CHAPTER 5
ENERGY RESOURCES

PHOTOVOLTAIC PANELS IN USE AT WINERY

CHRONOLOGY OF UPDATE

NOVEMBER 30, 2005—VERSION 1

PURPOSE

The purpose of this chapter is to document and compare existing electricity and natural gas production and consumption in Napa County since 1990. Trends in electricity and natural gas use are identified as well as the capacity of existing electrical and natural gas transmission infrastructure. Any possible shortfalls now or in the near future are identified and alternative energy sources are discussed. Energy consumption by vehicles is also evaluated.

TABLE OF CONTENTS

FIGURES

TABLES

MAPS

LIST OF ACRONYMS AND ABBREVIATIONS

ABAG	Association of Bay Area Governments
APD	abnormal peak day
BOE	barrel of oil equivalent
Btu	British thermal unit
Caltrans	California Department of Transportation
CEC	California Energy Commission
DOE	U.S. Department of Energy
GIS	Geographic information system
kV	Kilovolts
kW	Kilowatt
kWh	kilowatt hour
mcf	thousand cubic feet
Mcfh	thousand cubic feet per hour
MVA	mega volt-amps
MW	megawatt
MWh	megawatt hour
PG&E	Pacific Gas and Electric
TCU	transportation, communication and utilities

Monticello Dam and Lake Berryessa

INTRODUCTION

This chapter provides a detailed discussion of energy generation and consumption in Napa County (County). This discussion considers the County as a whole rather than as individual evaluation areas. The chapter also provides a general discussion of the federal, state, and local policies and regulations applicable to energy use in the County. In addition, the chapter describes the methods used to identify and quantify energy generation and consumption.

PURPOSE

The purpose of this chapter is to document and compare existing electricity and natural gas production and consumption in Napa County to that of 1990. Trends in electricity and natural gas use are identified as well as the capacity of existing electricity and natural gas transmission infrastructure. Any shortfalls now or in the near future are identified and alternative energy sources are discussed. Energy consumption by vehicles is also evaluated.

SPECIALIZED TERMS

- *Barrel of oil equivalent (BOE).* A unit of energy equivalent to the amount of energy contained in a single barrel of crude oil.
- *British thermal unit (Btu).* A unit of energy equivalent to the energy required to raise the temperature of one pound of water one degree Fahrenheit.
- *Capacity.* The maximum amount of electricity that a generating unit, power plant or utility can produce under specified conditions. Capacity is measured in kilowatts and megawatts.
- *Cogenerator.* Cogenerators use the waste heat created by one process, for example during manufacturing, to produce steam, which is used, in turn, to spin a turbine and generate electricity.
- *Kilowatt (kW).* One thousand watts, where a watt is a unit of electrical power calculated as the rate of energy transfer equivalent to one ampere flowing under a pressure of one volt. Ten 100-watt light bulbs use one kW of electric power.
- *Kilowatt hour (kWh).* A unit of energy equivalent to one kilowatt of power expended for one hour of time. The kilowatt hour is not a standard unit in any formal system, but it is commonly used in electricity use determinations.
- *Megawatt Hour (MWh).* One thousand kilowatt-hours, or an amount of electricity that would supply the monthly power needs of a typical home having an electric hot water system.
- *Mega Volt-Amps (MVA).* The installed rated capacity of a transformer.
- *Peak demand.* The maximum amount of electricity or gas necessary to supply customers during a stated period (e.g., an hour or day). Peak periods fluctuate by season. Peak demand generally occurs in the morning during the winter and in the afternoon during the summer.
- *Renewable Energy.* Resources that constantly renew themselves or that are regarded as practically inexhaustible. These include solar, wind, geothermal, hydroelectric, and wood.
- *Small wind energy system.* A wind energy conversion system consisting of a wind turbine, a tower or stand, and associated distribution, storage, control or conversion electronics and any accessory structure associated with them.
- *Substation*. A facility that steps up or steps down the voltage in utility power lines. Voltage is stepped up where power is sent through long-distance transmission lines. Voltage is stepped down where the power is to enter local distribution lines.
- *Therm.* One hundred thousand (100,000) British thermal units (1 therm = 100,000 Btu).
- *Thousand cubic feet (Mcf).* A common natural gas measurement. In the case of natural gas, “M” is the Roman numeral for thousand and “MM” would indicate a thousand thousand, or million.
- *Transmission.* Transporting bulk power over long distances.
- *Watt.* A unit of measure of electric power at a point in time, as capacity or demand.
- *Watt-Hour.* One watt of power expended for one hour. One thousandth of a kilowatt-hour.

POLICY CONSIDERATIONS

This section discusses the federal, state, and local policies that apply to energy resources in Napa County. Note that the discussion contained in this section is general and not an exhaustive description of all possible policies and regulations.

FEDERAL POLICIES

The U.S. Department of Energy (DOE) is the main body regulating national energy resources. The DOE’s activities are instrumental in establishing the safety, reliability, and efficiency of energy supplies throughout the nation. On the state level, much of the energy policy is included in the California Code of Regulations (Titles 20 and 24) or the California Public Utilities Code. The diverse regulations affect producers and consumers of gas, oil, electricity, and other energy resources. Local energy policy and regulations are limited.

