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THE UNIVERSITY AT ALBANY

1400 WASHINGTON AVENUE, ALBANY, NEW YORK 12222

JOLLY TIGER DATA REPORT

MAY 1978

DOE Contract
EY-76-C-03-1304

MASTER

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MAY

1978 JOLLY TIGER DATA REPORT

Monthly Report Submitted to:

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Division of Buildings & Community Systems
Room 2252C
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Washington, D.C. 20545
ATTENTION: Howard Ross, Project Officer
Contract No. EY-76-C-03-1304

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MAY 1978 JOLLY TIGER DATA REPORT

This is the eighteenth monthly report on the Jolly Tiger Restaurant Project. The analysis and discussion refers to data taken during the period 1 May 1978 to 31 May 1978.

For May 658 hours of data were collected. This represents 88.4% data collection.

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ECONOMICS SUMMARY - TABLE I

Customer counts increased 5% and sales 8% in May. Power consumption was virtually the same as in April. LP gas use decreased 45% because of a reduced heating load.

WATER USAGE - TABLE I

Total water consumption increased 20%, because of increased cold water usage, caused by lawn irrigation. Dishwasher water consumption decreased 9% and domestic hot water consumption decreased 12.5%.

ELECTRIC POWER CONSUMPTION - TABLE II

The power consumption of HP1 and HP2 decreased 64% as compared to April, because of a lower building heating load and resultant warmer tank temperatures. The refrigeration rack used 10% more power while the AC units, lights, and kitchen equipment used 15% more power than in April.

LP GAS CONSUMPTION - TABLE III

LP gas consumption was down 55% as compared to April. This reduction was the result of a reduced building heating load.

HVAC AND HOT WATER SUMMARY - TABLE IV

Power consumption of the AC units rose 15% as compared to April. LP gas consumption for heating was 31% of the April value. The hot water heater efficiency was low because of the reduced load.

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BUILDING HEATING SUMMARY - TABLE V

The building heating load was met by pre-heat (29.4%), heat pumps (55.5%), and supplemental heating (15.1%). In addition 78% of the hot water load (140°F) and 49% of the dishwasher (180°F) load was supplied by the reclamation systems.

ALTERNATE FUEL SOURCE COMPARISONS - TABLE VI

The reclaimed energy for May is worth \$36.84 to \$623.34 depending upon the alternate fuel used and the price paid for it.

When making an economic analysis of the energy conservation system it is important to compare energy costs using several fuel sources. Under "Net Reclaimed Energy", the "Actual" column lists the energy reclaimed by the subsystems. These values have been transformed into units for alternate fuel sources using "typical" efficiency factors.

The following factors are used in the calculations:

Fuel	BTU Value	Burner Efficiency
Electricity	3414 BTU/kWh	100%
LP Gas	91,500 BTU/GAL	67%
#2 Oil	130,000 BTU/GAL	62%
Natural Gas	102,500 BTU/CCF	76%

The BTU and burner efficiency values chosen are typical for fuels and burners in the Albany, New York area and will remain as constants when Table VI is presented in future monthly report.

Under "Fuel Cost Comparisons" four alternate fuel sources are listed. Three different costs are listed for each fuel source. Under the EARS and R-1 columns are listed the dollar values saved by each subsystem for three fuel rates. Typical costs of these fuels in the Albany, New York

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area are: electricity \$0.035/kWh; LP Gas \$0.48/gal; #2 Oil \$0.48/gal; natural gas \$0.21/CCF. The price of natural gas assumes that the customer used gas in sufficient quantity 1500-2000 CCF/month to be purchased at a rate block at that price. Fuel cost adjustments are not considered.

MONTHLY WEATHER SUMMARY - TABLE VII

This data is from the weather service station at the Albany Airport. The airport is about 4 air miles from the Colonie store and the weather conditions are for all purposes comparable.

TABLE I
Economics Summary

May 1978

ITEM	QUANTITY
Gross Sales, \$	\$21,973
Customer Count, Number	10,515
Electric Consumption*, kWh	28,218
Propane Gas Consumption, Gals.	1,286
Total Energy Consumption, kWh	62,695
kWh Per \$ Sales	2.85
kWh Per Customer	5.96
Total Water Consumption, Gals.	65,641
Dishwasher Use (180°), Gals.	15,241
Faucet Use (140°), Gals.	3,901
Cold Water , Gals.	46,499
Total Faucet Use, Gals.	50,400
ENERGY COSTS \$	
Electric @ 0.035/kWh	\$ 987.63
Gas @ 0.427/Gal	549.12
Totals, \$	\$ 1,536.75

