Furnace?

3. An output device with large mirrors that focuses the rays from the sun upon a small focal point to produce very high temperatures.

4. Energy Glossary, State of Maryland Energy Policy Office.

1. SOLAR RIGHTS

2. Solar Rights?

3. An unresolved legal issue involving who owns the rights to the sun's rays.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vii.

1. SOLAR SYSTEM EFFICIENCY

2. Solar System Efficiency?

3. Btu's are lost from the time the sun's rays hit the collector to the moment they are used to heat the house or the water supply. The question is how many Btu's are used in comparison to the original number coming in. The answer is the efficiency of the whole system. This is a very important consideration.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vii.

GLOSSARY

1. <u>SOLAR SYSTEM -- PASSIVE</u>

2. Passive Solar System?

3. A system that uses gravity, heat flows, evaporation or other acts of Mother Nature to operate without mechanical devices to collect and transfer energy (i.e., south facing windows).

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, <u>Buying Solar</u>, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vi.

1. <u>STRIP MINING</u>

2. Strip Mining?

3. The mining of coal by surface mining methods as distinquished from the mining of metalliforous ores by surface mining methods which is commonly designated as open pit mining.

4. <u>Energy Glossary</u>, State of Maryland Energy Policy Office.

1. <u>STRIPPER WELL</u>

2. Stripper Well?

3. A nearly depleted well for which income barely exceeds expense.

4. <u>Energy Glossary</u>, State of Maryland Energy Policy Office.

GLOSSARY

1. SUBBITUMINOUS - LIGNITE

2. Subbituminous and lignite coal?

3. Have low heat values (Btu/lb), low ash are located in huge reserves in Rocky Mountain states and northern Great Plains (via strip mining). More expensive due to lower heat value, transportation costs, fly ash controls.

4. League of Women Voters Education Fund, Energy 8 - Tapping Our Coal Reserves (Washington, D. C.: LWVEF, April 1974), Publication #479.

1. SUN TRACKING

2. Sun Tracking?

3. Following the sun with a solar collector to make the collector more effective.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vii.

1. THERM

2. Therm?

3. A unit of heat equal to 100,000 Btu's.

4. Federal Energy Administration, Office of Energy Conservation and Environment, Tips for Energy Savers (Washington, D. C.: U.S. Government Printing Office, May 1977), page 43.

GLOSSARY

1. THERMOSYPHON SYSTEM

2. Thermosyphon System?

3. The principle that makes water circulate automatically between a collector and a storage tank above it, while gradually increasing its temperature.

4. Federal Energy Administration, Energy Resource Development and the U. S. Department of Health, Education, and Welfare, Office of Consumer Affairs, Buying Solar, by Joe Dawson (Washington, D. C.: U. S. Government Printing Office, June 1976), page vii.

1. (U-FACTOR) - COEFFICIENT OF HEAT TRANSMISSION

2. What is the meaning of U-factor?

3. Coefficient of Heat Transmission (U-factor): The rate of heat flow through a square foot of a building section for a one degree Fahrenheit temperature difference. This is the reciprocal of the total resistance of all materials in the building section (U=1/Total R).

4. Northeast Utilities, Inc., Recommended Standards of Insulation and Ventilation for New Residential Structures, page 11.

1. U - VALUE

2. U - Value?

3. Overall coefficient of heat transmission expressed in Btu/hour/square foot/^{o}F for wall, ceiling, floor, windows, or doors.

4. Minimum Specifications for the Installation of Residential and Electric Heating Equipment January 1976, Rochester Gas & Electric.

GLOSSARY

1. <u>URANIUM (235, 238)</u>

2. Uranium?

3. A radioactive element with the atomic number of 92, and as found in natural ores, an average atomic weight of approximately 238. The two principal natural isotopes are uranium-235 (0.7% of natural uranium) which is fissionable, (capable of being split and releasing energy) and uranium-238 (99.3% natural uranium) which is fertile, (having the property of being convertible to a fissionable material). Natural uranium also includes a minute amount of uranium-234.

