
Section 7

ENERGY & SCIENCE

The increase in Maui County's population has been reflected in the utilities. Consumption and use of electricity, gas, utilities, and water have all increased dramatically over the last decade. Statistics on electricity, gas, water production and consumption are covered. Hawaiian Commercial and Sugar generated about 10.0% of the electric power used on the island of Maui in 2001. Ongoing scientific endeavors include observation of astronomical and man-made space objects from the summit of Mt. Haleakala.

7.1.1

TELESCOPES AT THE SUMMITS OF MAUNA KEA AND HALEAKALA: 2003

Facility (mirror diameter in meters)	Capital cost ¹ (\$mil)	Annual operating cost (\$mil)	County based staff	Operational
Mauna Kea observatories:				
UH 0.6-m (Optical)	0.3	- ²	- ²	1968
UH 2.2-m (Optical/Infrared)	5	1.3	8	1970
Canada-France-Hawaii 3.6-m (Optical/Infrared)	30	6.2	50	1979
NASA IRTF 3.0-m (Infrared)	10	3.2	16	1979
United Kingdom 3.8-m (Infrared)	5	3.0	31	1979
James Clerk Maxwell 15-m Submillimeter	32	5.0	39	1986
Caltech 10.4-m Submillimeter	10	2.6	11	1986
W.M. Keck Observatory (Keck I & II) 10-m x 2 (Optical/Infrared)	170	11.0	115	1992/96
VLBA Antenna 25-m (Radio)	7	0.25	2	1992
Submillimeter Array 8x6-m	80	6.0	36	2003
Subaru (Japan National Large Telescope) 8-m (Optical/Infrared)	170	15.0	70	1999
Fredrick C. Gillett Gemini 8m (Optical/Infrared)	92	8.0	70	1999
Mauna Kea Observatories Support Services	(X)	2.4 ³	28	(X)
Total	611	61.6	476	
Haleakala observatories:				
Mees Solar Observatory	0.5	0.1	2	1968
Lunar Ranging Facility	3.3	0.7	7	1976/84
Haleakala Observatories Projects	(NA)	0.5	4	1979
Maui Space Surveillance Site (MSSS) ⁴	200.0	16.0	120	1979
Advanced Electro-Optical System 3.7-m Telescope (AEOS)	50.0	15.0	55	1997
Magnum 2-m Telescope ⁵	5.0	0.25	1	2000
Faulkes 2-m Telescope ⁶	5.0	(NA)	(NA)	2003
Haleakala Support Facilities	(X)	0.13	6	(NA)
Total	263.8	32.68	195	

NA Not available.

X Not applicable.

¹ Historical cost, not adjusted for inflation.² Combined budget and staffing with UH 2.2-m telescope.³ Not included in the total since derived from facility operating costs.⁴ Formerly Air Force Maui Optical Station (AMOS).⁵ MAGNUM = Multicolor Active Galactic Nuclei Monitoring.⁶ Under construction.

SOURCE: University of Hawaii at Manoa, Institute for Astronomy, records.

7.1.2

ELECTRIC UTILITIES, MAUI COUNTY

	2000	2001	2002	2003	2004
CUSTOMERS, DEC. 31					
<i>Total</i>					
Maui Island	53,204	54,405	55,504	56,880	57,430
Molokai	2,903	2,926	2,960	3,017	3,018
Lanai	1,494	1,509	1,519	1,526	1,548
Maui County	57,601	58,840	59,983	61,423	61,996
<i>Residential¹</i>					
Maui Island	45,379	46,320	47,253	48,327	48,753
Molokai	2,351	2,381	2,416	2,464	2,472
Lanai	1,296	1,306	1,310	1,319	1,334
Maui County	49,026	50,007	50,979	52,110	52,559
<i>Other</i>					
Maui Island	7,825	8,085	8,251	8,553	8,677
Molokai	552	545	544	553	546
Lanai	198	203	209	207	214
Maui County	8,575	8,833	9,004	9,313r	9,437
GENERATING AND FIRM PURCHASED CAPABILITY, DEC. 31 (MW)					
Maui Island	250.1	250.1	250.1	245.2	245.2
Molokai	12.1	12.1	12.0	11.8	11.8
Lanai	10.4	10.4	10.4	10.3	10.3
Maui County	272.6	272.6	272.5	267.3	267.3
PEAK DEMAND (MW)²					
Maui Island	185.1	191.0	193.9	197.7	206.5
Molokai	6.5	6.5	6.6	6.5	6.7
Lanai	5.0	5.2	4.9	5.0	4.8
POWER SOLD (1,000 kWh)					
<i>Total</i>					
Maui Island	1,042,006	1,071,486	1,096,739	1,142,689	1,184,554
Molokai	36,349	35,681	34,942	35,894	35,344
Lanai	27,108	26,905	27,036	28,136	27,802
Maui County	1,105,463	1,134,072	1,158,717	1,206,719	1,247,700
<i>Residential</i>					
Maui Island	354,689	360,025	378,828	398,949	419,276
Molokai	12,687	12,348	12,439	13,048	13,413
Lanai	6,855	7,068	7,358	7,515	7,688
Maui County	374,231	379,440	398,625	419,512	440,377
<i>Other</i>					
Maui Island	687,317	711,462	717,911	743,741	765,268
Molokai	23,661	23,333	22,503	22,846	21,931
Lanai	20,253	19,838	19,678	20,621	20,114
Maui County	731,232	754,633	760,092	787,208	807,313