The DOE's activities are instrumental in establishing the safety, reliability, and efficiency of energy supplies in the nation. Resource areas the department oversees include coal and natural gas power systems, hydrogen and clean fuels, oil and gas supply and delivery, and petroleum reserves. They also promulgate and enforce electricity and natural gas regulations. Most federal energy policies are available through the DOE website at http://www.energy.gov.

The National Energy Policy, developed in May 2001, proposes recommendations on energy use and on the repair and expansion of the nation's energy infrastructure. The policy is based on findings that growth in U.S. energy consumption is outpacing the current rate of production. Over the next 20 years, the growth in the consumption of oil is predicted to increase by 33%, natural gas by over 50%, and electricity by 45%. Whereas the U.S. economy has grown by 126% in the past three decades, energy use has increased by only 30%. Meanwhile, automobiles currently use 60% less gasoline than they did in 1972. While the federal policy promotes further improvements in energy use through conservation, it focuses on increased development of domestic oil, gas, and coal and the use of hydroelectric and nuclear power resources. To address the over-reliance on natural gas for new electric power plants, the federal policy proposes research in clean coal technology and expanded generation from landfill gas, wind, and biomass sources.

STATE POLICIES

The California Energy Commission (CEC) is the state agency established by the Warren-Alquist State Energy Resources Conservation and Development Act (Warren-Alquist Act) responsible for energy policy. The Energy Commission's five major areas of responsibilities are: forecasting future statewide energy needs; licensing power plants sufficient to meet those needs; promoting energy conservation and efficiency measures; developing renewable and alternative energy resources, including providing assistance to develop clean transportation fuels; and planning for and directing state response to energy emergencies.

California regulates energy consumption under Title 24 of the California Code of Regulations. The Title 24 Building Energy Efficiency Standards were developed by the CEC and apply to energy consumed for heating, cooling, ventilation, water heating, and lighting in new residential and nonresidential buildings. The CEC adopted the first Title 24 standards in 1978 and updates them periodically to incorporate new energy-efficiency technologies and methods. The most recent standards were adopted in 2001 and updated on October 1, 2002. Newly updated standards will take effect October 1, 2005, and will supersede the 2001 Standards. The amended Title 24 standards apply to the design and insulation of structures and to the space-cooling equipment installed in these structures. Under Assembly Bill 970, signed September 6, 2000, the CEC will update and implement its appliance and building efficiency standards to make the "maximum feasible" reductions in unnecessary energy consumption.

In 2001, the California Legislature passed landmark legislation, Assembly Bill 1207, to promote small wind turbine installations by standardizing permitting requirements. Other state incentives include a rebate program administered by the CEC and a state income tax credit for purchasers of small wind systems. The following excerpt from AB 1207 articulates the benefits the state hopes to derive from small development:

> *Distributed small wind energy systems… enhance the reliability and power quality of the power grid, reduce peak power demands, increase in-state electricity generation, diversity the state's energy supply portfolio, and make the electricity supply market more competitive by promoting consumer choice.*

There are a large number of state regulations relating to energy production, consumption, and transmission. These regulate state agencies, privately owned energy companies, as well as individuals. Energy regulations range from Energy Efficiency Appliance Standards to Energy Efficiency Building Standards, to policies affecting gas, oil, electric and water franchises. Much of the energy policy is included in the California Code of Regulations (Titles 20 and 24), and the California Public Utilities Code. These are available on line at http://www.energy.ca.gov and http://www.leginfo.ca.gov, respectively.

COUNTY POLICIES

SMALL WIND ENERGY SYSTEMS

SMALL ENERGY WIND SYSTEMS ORDINANCE (COUNTY CODE 18.117)

The purpose and intent of these regulations is to provide a uniform and comprehensive set of standards for the installation and use of small energy wind systems, designed for onsite home, farm, and small commercial use which are used primarily to reduce onsite consumption of utility power. The regulations are designed to protect the public health, safety, and community welfare while at the same time not unduly restricting the development of small wind energy systems.

METHODOLOGY

This section identifies the methods used to determine and evaluate electricity and gas consumption and peak demand in Napa County. It includes a description of the study area considered in this analysis. Population data was attained from the Association of Bay Area Governments (ABAG) Census Data, U.S. Census 2000 (Association of Bay Area Governments 2005a, 2005b) (see population and housing chapter).

The CEC and Pacific Gas and Electric (PG&E) were contacted to obtain the data presented in this chapter. The CEC provided maps of major electrical transmission lines and natural gas pipelines in the County as well as supporting geographic information system (GIS) data. Due to security concerns, this information, however, was given with the understanding that it would not be made available for viewing by the general public. Employees at the CEC performed calculations to estimate electricity and gas consumption for the entire County for the years 1990–2003. PG&E provided estimates on peak consumption rates, transmission capacity and system upgrades, and solar energy production. Energy

consumed by vehicles within the County as projected by the California Department of Transportation (Caltrans) Office of Travel Forecasting and Analysis, is summarized as total on-road fuel consumption. Per capita electricity, gas and fuel use were calculated using population data extracted from the Population & Housing chapter and the U.S. Census Bureau including the following reports: 1990 and 2000 Census Data, Time Series of Intercensal Estimates by County, 1990 to 2000, and Annual Estimates of the Population for Counties of California: April 1, 2000 to July 1, 2004.