4. <u>Energy Glossary</u>, State of Maryland Energy Policy Office.

1. <u>WATT</u>

2. Watt?

3. The amount of power available from an electric current of 1 ampere (amp.) at a potential of 1 volt.

4. Federal Energy Administration, Office of Energy Conservation and Environment, <u>Tips for Energy Savers</u> (Washington, D. C.: U. S. Government Printing Office, May 1977), page 43.

1. <u>WILD CAT WELL</u>

2. Wild Cat Well?

3. A well drilled in an area which has not produced gas or oil previously. Usually exploratory and often without geophysical investigation. On the average, one of nine or ten wildcat wells strike oil or gas deposits.

4. <u>Energy Glossary</u>, State of Maryland Policy Office.

PART B

New York Tech Energy Hot Line

PAMPHLET COLLECTION

Pamphlets and other published materials used in Hot Line mailings are listed below prefaced by their assigned code numbers. For each item, information is also provided concerning publisher, date, cost (if any), sources with whom the Hot Line has established contact to acquire bulk supplies and status of the pamphlet in Hot Line operation.

Code #	*Title*	*Source/Contact*	*Status*
001	Trucker's Guide to Fuel Savings--March, 1976 FEA/D-75/412	FEA Truck & Bus Program Washington, D.C. 20461	Available
002	How to Start an Energy Management Program October, 1973 ($.25 ea.) (Quantities of 50 or less, no charge)	U.S. D.O.C. Office of Energy Programs Washington, D.C. 20230 (202) 377-3040	Available
003	Industry's Vital Stake in Energy Management May, 1974--($.25 ea.) (Quantities of 50 or less, no charge)	U.S. D.O.C Office of Energy Programs Washington, D.C. 20230 (202) 377-3040	Available
004	33 Money-Saving Ways to Conserve Energy in your Business--October, 1975 ($.25 ea.) (Quantities of 50 or less, no charge)	U.S. D.O.C. Office of Energy Programs Washington, D.C. 20230 (202) 377-3040	Out of Print
005	Energy Management: Economic Sense for Retailers February, 1974--($.30 ea.) (Quantities of 50 or less, no charge)	U.S. D.O.C. Office of Energy Programs Washington, D.C. 20230 (202) 377-3040	Available
006	Energy Management: in Health Care Institutions No. 76-619	U.S.D. H.E.W. Energy Office 5600 Fishers Lane, Rockville, Maryland 20852 (301) 443-5014	Available
007	Energy Management: Marketing Priorities and Energy ($.25 ea) (Quantities of 50 or less, no charge)	U.S. D.O.C. Office of Energy Programs Washington, D.C. 20230 (202) 377-3040	Available
008	Energy Management: Trade Associations and the Economics of Energy ($.30 ea.) (Quantities of 50 or less, no charge)	U.S. D.O.C. Office of Energy Programs Washington, D.C. 20230 (202) 377-3040	Available

009	Energy Conservation Handbook for Light Industries & Commercial Buildings--May, 1974 ($.35) (Quantities of 50 or less, no charge)	U.S. D.O.C. Office of Energy Programs Washington, D.C. 20230 (202) 377-3040	Available
010	How to Profit By Conserving Energy A Do-It-Yourself Kit	U.S. D.O.C. Office of Energy Programs Washington, D.C. 20230 (202) 377-3040	Out of Print
011	Fact Sheet: Oil and Gas	FEA Washington, D.C. 20461 (202) 566-7263	Out of Date
012	Fact Sheet: Oil Shale	FEA Washington, D.C. 20461 (202) 566-7263	Available
013	Fact Sheet: Solar Energy FEA-168A	FEA Washington, D.C. 20461 (202) 566-7263	Available
014	Fact Sheet: Coal	FEA Washington, D.C. 20461 (202) 566-7263	Out of Date
015	Fact Sheet: Outer Continental Shelf	FEA Washington, D.C. 20461 (202) 566-7263	Available
016	Fact Sheet: Nuclear	FEA Washington, D.C. 20461 (202) 566-7263	Out of Date
017	Consumer News June, 1976	Consolidated Edison 4 Irving Place New York, New York 10003 (212) 460-4600	Out of Print
018	Energy Management Checklist For the Home--October, 1975 PA-118	U.S. D.O.A. Washington, D.C. 20402	Out of Print
019	Take a Quick Look At Your Home (In the Bank or Up the Chimney) short version--October, 1975 HUD-400-PD&R	U.S. HUD Washington, D.C. 20410 Office Code:RR-12-03-00	Available