7.1.2

CONTINUED

	2000	2001	2002	2003	2004
AVERAGE ANNUAL USE (kWh)³					
<i>Residential</i>					
Maui Island	7,816	7,773	8,017	8,255	8,600
Molokai	5,397	5,186	5,149	5,296	5,426
Lanai	5,289	5,412	5,617	5,697	5,763
Maui County	7,633	7,588	7,819	8,050	n/a
<i>Other</i>					
Maui Island	87,836	87,998	87,009	86,957	88,195
Molokai	42,865	42,814	41,366	41,312	40,166
Lanai	102,288	97,722	94,152	99,619	93,990
Maui County	85,275	85,433	84,417	84,528	n/a
AVERAGE RATE (dollars per kWh)					
<i>Residential</i>					
Maui Island	0.18232	0.18656	0.17119	0.18289	0.20817
Molokai	0.22787	0.23631	0.22173	0.22953	0.25741
Lanai	0.22184	0.24415	0.22445	0.23460	0.25149
Maui County	0.18459	0.18925	0.17375	0.18527	n/a
<i>Other</i>					
Maui Island	0.16582	0.17125	0.15684	0.16954	0.19296
Molokai	0.22376	0.22841	0.21110	0.22509	0.25543
Lanai	0.22112	0.24555	0.22480	0.23516	0.23959
Maui County	0.16922	0.17497	0.16020	0.17287	n/a
REVENUES (\$1,000)					
<i>Total</i>					
Maui Island	178,638	189,003	177,446	199,057	234,943
Molokai	8,186	8,247	7,508	8,137	9,054
Lanai	5,999	6,597	6,075	6,612	6,752
Maui County	192,823	203,847	191,030	213,806	250,749
<i>Residential</i>					
Maui Island	64,668	67,166	64,851	72,964	87,281
Molokai	2,891	2,918	2,758	2,995	3,453
Lanai	1,521	1,726	1,652	1,763	1,933
Maui County	69,080	71,809	69,260	77,721	92,667
<i>Other</i>					
Maui Island	113,970	121,837	112,596	126,093	147,662
Molokai	5,294	5,330	4,750	5,142	5,602
Lanai	4,478	4,871	4,424	4,849	4,819
Maui County	123,743	132,038	121,769	136,085	158,083

¹ Residential refers to single-metered residential customers which may include condominiums for visitor use but excludes master-metered apartment and condominium buildings used by residents, which are classified as commercial customers.

² Peak demand is the maximum amount of energy required from the electrical system. The islands' electrical systems are not interconnected, so no peaks are reported for Maui County as a whole.

³ Based on number of customers at end of year. r: Revised from previous Data Book. n/a Not Available.

MW: Megawatts kWh: Kilo-watt-hour.

SOURCE: Hawaii State Department of Commerce and Consumer Affairs, Division of Consumer Advocacy, records; capacity and peak demand: Hawaiian Electric Industries, Inc., Securities and Exchange Commission 10-K filings, 2000-2004.