Data for electricity, natural gas, and fuel consumption was provided in units of kilowatt hours (kWh), therms, and gallons of gasoline, respectively. This information was converted to British thermal units (Btu) and barrel of oil equivalent (BOE) using the following standard conversion factors.

1 kWh = 3,414.37 Btus or 0.0005907 BOEs

1 therm = 100,000 Btus or 0.017301 BOEs

1 gallon of gasoline = 124,000 Btus or 0.02145 BOEs

BOE conversions are based on the weight of a barrel of oil being 0.136 tons making 1 BOE equal to 5,396,745 Btus.

Photovoltaic Energy Collection at Winery

COUNTYWIDE ENERGY CONSIDERATIONS

ELECTRICITY PRODUCTION, CONSUMPTION, AND TRANSMISSION

ELECTRICITY PRODUCTION

In Napa County, PG&E is the main utility providing energy for all sectors including residential, commercial, industrial, mining, agriculture, transportation, communication and utilities (TCU). Within the County, there are five energy-producing facilities with a capacity of 0.1 MW or more, including two oil/gas facilities, one hydroelectric facility, and one landfill gas facility (California Energy Commission 2004). In addition, there is an anaerobic digester (methane) facility located at the Souscol Water Recycling Facility. Information on these facilities is provided in Table 5-1. These six facilities have a combined capacity of 20.06 MW.

Napa Sanitation District's energy generation from their wastewater treatment plant creates up to 3200 kWh/day of electricity using a gas engine generator. This co-generation system supplies enough energy to meet the requirements of 192 homes and reduces costs for Napa sewer use ratepayers (Napa Sanitation District 2004).

Table 5-1: Napa County Energy Producing Facilities

	Monticello Dam	American Canyon Powerplant	Napa State Hospital	Pacific Union College (Angwin)	Yountville COGEN	Souscol Water Recycling Facility
Facility Type	Hydroelectric	Waste To Energy	Oil/Gas	Oil/Gas	Oil/Gas	Waste to Energy
Primary Fuel	Hydro	Landfill Gas	Natural Gas	Natural Gas	Natural Gas	Methane
Capacity (MW)	11.9	1.76	1.6	1.38	3.0	0.415
Year Online	1983	1985	1984	2005	1986	2001
Owner	Solano Irrigation District	Gas Recovery Systems, Inc.	Napa State Hospital	Pacific Union College	Yountville Cogen Association	Napa Sanitation District

Source: CEC 2004, pers. comm., S. Maglione 2005

The County is also home to a growing number of smaller electricity generating units owned privately by residents and businesses. Vineyards and wineries in particular often use solar or wind powered generation to meet their energy demands. A number of wineries meet either part or all of their energy demand through solar power (photovoltaic) generation, including Domaine Carneros, Dutch Henry Winery, Frog's Leap, Green & Red Vineyard, Long Meadow Ranch, Robert Sinskey Winery, and Shafer Vineyards. The Domain Carneros winery, for example, currently utilizes a solar powered unit delivering 100 kW of energy on a typical sunny day and has plans to enlarge their system by 76 kW for a total generation capacity of almost 200 kW (Napa Valley Register 2003, M.Culligan pers. comm. 2005).

Residential or small scale solar power units generally produce between 5 and 20 kW. There are currently 119 small scale (less than 30 kW) solar power facilities approved within Napa County. Of these, 83 have been built and have a total capacity of 462.6 kW, while the remaining 36 approved but yet unbuilt facilities have a projected capacity of 323.0 kW. Small scale photovoltaic facilities will provide the County with a total capacity of 785.6 kW of power (California Energy Commission 2005a, 2005b).

PG&E estimates that the current capacity of solar generation within the County is 1,867 kW or 1.8 MW. This represents less than 1% of the peak electrical demand in 2004 (S.Birmingham pers. comm. 2005). However, a number of systems are in the planning or permitting phase of development that will dramatically increase solar production within the County. For instance, the City of Napa has plans to install over an acre of solar panels, with a peak production capacity of 365 kW, at the base of Conn Dam. This system will support operations at the Hennessey Pump Station. In addition, Napa Valley College plans to install a 1,188 kW solar generation system (M. Culligan pers comm. 2005). These systems combined with the Domain Carneros winery upgrades will almost double the solar energy production in the County.

ELECTRICITY CONSUMPTION

Annual and peak demand electricity use numbers for the entire County were obtained from the CEC for the period 1990 through 2003 (see Tables 5-2 and 5-3). Peak demand values represent peak summer demand, which is generally higher than peak winter demand. Peak winter demand figures were not available.

Residential energy consumption peaked in 2000, at 207.6 thousand BOEs, and again in 2003, at 224.9 thousand BOEs. At these times the relative contributions of the residential sector to total Countywide electricity consumption were 38% and 43%, respectively. However, in 1990, residential consumption accounted for 46% of the total. These numbers indicate that increases in electricity consumption by the residential sector have not kept pace with increases by other sectors. In fact per capita residential electricity use has actually dropped over the 13 year period in question from 3.43 BOEs to 2.95 BOEs or by nearly 14% (i.e., by approximately 1%/year).