020	EER* Air Conditioning and You	Nassau County Bureau of Energy Resources 1505 Kellum Place Mineola, New York 11501 (516) 535-3838	Available
021	Tomorrow's Cars September, 1976 EDM-428R	ERDA-TIC Publications Request Section P.O. Box 62 Oak Ridge, Tennessee 37830 (615) 483-8611 Ext. 34672	On Order
022	Annual Cycle Energy System - (ACES) May, 1976 EDM-070	ERDA-TIC Publications Request Section P.O. Box 62 Oak Ridge, Tennessee 37830 (615) 483-8611 Ext. 34672	Available
023	Energy From the Winds - April, 1976 EDM - 812	ERDA-TIC Publications Request Section P.O. Box 62 Oak Ridge, Tennessee 37830 (615) 483-8611 Ext. 34672	Out of Date
024	Buying Solar ($1.85 ea.) June, 1976 FEA-G-76/154 GPO. Stock No. 041-018-00120-4	Superintendent of Documents U.S. G.P.O. Washington, D.C. 20402	Available
025	I've Got a Question About Using Solar Energy-September, 1976 EDM-816R	ERDA-TIC Publications Request Section P.O. Box 62 Oak Ridge, Tennessee 37830 (615) 483-8611 Ext. 34672	Available
026	Solar Energy For Heating and Cooling January, 1977 EDM - 817R	ERDA-TIC Publications Request Section P.O. Box 62 Oak Ridge, Tennessee 37830 (615) 483-8611 Ext. 34672	Available
027	Some Helpful Hints on How to Conserve Energy 40MWP1173	North East Utilities P.O. Box 270 Hartford, Connecticut 06101 (203) 666-6911	Available

028	Use Energy Wisely and Save Money	PSE & G of New Jersey 70 Park Place Newark, New Jersey 07101 (201) 622-7000	Available
029	Saving School Bus Fuel	FEA Truck and Bus Program Washington, D.C.20461	Available
030	Energy Conservation: Landscaping March, 1976 FEA/D-76/143	FEA Washington, D.C. 20461 (202) 566-7263	Out of Print
031	Energy Conservation: Windows March, 1976 FEA/D-76/142	FEA Washington, D.C. 20461 (202) 566-7263	Out of Print
032	Your Guide to Meter Reading and your LILCO Bill	LILCO Consumer Affairs 250 Old Country Road Mineola, New York 11501 (516) 228-2226	Available
033	How to Conserve Energy (and save money) in your home	LILCO Consumer Affairs 250 Old Country Road Mineola, New York 11501 (516) 228-2226	Available
034	Fusion	ERDA-TIC Publications Request Section P.O. Box 62 Oak Ridge, Tennessee 37830 (615) 483-8611 Ext. 34672	Available
035	Oil Shale April, 1975- EDM-528	ERDA-TIC Publications Request Section P.O. Box 62 Oak Ridge, Tennessee 37830 (615) 483-8611 Ext. 34672	Available
036	Geothermal Energy June, 1976 EDM-526	ERDA-TIC Publications Request Section P.O. Box 62 Oak Ridge, Tennessee 37830 (615) 483-8611 Ext. 34672	Available