*Does not include ASRC use of 1071kWh

TABLE II
Electric Power Consumption
May 1978

	<u>kWh</u>	<u>%Total</u>
HP-1	893	3.1%
HP-2	<u>915</u>	<u>3.1%</u>
Subtotal HP-1 & HP-2	<u>1,808</u>	<u>6.2%</u>
Refrigeration	<u>4,576</u>	<u>15.6%</u>
AC-1	1,853	6.3%
AC-2	1,495	5.1%
AC-3	<u>3,415</u>	<u>11.7%</u>
Subtotals AC's	<u>6,763</u>	<u>23.1%</u>
ASRC use	1,071	3.7%
Lights, kitchen	<u>15,071</u>	<u>51.4%</u>
Total Electric	<u>29,289</u>	<u>100%</u>
Peak Demand 5/2,5/17	74.4 kWh	

TABLE III
L.P. Gas Consumption

	<u>Gallons</u>	<u>%Total</u>
Hot Water Heater	454	35.3%
Cooking use	832	64.7%
Total LP Gas Delivered	1,286	100%

TABLE IV
HVAC and Hot Water Summary

May 1978

	<u>kWh</u>	<u>LP Gas Gallons</u>
AC-1	1,853	----
AC-2	1,495	----
AC-3	3,415	----
Hot Water Heater	-----	454.0 x 28.7% EFF = 130.3 gal
Totals	6,763	454.0 at 100% EFF = 3,493 kWh
Total Energy Consumption	18,934	
Total Energy Consumption (100% Eff Gas)	10,256	

Hot Water Heater Efficiency

Energy consumed: 454 gal x 91,500 BTU/gal = 41,541,000 BTU's
 Energy supplied (water): (187.01°F-116.49°F) x 8.33 lbs/gal x 1 BTU/lb°F x
 15,241 gal + (135.5°F-116.49°F) x 8.33 lbs/gal x
 1 BTU/lb°F x 3,901 gal = 8,953,045 BTU's +
 617,736 BTUs = 9,570,781 BTU + supplemental
 heating of 3,151,088 BTU = 12,721,869 BTU -
 dishwasher heat exchanger 796,080 BTU =
 11,925,789 BTUs

$$\text{Efficiency} = \frac{11,925,789 \text{ BTU}}{41,541,000 \text{ BTU}} = 28.7\%$$

TABLE V

Jolly Tiger Colonie, NY Building Heating Summary

May 1978

	DEMAND	PRE-HEAT	HEAT PUMPS	SUPPLEMENTAL HEAT (FOR HEATING)	HEAT EXCHANGERS
BTU/HR	28,082	8,253	15,594	4,235	7,263
kW	8.23	2.42	4.57	1.24	2.13
BTU/FT ²	3,705	1,089	2,057	559	958
kW/FT ²	1.09	0.32	0.60	0.16	0.28
BTU/\$	951	279	528	143	246
kW/\$	0.28	0.08	0.16	0.04	0.07
BTU/Cust	1,987	584	1,103	300	514
kW/Cust	0.58	0.17	0.32	0.09	0.15
%Heating demand	100%	29.4%	55.5%	15.1%	25.9%

	HEAT FROM STORAGE TANKS	TOTAL REUSED ENERGY REF. RACK	EARS	ENERGY DISH	NET REUSED ENERGY REF. RACK	EARS
BTU/HR	15,516	7,373	17,159	3,449	4,847	8,865
kW/HR	4.55	2.16	5.03	1.01	1.42	2.60
BTU/FT ²	2,047	973	2,264	455	639	1,169
kW/FT ²	0.60	0.29	0.66	0.13	0.19	0.34
BTU/\$	525	250	581	117	164	300
kW/\$	0.15	0.07	0.17	0.03	0.05	0.09
BTU/Cust	1,098	522	1,214	244	343	627
kW/Cust	0.32	0.15	0.36	0.07	0.10	0.18
%Heating demand	55.3%	26.3%	61.1%	12.3%	17.3%	31.6%

LP Gas Consumption 1,286 gal

TABLE VI

Alternate Fuel Source Comparison

May 1978

Net Reclaimed Energy

	Actual (MMBTU)	Elec (kWh)	LP Gas (Gal)	#2 Oil (gal)	Nat Gas (CCF)
HX 1&2	2.57	752	42	32	33
EARS	12.77	3,740	208	158	166
AC's	2.82	827	46	35	37
R-1	5.49	1,607	90	68	71