Between 1990 and 2003, the contribution to total Countywide electricity consumption from the commercial sector has remained relatively constant, ranging between 31% and 33%. Commercial electricity consumption also peaked in 2000 at 171.5 thousand BOEs. This was a 41% increase from the 1990 value of 121.3 thousand BOEs. However, in 1990, commercial consumption accounted for 33% of the total while in 2000, it accounted for slightly less at 31%. Since 2000, commercial energy consumption has remained relatively constant, accounting for 32% (165.8 thousand BOE) of the total Countywide consumption in 2003.

Over the entire period from 1990 to 2003, the relative contribution from the industrial sector to Countywide electricity consumption has remained between 15% and 17%. Industrial electricity consumption peaked in 1999 at 89.5 thousand BOEs, up 68% from the 1990 value of 53.4 thousand BOEs. Since 1999, electricity consumption from the industrial sector has decreased from 89.5 to 83.5 thousand BOEs (i.e., 16% of total deliveries).

In 1990, electricity consumption by mining operations accounted for 0.5% of the total energy delivered to the County. Seven years later, in 1997, mining, primarily the McLaughlin Gold Mine, accounted for over 9% of total consumption in the County. During this period, electricity consumption by mining increased from 1.8 to 45.1 thousand BOE, an increase of over 2,400%. Since 1997, electricity consumption by the mining sector has gradually returned to its previous low levels as the McLaughlin Mine closure proceeded. In 2003, consumption of electricity by mining only accounted for 0.3% (1.8 thousand BOE) of the total energy consumed.

In 1990, the TCU sector accounted for 2.5% of total electricity consumption in the County while in 2000, it accounted for 4.5%. Between 1990 and 2000, electricity consumption by the TCU sector increased steadily from 9.8 to 24.5 thousand BOE (53.1 to 141.9 billion Btu), an increase of 150%. Since 2000, TCU consumption has leveled off, accounting for 4.8% (24.4 thousand BOE or 141.2 billion Btu) of the total in 2003.

Table 5-2: Annual Electricity Deliveries in Napa County by Sector

Year	Residential	Commercial	TCU*	Industrial	Mining	Ag and Water Pumping	Total	Total per Capita
	Thousand BOEs							BOE
1990	171.7	121.3	9.2	53.4	1.8	8.1	365.4	3.3
1991	172.0	122.8	9.2	61.1	1.5	7.9	374.6	3.3
1992	177.3	131.3	9.7	65.3	1.4	9.3	394.4	3.4
1993	181.6	130.2	10.9	61.0	1.3	8.7	393.7	3.4
1994	176.1	128.1	13.0	63.4	1.3	9.1	391.1	3.4
1995	181.7	132.1	13.2	71.1	1.3	9.1	408.5	3.5
1996	186.9	136.8	15.0	74.5	42.7	9.8	465.7	3.9
1997	191.6	152.1	16.2	72.6	45.1	11.5	489.0	4.1
1998	197.4	160.2	16.4	80.8	43.0	10.1	508.0	4.2
1999	203.9	166.3	20.5	89.5	43.7	11.2	535.2	4.4
2000	207.6	171.5	24.5	87.3	38.9	10.8	540.8	4.4
2001	193.3	168.9	24.7	85.0	14.5	12.6	499.0	3.9
2002	199.9	164.5	24.3	83.5	3.9	12.2	488.3	3.8
2003	224.9	165.8	24.4	83.5	1.8	12.1	512.5	3.9

*Transportation, communication and utilities

Electrical Substation

Table 5-3: Electricity Peak Demand in Napa County by Sector

Year	Residential	Commercial	TCU*	Industrial	Mining	Ag and Water Pumping	Total
California Utility Energy Deliveries in Napa County							
Coincident Peak to PG&E System (BOE)							
1990	42.5	22.8	1.1	8.2	0.2	1.5	76.3
1991	42.6	23.1	1.1	9.4	0.2	1.5	77.8
1992	43.9	24.7	1.2	10.0	0.2	1.7	81.7
1993	44.9	24.5	1.3	9.4	0.2	1.6	81.9
1994	43.6	24.1	1.6	9.7	0.2	1.7	80.8
1995	45.0	24.9	1.6	10.9	0.2	1.7	84.2
1996	46.2	25.7	1.8	11.4	5.2	1.8	92.3
1997	47.4	28.6	1.9	11.1	5.5	2.2	96.8
1998	48.9	30.1	2.0	12.4	5.3	1.9	100.5
1999	50.5	31.3	2.5	13.7	5.4	2.1	105.4
2000	51.4	32.2	2.9	13.4	4.8	2.0	106.8
2001	47.8	31.8	3.0	13.0	1.8	2.4	99.8
2002	49.5	30.9	2.9	12.8	0.5	2.3	98.9
2003	55.7	31.2	2.9	12.8	0.2	2.3	105.1

*Transportation, communication and utilities

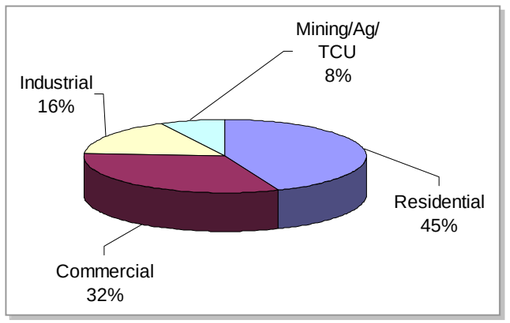

Figure 5-1: Countywide Electricity Consumption (2003) per sector

The total contribution from the agriculture and water-pumping sector has remained small and has accounted for approximately 2.5% of the total Countywide electricity consumption over the last 13 years. Agriculture and water pumping electricity consumption peaked in 2001 at 12.6 thousand BOEs, up 55% from the 1990 value of 8.1 thousand BOEs. Since 1999, electricity consumption from the agriculture and water-pumping sector has not decreased significantly, with 12.1 thousand BOEs consumed in 2003 or 2.4% of the total electricity delivered to the County.