037	Energy Technology February, 1977 EDM-1007R	ERDA-TIC	Available
038	Energy Storage December, 1975 EDM-066	ERDA-TIC	Available
039	Shipping of Nuclear Waste April, 1975 EDM-529	ERDA-TIC	Available
040	Creating Energy Choices for the Future March, 1977 EDM-062	ERDA-TIC	Available
041	1975 Gas Mileage Guide January, 1975 FEA 227-D	FEA Washington, D.C. 20461 (202) 566-7263	Out of Date
042	1976 Gas Mileage Guide September, 1975 FEA-596-D	FEA Washington, D.C. 20461 (202) 566-7263	Out of Date
043	Tips For the Motorist Don't be Fuelish	FEA Washington, D.C. 20461 (202) 566-7263	Available
044	Connecticut Commuter Carpool Tips	Connecticut Department of Transportation P.O. Drawer A Wethersfield, Ct. 06109	Available
045	Tips on Saving Energy No. 311-02217A30775 $10.00 per 1,000	Council of Better Business Bureaus 1150 17th Street, N.W. Washington, D.C. 20036	On Order
046	1977 Gas Mileage Guide January, 1977 FEA/007/D	FEA Washington, D.C. 20461 (202) 566-7263	Out of Date
047	How to Save Money By Insulating Your Home June, 1976 - FEA/269	FEA Washington, D.C. 20461 (202) 566-7263	Revision in Progress
048	Energy Saver 1 How to Insulate Your Home February, 1974	Con Edison 4 Irving Place New York, New York 10003 (212) 460-4600	Available

049	Energy Saver 2 - How to Keep Your House Warm 44 Ways	CON ED	On Order
050	Energy Saver 3 - How to Keep Cool and Save Money, Too	CON ED	Available
051	Energy Saver 4 - How to Save Energy Around the Kitchen	CON ED	Available
052	Energy Saver 5 - How to Achieve Good Lighting and Save Money, Too	CON ED	On Order
053	Energy Saver 6 - How to Get the Most for Your Water Heating Dollar	CON ED	Available
054	Energy Saver 7 - Tips for the Young	CON ED	On Order
055	Energy Saver 8 - How to Save Gas and Money, Too	CON ED	Available
056	Making the Most of your Energy Dollars in Home Heating and Cooling October, 1975	U.S. D.O.C. National Bureau of Standards Washington, D.C. 20234 (301) 921-3181	On Order
057	Nuclear Energy May, 1976 EDM - 1016	ERDA-TIC Publications Request Section P.O. Box 62 Oak Ridge, Tennessee 37830 (615) 483-8611 Ext. 34672	Available
058	Total Energy Management March, 1976	U.S. D.O.C. Office of Energy Programs Washington, D.C. 20230 (202) 377-3040	On Order
059	Tips For Energy Savers 1975 Edition	FEA Washington, D.C. 20461 (202) 566-7263	Out of Print
060	Solar Energy and Your Home April, 1977 HUD-PDR-183(5)	National Solar Heating and Cooling Information Center P.O. Box 1607 Rockville, Maryland 20850	Available

061	Solar Energy for Space Heating and Hot Water May, 1976 - SE101	ERDA - TIC Publications Request Section P.O. Box 62 Oak Ridge, Tennessee 37830 (615) 483-8611 Ext. 34672	Available
062	How Solar Heating and Cooling Works February, 1976	Minneapolis Honeywell Office of Public Affairs Minneapolis, Minnesota (612) 870-5200	Available
063	Energy Conservation: Heat Pumps March, 1976 FEA/D-76/141	FEA Washington, D.C. 20461 (202) 566-7263	Out of Print
064	Schoolhouse January, 1977 No. 26	Educational Facilities Laboratories 850 Third Avenue New York, New York 10022	On Order
065	Energy Conservation: Fuel Cells: A New Kind of Power Plant September, 1976 EDM-034R	ERDA TIC Publications Request Section P.O. Box 62 Oak Ridge, Tennessee 37830 (615) 483-8611 Ext. 34672	Available
066	Energy Conservation: Waste Heat Recovery: More Power from Fuels September, 1976 EDM-1020	ERDA TIC	Available
067	NYIT/USERDA Energy Management Seminar Program November, 1976	CEPR NYIT O.W 11568	Out of Print
068	Home Energy Savers' Workbook April, 1977 FEA/D-77/177	FEA Washington, D.C. 20461 (202) 566-3047	Available
069	Understanding Your Utility Bill April, 1975 FEA/A-75/422	FEA	Available
070	Como Economizar Energia y Dinero en Su Hagar April, 1975 FEA 6A-75/312	FEA	Available