Fuel Cost Consumption

Fuel	Cost	HX 1&2	EARS	AC's	R-1	TOTAL
Elec.	\$0.035/kWh	\$ 26.32	\$130.90	\$ 28.95	\$ 56.25	\$242.42
	0.050/kWh	37.60	187.00	41.35	80.35	346.30
	0.090/kWh	67.68	336.60	74.43	144.63	623.34
LP Gas	\$0.45/gal	\$ 18.90	\$ 93.60	\$ 20.70	\$ 40.50	\$172.70
	0.50/gal	21.00	104.00	23.00	45.00	193.00
	0.55/gal	23.10	114.40	25.30	49.50	212.30
#2 Oil	\$0.40/gal	\$ 12.80	\$ 63.20	\$ 14.00	\$ 27.20	\$117.20
	0.45/gal	14.40	71.10	15.75	30.60	131.85
	0.50/gal	16.00	79.00	17.50	34.00	146.50
Nat Gas	\$0.12/CCF	\$ 3.96	\$19.92	\$ 4.44	\$ 8.52	\$ 36.84
	0.21/CCF	6.93	34.86	7.77	14.91	64.47
	0.34/CCF	11.22	56.44	12.58	24.14	104.38

MONTHLY WEATHER SUMMARY
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TEMPERATURE (degrees Fahrenheit)

Mean=====	58.4°
Normal=====	57.7
Departure from normal=====	+0.7
Highest recorded and date=====	89 on the 30th
Normal maximum=====	69.7
Lowest recorded and date=====	28 on the 4th
Normal minimum=====	45.7

Records broken or equalled=====

28 on the 4th broke the 1946 record low of 30.

HEATING DEGREE DAYS (base 65°F)

Monthly total=====	245
Monthly normal=====	253
Departure from monthly normal=====	-8
Seasonal total=====	7114
Seasonal normal=====	6849
Departure from seasonal normal=====	+265

PRECIPITATION (inches)

Monthly total=====	1.96
Monthly normal=====	3.26
Departure from monthly normal=====	-1.30
Greatest amount in 24 hours and date=====	0.69 on the 16th/17th
Number of days with 0.01 inch or more=====	13

SNOWFALL (inches)

Monthly total=====	Trace
Monthly average in recent years=====	0.2
Departure from monthly average=====	-0.2

SUNSHINE

Total number of hours=====	256.0
Percent of possible sunshine=====	56%
Normal percent of possible sunshine=====	55%
Departure from normal percent=====	+1%

WIND (miles/hour)

Mean hourly speed=====	9.0
Prevailing direction=====	South
Fastest wind and date=====	28 mph on the 1st/21st
Highest gust and date=====	39 mph on the 1st

MISCELLANEOUS

Number of days with thunderstorms=====	3
Number of days with heavy fog=====	1

* Data assembled by the Atmospheric Sciences Research Center

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Table VIIa

JOLLY TIGER PROJECT

MONTHLY ELECTRIC POWER CONSUMPTION

1977

1978

DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

AC-1

KWH x 10³

8

6

4

2

a

AC-2

KWH x 10³

8

6

4

2

b

AC-3

KWH x 10³

8

6

4

2

c

R-1

KWH x 10³

8

6

4

2

d

FIGURE 1

JOLLY TIGER PROJECT

MONTHLY ELECTRIC POWER AND LP GAS CONSUMPTION % DATA COLLECTED

1977

1978

DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

HEAT PUMPS

HP-1

HP-2

KWH $\times 10^3$

8

6

4

2

a

L.P.

GAS

GALS $\times 10^3$

4

3

2

1

b

TOTAL

KWH
USAGE

KWH $\times 10^3$

40

30

20

10

c

% DATA

COLLECTED

80

60

40

20

d

FIGURE 2

46 1512

K&E
10 X 10 TO THE CENTIMETER 18 X 25 CM.
KEUFFEL & ESSER CO. MADE IN U.S.A.

JOLLY TIGER PROJECT

MONTHLY ENERGY RECLAIMED

FIGURE 3

JOLLY TIGER PROJECT

MONTHLY ENERGY RECLAIMED

FIGURE 3 (con't)

46 1512

K&E
10 X 10 TO THE CENTIMETER 18 X 25 CM.
KEUFFEL & ESSER CO. MADE IN U.S.A.

JOLLY TIGER PROJECT

MONTHLY HEATING BY WATER SYSTEM

1977

1978

DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

PRE-HEAT

BTU $\times 10^6$

60

50

40

30

20

10

a

SUPPLEMENTAL
HEATBTU $\times 10^6$

120

100

80

60

40

20

b

HEAT SUPPLIED
TO
AC HEAT PUMPSBTU $\times 10^5$

300

200

100

c

FIGURE 4

JOLLY TIGER PROJECT

MONTHLY MEAN TEMPERATURES

1977

1978

DEC

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

OUTSIDE AIR

TEMP (°F)

80

60

40

20

a

TANK-1

TEMP (°F)

130

120

110

100

90

b

TANK-2

TEMP (°F)

130

120

110

100

90

c

FIGURE 5