When two or more sectors or customer groups place demand on the electricity transmission system at the same time, it is referred to as a coincident peak. Coincident peak demand is the energy demand by a group or sector during periods of peak system demand. Loosely speaking, it refers to demand among a group of customers that coincides with the peak total demand on the system.

Peak demand was highest in 2000 at 106.8 BOE, then slightly decreased to 98.9 BOE in 2002, and rebounded slightly in 2003 to 105.1 BOE. The total peak demand in 2003 (105.1 BOE) is 28.8 BOE higher than 1990 peak demand value of 76.3 BOE, which is an increase of 38%, or 2.5% per year on average. The greatest contribution to peak demand is from the residential sector, which has accounted for between 48% and 56% of the total peak demand over the 1990–2003 period. The commercial sector contributes the second largest portion, between 28% and 32% over the same period. The remaining sectors make relatively smaller contributions as follows: industrial (11–13%), mining (0–6%), TCU (1–3%), and agriculture and water pumping (2%).

Napa County's per capita contribution to coincident peak demand in 2003 was 7.98 BOEs/10,000 people, 16% less than the per capita demand in 1990. This constitutes a just under 1.1% annual average decrease in peak per capita electricity usage.

ELECTRICITY TRANSMISSION[1]

There are three major electrical transmission routes that cross the County from east to west. Two 110–161 kilovolt (kV) lines and two 220–287 kV lines are aligned along the first route, which is along the southern border of the County, passing just north of Mare Island, and through the City of American Canyon. Slightly more north, two 220–287 kV lines cross the County just south of the City of Napa. Two 110–161 kV lines pass from west to east through the City of St. Helena, skirting the northern edge of Lake Hennessey, across the southern portion of Lake Berryessa on their way to Putah Creek in Yolo County. In addition, a 110–161 kV line enters from Sonoma County in the west, adjacent to the City of Napa, then runs northwest from the City of Napa to the City of St. Helena, where it turns westward, returning to Sonoma County. A smaller 60–92 kV line continues northward from the City of St. Helena through the City of Calistoga, and onwards to Lake County.

There are nine electrical substations in the County owned by PG&E. These are, from south to north, the Highway, Tulucay, Basalt, Napa, Pueblo, Silverado, St. Helena, Monticello, and Calistoga Substations. In addition, there are two substations owned by other utilities. These are the Cordelia Interm Pumps, and the Homestake Substations. A 220-287 kV transmission line runs northwest from the Homestake Substation, located at the northern tip of the County.

Electrical Transmission Lines

The normal transmission capacity for Napa County is estimated at 390 mega volt-amps (MVA). For the worst contingency (emergency) condition, it is estimated that the transmission capacity could be reduced to 270 MVA. "Worst contingency" is defined as the contingency that decreases the load serving capacity. Based on the projected demand for Napa County, the latest ISO-approved Grid Expansion Plan for PG&E's service territory, which identifies transmission projects needed over the next five years, does not require construction of any additional transmission projects to increase existing transmission capacity in Napa County. There is a transmission capacity need beyond the next five years, years 2011 to 2015. Additional transmission capacity will be needed at Tulucay Substation by Year 2015 (Tulucay 230/60 kV Transfomer Project) to mitigate a projected capacity deficiency.

The existing transmission lines have sufficient normal capacity to serve Napa County's current and projected demand for the next five years. Under emergency conditions, an outage of the existing Tulucay 230/60 kV transformer would result in customer interruptions (99 MW), since the Tulucay area is a radial system served from a single transformer[2]. In addition, this contingency is considered the worst contingency that decreases load serving transmission capacity for Napa County.

For the Napa County transmission system, PG&E is moving forward with two transmission projects: Tulucay 230/60 kV Transformer Project and Pueblo Voltage Support Project.

- Tulucay 230/60 kV Transformer Project:

  By year 2015, additional transmission capacity is needed on the existing Tulucay 230/60 kV transformer for normal conditions. PG&E is advancing this project for the year 2007 to take advantage of increasing station reliability by installing a redundant Tulucay 230/60 kV transformer to improve reliability by not interrupting customers in a radial system for a transformer outage[2].

- Pueblo Voltage Support Project:

  By July 2005, PG&E is moving forward to install an 8 MVAr voltage device at Pueblo Substation. Currently, Pueblo's existing transmission capacity and voltage levels are adequate to serve the existing and projected demand. However, installing this voltage device will further increase transmission capacity and improve voltages at Pueblo Substation for emergency conditions. This increase in capacity and improvement in voltages will provide additional flexibility and margin in operating the Napa County transmission system.