7.1.3

GAS UTILITIES, MAUI COUNTY

Excludes bottled gas

	1999	2000	2001	2002	2003	2004
Island of Maui						
Customers (December 31)						
Residential ¹	326	333	329	325	321	317
Other	79	78	79	75	76	74
Total	405	411	408	400	397	391
Gas Sold (1,000 therms)						
Residential	74	78	77	68	69	69
Other	813	805	786	771	766	782
Total	887	883	863	839	836	850
Average Annual Use (therms)						
Residential	228	233	234	210	216	217
Other	10,285	10,320	9,947	10,281	10,081	10,561
Average Rate (\$ per therm)²						
Residential	1.98769	2.10372	2.43086	2.71343	2.82044	2.91367
Other	1.14251	1.23916	1.45250	1.36960	1.51092	1.59858
Revenues (\$1,000)						
Residential	148	163	187	185	196	201
Other	928	997	1,141	1,056	1,158	1,249
Total	1,076	1,161	1,329	1,241	1,353	1,450
Island of Molokai³						
Customers (December 31)						
Total/Residential	92	78	71	80	72	73
Gas Sold (1,000 therms)						
Total/Residential	19	17	15	14	15	14
Average Annual Use (therms)						
Total/Residential	206	220	205	117	202	185
Average Rate (\$ per therm)						
Total/Residential	2.23825	2.33821	2.62590	2.84208	3.00433	3.15372
Revenues (\$1,000)						
Total/Residential	42	40	38	40	44	43

¹ Residential refers to single-metered residential customers which may include condominiums for visitor use but excludes master-metered apartment and condominium buildings used by residents which are classified as commercial customers.

² Based on number of customers at end of year.

³ All Molokai customers are residential.

SOURCE: Hawaii State Department of Commerce and Consumer Affairs, Division of Consumer Advocacy, records.

7.1.4

HAWAII STATE ENERGY REPORT, ENERGY CONSUMPTION ESTIMATES BY SOURCE

In billion BTU

	1997	1998	1999	2000	2001	2002
Asphalt and road oil	2,629.6	2,138.0	2,340.3	4,009.3	2,271.0	709.9
Aviation gasoline	608.8	540.3	293.6	226.3	243.8	88.6
Distillate fuel	27,025.5r	25,925.21r	30,951.2	29,672.1	35,180.4	47,099.5
Kerosene-type jet fuel	57,930.6r	56,643.3	53,720.0	53,510.8	50,437.3	59,450.4
Naphtha-type jet fuel	9.0	0.0	0.0	0.0	0.0	0.0
Kerosene	2.8	1.5	0.9	1.3 ^r	0.9	0.7
Liquified petroleum gasses	870.3	3,050.5	1,358.0	2,027.4	2,102.2	2,782.4
Lubricants	571.7	598.5	604.8	595.7	545.8	539.3
Motor gasoline	48,781.1	48,692.3	46,653.8	48,397.8	50,587.3	54,261.1
Residual fuel	76,811.8r	83,261.3r	81,383.5	85,001.5	83,517.5	80,086.4
Other petroleum products ¹	17,607.0r	14,778.7r	14,730.2r	13,959.5r	17,261.8r	16,453.0
Subtotal petroleum products	230,489.6r	233,446.2r	229,921.2	235,194.0r	239,885.4r	259,230.9
Geothermal energy	4,683.3	4,983.0	4,437.1	5,515.6	4,349.9	NA
Solar thermal & photovoltaic energy	1,273.0	1,317.7	1,353.0	1,364.9	1,341.0	NA
Wind energy	206.2	196.6	168.7	173.4	21.6	NA
Subtotal geothermal, solar thermal, photovoltaic and wind energy	6,162.4	6,496.2	5,958.8	7,053.9	5,712.6	NA
Coal	20,040.3	18,222.9	17,653.7	17,653.7	17,550.7	NA
Hydroelectric power	1,194.5	1,236.6	1,175.0	1,055.4	1,025.0	NA
Natural gas	2,688.3	2,803.7	2,886.5	2,975.0	2,919.4	NA
Wood and waste	14,779.2	17,649.8	18,098.3	16,101.2	15,121.0	NA
Total energy consumption	241,824.9	279,884.9	275,730.6	280,033.8	282,163.2	NA

NOTE: Totals may not equal sum of components due to independent rounding.

¹ Other petroleum products are aviation gasoline blending components, motor gasoline blending components, petroleum coke, still gas, unfinished oils, and petroleum waxes.

^r Revised from previous Data Book.

NA: Not Available.

SOURCE: U.S. Department of Energy, Energy Information Administration, Combined State Energy Data System 2001 and 2002.