071	Sunset Magazine Reprint November & December, 1976	National Solar Heating and Cooling Information Center P.O. Box 1607 Rockville, Maryland 20850	Available
072	Energy Conservation: Energy Savings Through Automatic Thermostat Controls	ERDA-TIC Publications Request Section P.O. Box 62 Oak Ridge, Tennessee 37830 (615) 483-8611 Ext. 34672	Available
073	Energy Conservation Measures for Commercial Buildings Are They Worth It?	FEA Washington, D.C. 20461 (202) 566-7263	Available
074	An Energy Management Program for Commercial Buildings	FEA	Available
075	Coal in Our Energy Future November, 1976 EDM-603	ERDA-TIC	Available
076	Energy Conversion Storage, and Transmission May, 1976 EDM-1008	ERDA-TIC	On Order
077	Experimental Electric Vehicle February, 1976 EDM-067	ERDA-TIC	Available
078	Energy Efficient Sharing February, 1977 ($.35 ea.) (Quantities of 50 or less, no charge)	U.S. D.O.C. Office of Energy Program Washington, D.C. 20230 (202) 377-3040	Available
079	New Energy Saving Light Bulb September, 1976 EDM-1017R	ERDA-TIC	Available
080	Project Retro-Tech: Home Weatherization Job Book FEA/D-75/458R	FEA Washington, D.C. 20461 (202) 566-9320	Available
081	Solar Energy for Health Care Institutions (HRA) 77-618	U.S.D. H.E.W. Energy Office 5600 Fishers Lane Rockville, Maryland 20852 (301) 443-5014	Available

082	Summer Energy Tips	N.Y. State Energy Office Core 1 Swan Street Building Albany, New York 12223 (518) 474-5813	Available
083	Energy Efficient Residence	NAHB Research Foundation 15th and M Streets, N.W. Washington, D.C. 20005 (202) 452-0200	Available
084	Unas Sugerencias Para Conservar La Energia	North East Utilities P.O. Box 270 Hartford, Connecticut 06101 (203) 666-6911	Available
085	Tips For Energy Savers May, 1977 FEA/D-76/513	FEA Washington, D.C. 20461 (202) 566-9320	Out of Date
086	Solar Electricity From Thermal Conversion May, 1977 EDM-821	ERDA-TIC Publications Request Section P.O. Box 62 Oak Ridge, Tennessee 37830 (615) 483-8611 Ext. 34672	Available
087	Environment, Health & Safety December, 1976 EDM-222	ERDA-TIC	Available
088	Heated Water From Power Plants December, 1975 EDM-524	ERDA-TIC	Available
089	How Probable is a Nuclear Plant Accident? September, 1976 EDM-074R	ERDA-TIC	Available
090	Safeguarding of Nuclear Materials September, 1976 EDM-073R	ERDA-TIC	Available
091	Nuclear Power Plant Safety September, 1976 EDM -075R	ERDA-TIC	Available