ELECTRICITY PRODUCTION VERSUS CONSUMPTION

Napa County consumes more energy than it generates. Within the County, there are five energy-producing facilities with a capacity of 0.1 MW or more, one cogeneration facility with a 412 kW capacity, and a number of solar power (photovoltaic) facilities with 1.867 MW of capacity. In total, these facilities

[1] Per CEC and PG&E confidentiality requirements, the maps associated with this chapter are not presented, however, the information is in Napa County's GIS system.

[2] According to ISO planning criteria, customer interruptions in a radial system is allowed.

have a combined capacity of 21.92 MW. PG&E calculated a peak demand of 235 MW in 2004 within Napa County. This leaves a 212.87 MW net shortfall between production capacity and peak demand. While there are additional small energy generation facilities throughout the County, their contribution is not considered significant enough to bridge the gap between generation capacity and demand.

NATURAL GAS PRODUCTION, CONSUMPTION, AND TRANSMISSION

NATURAL GAS PRODUCTION

There are no natural gas wells in the County (California Energy Commission 2004).

NATURAL GAS CONSUMPTION

Total annual natural gas consumption data for the entire County were obtained from the CEC for the past 13 years (see Table 5-4). Over this period, overall natural gas consumption has both increased and decreased by as much as 25%. However in 2003, natural gas consumption was nearly the same (within 1% or 5.3 thousand BOEs) as it was in 1990. Peak demand values for natural gas are not available.

Table 5-4: Annual Natural Gas Consumption for Napa County

California Utility Energy Deliveries in Napa County								
Year	Residential	Commercial	TCU*	Industrial	Mining	Ag and Water Pumping	Total	Total per Capita
Natural Gas (thousand BOE)								BOE
1990	397.90	209.42	0.91	57.18	0.77	2.61	668.79	6.04
1991	411.68	197.23	0.90	75.46	0.64	2.75	688.67	6.14
1992	403.29	152.43	0.89	64.32	0.36	2.20	623.48	5.45
1993	434.07	158.29	0.95	49.50	0.35	2.13	645.30	5.61
1994	428.31	159.55	1.26	56.34	0.38	1.16	647.01	5.57
1995	369.36	146.69	1.10	46.10	0.29	1.03	564.57	4.84
1996	368.18	155.30	1.13	50.59	0.25	1.16	576.60	4.89
1997	369.66	162.16	1.34	50.89	0.48	1.69	586.23	4.89
1998	432.52	179.07	1.36	79.15	0.55	2.00	694.64	5.71
1999	451.95	193.35	1.28	93.87	0.55	2.28	743.28	6.04
2000	408.26	200.13	1.48	79.01	0.99	1.89	691.77	5.57
2001	366.90	178.82	1.89	86.90	0.19	1.66	636.36	4.98
2002	384.08	178.57	2.20	80.80	0.37	1.86	647.88	4.98
2003	388.21	185.77	2.11	85.58	0.30	1.67	663.65	5.04

During the period 1990 to 2003, annual energy consumption as natural gas has been consistently higher than annual energy consumption as electricity. Over that time however, electricity demand has grown while natural gas demand has remained relatively constant, such that the difference between energy consumption as electricity and energy consumption as natural gas has narrowed. In 1990, around 70% more energy was consumed as natural gas than as electricity, with electricity and natural gas consumption at 391 and 668 thousand BOE, respectively. By 1995, that number had decreased to about 29%, with electricity consumption having increased to 437 thousand BOE and natural gas consumption having decreased to 564 thousand BOE. In 2003, energy use as natural gas was only 21% greater than energy use as electricity with electricity and natural gas use at 548 and 663 thousand BOE respectively.

The residential sector is by far the largest consumer of natural gas in Napa County, having accounted for between 57.7% and 67.3% of Countywide annual consumption over the period 1990–2003. Comparatively, electricity consumption by residents has accounted for between 38.1% and 47.0% of total annual consumption. In 2003, the residential sector consumed 388.21 thousand BOE, or 58.5% of total natural gas consumption. However, natural gas consumption by residents has not kept pace with the growing population. In fact, total annual consumption by the residential sector in 1990 (397.9 thousand BOE) was greater than in 2003 (388.21 thousand BOE) despite population growth of over 18%. Residential per capita gas use has dropped over this same period from 3.6 BOEs to 2.95 BOEs or by nearly 17% (i.e., by approximately 1.2% per year).

The commercial sector is the second largest consumer of natural gas in the County, accounting for between 24.5% and 31.3% of total annual Countywide consumption over the years 1990–2003. In 2003, the commercial sector consumed 185.77 thousand BOE or 28% of total natural gas consumption.

The industrial sector has accounted for between 8% and 14% of total annual natural gas consumption. In 2003, the industrial sector consumed 85.58 thousand BOE or 13% of total natural gas consumption. The gradual decrease in the overall consumption of the residential sector has been largely compensated for by this increase in the overall consumption of the industrial sector. The TCU, mining, and agriculture sectors combined account for less than 1% of total annual natural gas consumption in the County.

Total Countywide natural gas consumption peaked in 1999 at 743.28 thousand BOE, 12% higher than the total consumption in 2003. The majority of this decrease can be attributed to reduced residential consumption. Commercial and industrial natural gas consumption also decreased by small amounts over this period.