7.1.6

DAILY AVERAGES FOR WATER PRODUCTION BY AREA, MAUI COUNTY

in thousands of gallons

Area	06/04	07/04	08/04	09/04	10/04	11/04	12/04	01/05	02/05	03/05	04/05	05/05	Prev. 12 months
Central Maui													
Groundwater-lao	17,75	19,927	18,842	18,306	18,239	16,864	16,075	13,573	14,336	15,685	16,089	17,483	16,949
lao Tunnel	1,837	1,959	2,015	2,039	2,073	2,016	2,036	2,011	1,985	1,777	2,054	2,149	1,996
Groundwater-Waihee	4,091	3,702	2,929	3,498	4,795	3,165	3,466	3,180	3,595	3,547	4,322	4,608	4,146
Surface Water	1,082	749	530	0	726	935	1,043	780	892	580	838	959	759
Upcountry Maui													
Surface Water	7,321	8,923	8,048	8,821	7,933	5,384	5,440	4,421	4,983	5,389	6,310	7,215	6,693
Groundwater	344	394	370	1,783	2,764	1,205	1,110	953	1,170	1,139	1,099	1,327	1,138
West Maui													
Surface Water	3,583	3,767	3,595	3,450	3,359	3,445	3,187	3,542	3,544	3,591	3,722	3,609	3,532
Groundwater	2,764	2,778	2,909	2,911	2,553	2,009	1,863	1,353	1,608	1,795	1,685	2,015	2,190
East Maui													
Groundwater	375	356	370	392	441	452	370	345	376	350	339	382	379
Molokai													
Groundwater	1,255	1,340	1,256	1,298	1,220	1,074	1,100	912	1,055	1,040	1,180	1,406	1,179
TOTAL WATER PRODUCTION	40,404	44,451	42,549	45,096	44,104	36,548	35,689	31,069	33,545	34,893	37,638	41,154	38,962

SOURCE: County of Maui, Department of Water Supply, Water Quality Report.

7.1.7

WATER SYSTEM DEVELOPMENT FEE SCHEDULE

Effective July 29, 2002

METER SIZE	TOTAL FEE
5/8 inch	\$6,030
3/4 inch	8,442
1 inch	15,678
1 1/2 inch	34,974
2 inch	61,506
3 inch	138,690
4 inch	247,230
6 inch	555,966
8 inch	987,714
10 inch	1,543,680
12 inch	2,222,658

NOTE: Fees do not include installation charges.

SOURCE: County of Maui, Department of Water Supply, *Annual Report FY 2004*.

7.1.8

WATER SERVICES BY METER SIZE, MAUI COUNTY

District	5/8"	3/4"	1"	1-1/2"	2"	3"	4"	6"	8"	Total
Regular Rates										
Wailuku	15,304	827	493	383	362	70	22	3	1	17,465
Makawao	8,268	285	159	77	24	13	5	0	0	8,831
Lahaina	2,631	130	116	126	116	28	6	1	0	3,154
Hana	478	8	8	4	3	0	0	0	0	501
Molokai	1,483	37	31	14	18	1	0	1	0	1,585
Subtotal	28,164	1,287	807	604	523	112	33	5	1	31,536
Agricultural Service Meters										
Wailuku	27	9	7	5	1	0	0	0	0	49
Makawao	427	66	104	93	37	1	1	0	0	729
Lahaina	2	3	1	0	0	0	0	0	0	6
Hana	13	0	3	0	0	0	0	0	0	16
Molokai	4	2	1	1	0	0	0	0	0	8
Subtotal	473	80	116	99	38	1	1	0	0	808
Total	28,637	1,367	923	703	561	113	34	5	1	32,344

SOURCE: County of Maui, Department of Water Supply, *Annual Report FY 2004*.

7.1.9

**OUTSIDE WATER DELIVERIES TO DEPARTMENT OF
WATER SUPPLY, MAUI COUNTY**

Purchased From	1,000 Gallons	Amount	Cost Per 1,000 Gallons
East Maui Irrigation	2,634,661	\$158,871	\$0.060
Wailuku Agribusiness	101,972	18,964	0.186
Maui Land & Pine	846,126	42,306	0.050
Hawaiian Home Lands	11,963	17,500	1.460
R.W. Meyers	3,198	1,279	0.400
HC&S	113,095	28,082	0.248
Total	3,711,015	\$267,002	\$0.072
District			
Wailuku	215,067	\$47,047	\$0.219
Kula	1,639,509	98,862	0.060
Makawao	987,191	59,528	0.060
Lahaina	846,126	42,306	0.050
Hana	7,961	480	0.060
Molokai	15,161	18,779	1.239
Total	3,711,015	\$267,002	\$0.072

SOURCE: County of Maui, Department of Water Supply, *Annual Report FY 2004*.