092	Plutonium in the Environment September, 1976 EDM - 219	ERDA-TIC Publications Request Section P.O. Box 62 Oak Ridge, Tennessee 37830 (615) 483-8611 Ext. 34672	Available
093	Improving Underground Transmission of Electric Power April, 1977 EDM - 405	ERDA - TIC	Available
094	Total Energy Management for Nursing Homes... (HRA) 77-614	U.S.D. H.E.W. Energy Office 5600 Fishers Lane Rockville, Maryland 20852 (301) 443-5014	Available
095	Energy Strategies for Health Care Institutions (HRA) 77-620	U.S.D. H.E.W.	On Order
096	Total Energy Management for Hospitals	U.S.D. H.E.W.	Available
097	Solocost - Solar Hot Water Handbook 2nd. Edition DSE-2531/2	International Business Services, Inc. 1010 Vermont Avenue, N.W. Suite 1010 Washington, D.C. 20005 (202) 628-1470	On Order
098	Solar Hot Water and Your Home	National Solar H&C.I.C. P.O. Box 1607 Rockville, Maryland 20850	Available
099	Energy Conservation: Gas Heat Pumps: More Heat From Natural Gas April, 1977 EDM-079	ERDA-TIC	Available
100	Energy Conservation: Insulate Your Water Heater and Save Fuel April, 1977 EDM-080	ERDA - TIC	Available
101	How to Improve the Efficiency of Your Oil-Fired Furnace October, 1977	U.S. D.O.C. NBS Washington, D.C. 20234 (301) 921-3181	On Order

102	1978 Gas Mileage Guide September, 1977 FEA/D-77/372	U.S. Department of Energy Fuel Economy DPM Room 6500 Washington, D.C. 20461	Available
103	Energy In Focus Basic Data May, 1977 FEA/A-77/144	FEA Washington, D.C. 20461 (202) 566-9320	On Order
104	Tips for Energy Savers August 1977 FEA/D-77/212	FEA	Available

PART C

Key To

New York Tech Energy Hot Line

SPECIAL INFORMATION PACKETS

For each of the subjects listed, a packet of materials has been assembled. An Information Packet would be mailed to a Hot Line caller in those situations where standard materials do not exist or available pamphlets will not suffice. The code numbers which precede each listed subject refer to the notations found on pertinent Hot Line Question and Answer materials reproduced in Part A.

Code #	Special Information Packet
A-1	Solar Bibliography
A-2	Solar Company List-Computer printout I-(available through NYIT Energy Referral Service)
A-3	Solar Course List
A-4	Solar Energy Grants Information
A-5	Solar Do-It-Yourself--includes passive
A-6	Solar Swimming Pools
A-7	Solar Greenhouses
A-8	Solar-Electric (Photovoltaic)
A-9	Buying Solar (title page with instructions on obtaining)
A-10	Solar Commercial Demonstrations
B-1	Wind Power Package

C-1	Heat Pump Package
C-2	Solar Heat Pumps
D-1	Caulking and Weatherstripping--How to...
D-2	Insulation: Basement Walls
D-3	Insulation: Floors
D-4	Weatherstripping: Doors
D-5	Plastic storm windows: Installation
D-6	Insulation: Crawl Space walls
D-7	Insulation: Walls
D-8	Insulation: Types and Characteristics
E-1	Energy Management Consultants List-Preliminary I
F-1	Furnace Servicing--Overview for homeowner
G-1	Fireplaces
H-1	Nuclear Debate file
I-1	Wood and Wood stoves
I-2	Wood Stoves and Solar
J-1	Total Energy Systems (T.E.S.)
K-1	Energy Conservation
L-1	Architect, Engineer, Educator Energy Bibliography
L-2	Alternate Energy Sources Bibliography
M-1	New York State Energy Legislation
M-2	New Jersey State Energy Legislation
M-3	Connecticut State Energy Legislation
M-4	Federal Legislation for Tri-State Area

N-1	Attic Fans (pro-con)
O-1	Alaskan Oil Pipeline
P-1	Environmental Tradeoff file
Q-1	Choosing a Contractor--(insulation L.I. Only)
R-1	Sources of free loan films

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