Based on population figures released by the U.S. Census Bureau, the population of the County as of July 1, 2003 was approximately 131,751 people (U.S. Census Bureau 2005). Overall per capita natural gas consumption in 2003 was 5.04 BOEs.

PG&E designs gas facilities to insure reliable gas service to core customers on an abnormal peak day (APD). The APD is expected to occur once every 90 years on average and this equates to a 29.8 degrees F average daily temperature in Napa County. The expected APD gas daily demand for Napa County in 2004 was 36,890 Mcf (378,860.3 therms) with a 2,190 thousand cubic feet per hour (Mcfh) peak hour demand.

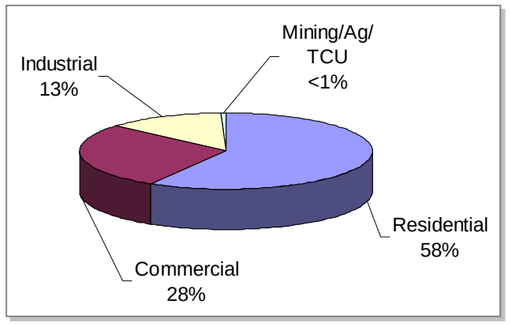

Figure 5-2: Countywide Natural Gas Consumption (2003) per sector

Natural Gas Meter

NATURAL GAS TRANSMISSION[3]

The primary large natural gas transmission pipelines in the County are located in the southern and western areas of the County. Two 12-inch diameter natural gas pipelines run northwest through Napa Valley, providing the bulk of natural gas needs to the Cities of Napa, Yountville, St. Helena, and Calistoga (California Energy Commission 2004). The 12-inch pipelines are connected to larger pipelines, up to 32 inches, which cross from east to west through the County in the Carneros, Napa River Marshes, and Jamieson/American Canyon Areas. The Napa metering station is located at the convergence point of these large pipelines and the 12-inch pipeline running northwest through Napa Valley. The locations of smaller pipelines providing natural gas to other areas of the County were not available through the CEC or PG&E.

PG&E has determined that there are no foreseen gas transmission capacity constraints in Napa County within the next 5 years. This is based on straight lining historical growth rates. The last gas transmission upgrade in Napa County was performed in 2004 in the St Helena/Calistoga/Angwin area. No upgrades are planned to the Napa County gas transmission system in the next 5 years.

VEHICLE ENERGY CONSUMPTION

Gas Station

Since 1990, per capita energy use in Napa County has increased nearly 18%.

Annual gasoline (Table 5-5) and diesel (Table 5-6) consumption in the County for 1993 through 2003 are specified below. Vehicle energy consumption is based on data from Caltrans' Office of Travel Forecasting and Analysis, and is reported here in millions of gallons. Statewide total on-road fuel consumption represents gasoline and diesel fuel used on all public roads. Methods for 2005 forecasts can be found in the California Motor Vehicle Stock, Travel and Fuel Forecast published in November 2004.

Table 5-5: Vehicle Fuel Consumption (Gasoline) - Napa County in gallons

Year	Gasoline (millions gallons)	Per capita (gallons)
1993	48.77	423.92
1994	49.18	423.68
1995	48.15	412.64
1996	49.38	418.51
1997	50.97	425.41
1998	52.94	435.39
1999	55.79	453.47
2000	57.37	461.65
2001	58.90	461.09
2002	60.57	465.93
2003	61.94	470.09

Sources: U.S. Census 2002, Caltrans 2005, U.S. Census 2005

[3] Per CEC and PG&E confidentiality requirements, the maps associated with this chapter are not presented, however, the information is in Napa County's GIS system.

Table 5-6: Vehicle Fuel Consumption (Diesel) - Napa County in gallons

Year	Diesel (millions gallons)	Per capita (gallons)
1997	2.81	23.41
1998	2.96	24.34
1999	3.46	28.08
2000	4.76	38.30
2001	4.68	36.65
2002	4.39	33.76
2003	4.21	31.98

Sources: Caltrans 1999, U.S. Census 2002, Caltrans 2004, U.S. Census 2005

Moreover, the annual per capita gasoline consumption for the County in 2000 (461.65 gallons per capita) was 9.2% (42.37 gallons) higher than the average for California (419.3 gallons per capita), but nearly equal to the national average of 461.1 (U.S. Department of Transportation 2002). Annual diesel fuel consumption at 38.3 gallons per capita for 2000 was well below the state's annual average of 77.73 gallons per capita.

CONCLUSIONS AND REPORT UPDATE RECOMMENDATIONS

ELECTRICITY PRODUCTION, CONSUMPTION, AND TRANSMISSION

Within Napa County, there are five energy-producing facilities with a capacity of 0.1 MW or more, including two oil/gas facilities, one hydroelectric facility, and one landfill gas facility (California Energy Commission 2004). The County is also home to a growing number of smaller electricity generating units owned privately by residents and businesses. Napa County produces approximately 22 MW.

Several electricity consumption trends are evident over the period from 1990 to 2003. Total energy deliveries peaked in 2000 at 540.8 thousand BOE. This represents a 48% increase from 1990 values. Between 2000 and 2002, total deliveries dropped by nearly 10% to 488.3 thousand BOE, but increased again in 2003 by nearly 5% to 512.5 thousand BOE. This constitutes a 40% increase in electricity "usage" in the County over this 13-year period, which translates into an average annual increase of approximately 2.6%.