7.1.10

**WATER SALES TO GENERAL AND AGRICULTURAL
CONSUMERS BY DISTRICT & SYSTEMS,
MAUI COUNTY FY JULY 2003 - JUNE 2004**

System	Services	Change from FY 2003	Consumption (1,000 gallons)	Change from FY 2003 (1,000 gallons)
Wailuku District				
Wailuku	5,150	51	1,202,221	(50,357)
Waihee	189	4	24,200	(1,889)
Waikapu	327	26	47,914	(3,790)
Wailuku Heights	472	6	78,465	(14,787)
Kahului	4,530	28	1,533,709	(195,091)
Puunene	10	0	29,886	(8,512)
Kihei	5,565	283	3,946,031	29,914
Maalaea	45	0	80,793	(2,846)
Makena	164	5	218,190	13,410
Paia-Kuau	886	30	163,271	(2,763)
Spreckelsville	171	6	77,520	(9,672)
Subtotal	17,509	439	7,402,200	(246,383)
Makawao District				
Kokomo-Kaupakalua	1,079	69	178,073	(3,128)
Kuiaha	303	4	58,133	5,375
Haiku-Pauwela	837	12	146,674	8,885
Makawao	1,980	5	348,717	(8,644)
Pukalani	2,040	20	370,656	(12,982)
Hailiimaile	201	1	38,301	2,488
Upper Kula	1,920	28	439,704	(65,069)
Lower Kula	1,084	8	758,392	(37,674)
Ulupalakua	79	3	55,254	(14,260)
Kula Agr. Park	40	3	192,208	(825)
Subtotal	9,563	153	2,586,112	(125,834)
Lahaina District				
Lahaina	1,973	3	891,755	(26,027)
Honokowai	430	17	642,345	58,859
Alaeloa	745	34	504,055	79,209
Honokohau	13	0	1,604	158
Subtotal	3,161	54	2,039,759	112,189
Molokai District				
Kawela-Kaunakakai	1,130	16	231,602	(16,129)
Ualapue	350	1	83,722	4,802
Kalae	107	0	15,790	4,615
Halawa	8	0	125	(147)
Subtotal	1,595	17	331,239	(6,859)
Hana District				
Hana	381	1	57,017	1,150
Nahiku	35	1	4,770	1,248
Keanae	80	0	13,084	5,005
Kaupo	20	(1)	1,457	144
Subtotal	516	1	76,328	7,547
Total	32,344	664	12,435,638	(259,340)

SOURCE: County of Maui, Department of Water Supply, *Annual Report FY 2004*.

7.1.11

**WATER CONSUMPTION BY DISTRICT,
MAUI COUNTY FY JULY 2003 - JUNE 2004**

1,000 GALLONS

Months	Total	Wailuku	Makawao	Kula	Lahaina	Molokai	Hana
General							
July-August	2,131,709	1,348,233	201,404	113,344	389,074	66,910	12,744
September-October	2,220,856	1,383,279	180,690	109,377	464,723	71,300	11,487
November-December	1,911,047	1,258,680	214,485	94,462	271,680	59,629	12,111
January-February	1,510,225	1,049,842	135,691	74,768	191,955	44,684	13,285
March-April	1,734,934	1,058,888	162,674	68,616	389,952	43,350	11,454
May-June	1,733,885	1,133,666	147,999	80,245	322,389	36,242	13,344
Total	11,242,656	7,232,588	1,042,943	540,812	2,029,773	322,115	74,425
Agricultural							
July-August	256,504	30,681	19,814	201,007	2,095	2,361	546
September-October	268,213	30,413	17,384	215,053	2,710	2,553	100
November-December	221,785	30,352	22,989	165,043	1,406	1,702	293
January-February	152,529	26,904	14,378	108,827	907	1,246	267
March-April	148,680	27,781	12,838	106,133	1,481	330	117
May-June	145,271	23,481	10,771	108,120	1,387	932	580
Total	1,192,982	169,612	98,174	904,183	9,986	9,124	1,903
Grand Total	12,435,638	7,402,200	1,141,117	1,444,995	2,039,759	331,239	76,328

SOURCE: County of Maui, Department of Water Supply, *Annual Report FY 2004*.