Perhaps more revealing of actual electricity usage trends is per capita electricity consumption data (see Table 5-2). Per capita electricity consumption in 2000, when total deliveries reached their peak, was 4.4 BOEs. This was 32% higher than the 1990 per capita electricity consumption levels. While total

deliveries increased by 48%, the County's population increased by 12.2% (from 110,765 in 1990 to 124,279 people in 2000). In 2003 overall per capita energy use was 3.9 BOEs. Over the entire 13 year period, per capita energy use has increased nearly 18% or approximately 1.2%/year on average.

The major cause of this disproportional increase between residential electricity consumption and total electricity consumption was electricity consumption by sectors other than residential. In particular, the County experienced a large increase in consumption by mining. The dramatic increase in electricity use by the mining sector peaked in 1997 and returned to its previous levels by 2003.

NATURAL GAS PRODUCTION, CONSUMPTION, AND TRANSMISSION

While Napa County has no natural gas production, it consumed 663.65 thousand BOEs (5.04 BOEs per capita) of natural gas in 2003. From 1990 to 2003 the overall natural gas consumption fluctuated by as much as 25%. However, in 2003 natural gas consumption was nearly equal to 1990 levels. The residential sector is by far the largest consumer of natural gas followed by the commercial sector. One of the more striking trends in natural gas consumption is within the residential sector. Residential sector consumption has not kept pace with the growing population as residential per capita gas use dropped from 1990 to 2003 by nearly 17%. So while population increased by 18%, natural gas consumption has dropped by approximately 1.2% per year. There are no foreseen gas transmission capacity constraints in Napa County within the next 5 years.

VEHICLE ENERGY CONSUMPTION

The annual per capita gasoline consumption for the County in 2000 (461.65 gallons per capita) was 9.2% (42.37 gallons) higher than the average for California (419.3 gallons per capita), but nearly equal to the national average of 461.1 (U.S. Department of Transportation 2002). Annual diesel fuel consumption at 38.3 gallons per capita for 2000 was well below the state's annual average of 77.73 gallons per capita.

REPORT UPDATE AND RECOMMENDATIONS

- Energy-producing resources and energy conservation opportunities should be tracked by inventorying: resources, including wind, solar, hydroelectric, and biomass; energy conservation opportunities, including transportation economies, urban design (i.e., land use patterns), and residential, commercial, and industrial conservation programs.

- Coordination with PG&E to plan transmission/delivery needs in the future should be considered. It is recommended that a relationship with a high-ranking PG&E staff member be established in order to facilitate this coordination and future communications. The County should coordinate with PG&E and the CEC when planning electricity and natural gas demand and transmission lines in the future.

- The County should consider expanding their existing GIS information regarding energy resources by digitizing existing substations or power facilities and any new transmissions lines as they are built.

REFERENCES

Association of Bay Area Government (ABAG), 2005a. U.S. Census Data 1990. Retrieved from http://www.abag.ca.gov/

Association of Bay Area Government (ABAG), 2005b. U.S. Census Data 2000. Retrieved from http://census.abag.ca.gov/

California Department of Transportation (Caltrans), 1999. Estimates of Highway Gasoline Use 1993 to 1998 by County. Office of Transportation Economics. October 1999.

California Department of Transportation (Caltrans), 2002. Estimates of Highway Gasoline Use by County. Office of Transportation Economics, Transportation Planning Program. November 2002.

California Department of Transportation (Caltrans), 2004. California Motor Vehicle Stock, Travel and Fuel Forecast, November 2004. (Office of Travel Forecasting and Analysis, Modeling and Travel Analysis Branch.)

California Department of Transportation (Caltrans), 2005. Estimates of Diesel Fuel Use by County. Office of Transportation Economics, Division of Transportation Planning. June 2005.

California Energy Commission (CEC), 2004. California Power Plants Database. July 2004. Available online at: http://www.energy.ca.gov/database/index.html#powerplants

California Energy Commission (CEC), 2005a. Data Showing Approved and Completed Systems up to December 31, 2003. Updated: June 6, 2005. Available online at: http://www.energy.ca.gov/renewables/emerging_renewables.html

California Energy Commission (CEC), 2005b. Data Showing Approved and Completed Systems Since January 1, 2004. Updated: July 1, 2005. Available online at: http://www.energy.ca.gov/renewables/emerging_renewables.html

Napa Sanitation District (NSD), 2004. Available online at: http://www.napasanitationdistrict.com. June 2004.

Napa Valley Register, 2003. Domaine Carneros solar system to help save environment -- and money. Article by Paul Franson.

U.S. Census Bureau, 2002. Time Series of Intercensal Estimates by County, 1990 to 2000 (CO-EST2001-12-06). April 17, 2002.

U.S. Census Bureau, 2005. Table 1: Annual Estimates of the Population for Counties of California: April 1, 2000 to July 1, 2004 (CO-EST2003-01-06). Population Division. June 2005.

U.S. Department of Transportation (U.S. DOT), 2002. Federal Highway Administration, Highway Statistics.