4.6 ENERGY

4.6.1 INTRODUCTION

Energy reliability and supply are an ongoing concern in California. Energy consumption related to construction includes the energy used by construction equipment and other activities at the worksite, the energy used to manufacture equipment, materials, and supplies and transport them to the worksite. Energy for the operation of transportation systems consists of resources consumed by vehicles transporting people or goods, propulsion energy, and energy used to operate facilities.

Energy consumed in the operation and maintenance of transportation systems is referred to as the long-term operating energy requirement and energy consumed in construction is referred to as the indirect construction energy requirement. Over the life of a transportation project, long-term operating energy consumption is usually the largest component of total system energy use. From an energy conservation standpoint, long-term operating adverse energy effects are of more importance than indirect construction adverse energy effects. For these reasons, the energy analysis focuses on the long-term energy requirements of the project alternatives. It compares transportation system energy use with and without the alternatives.

4.6.2 ENERGY USE

Various forms of energy are used in vehicle propulsion and the operation of transportation facilities. Automobiles and trucks would continue to operate within the transportation system in 2030 and use a variety of energy forms, from gasoline to diesel to electricity to hydrogen, or a combination of these or other forms. Transit buses and trains would continue to provide service and consume similar forms of energy. The environmental assessment considered the supply and demand for three types: electricity, natural gas, and other petroleum-based fuels such as gasoline and diesel fuel.

Existing State Electricity Generation and Demand

In 2006, California energy sources included natural gas (41.5 percent); nuclear sources (12.9 percent); coal (15.7 percent); large hydroelectric resources (19 percent); and renewable resources including wind, solar, and geothermal (10.9 percent). Electricity imports in 2006 were 21.9 percent of total production. Imports from the Pacific Northwest and the southwest accounted for 6.7 percent and 15.2 percent respectively (California Energy Commission, 2007(a)).

Pacific Gas & Electric Company (PG&E) is the largest publicly owned utility in California and is the electricity and natural gas provider for residential, industrial, and agency consumers within the SVRT corridor. PG&E buys power from a diverse mix of

generating sources, including fossil-fueled plants, hydroelectric powerhouses, wind farms, solar facilities and nuclear power plants. In addition to electrical power purchased from PG&E, BART purchases power directly from the Bonneville Power Administration (BPA), which is a federal agency headquartered in Portland, Oregon that markets power to large portions of the Northwest in addition to California. The majority of the power sold by BPA is hydroelectrically generated.

According to the California Energy Commission (CEC), total statewide electricity consumption grew from 166,979 gigawatt-hours (GWh) in 1980 to 228,038 GWh in 1990, at an estimated annual growth rate of 3.2 percent.[1] The 1990s saw a slowdown in demand growth because of the recession that lasted through the early and middle parts of the decade. The statewide electricity consumption in 2000 was 265,769 GWh, reflecting an annual growth rate of 1.46 percent between 1990 and 2000 (CEC, 2007a). CEC staff statewide energy forecast for 2008 is 288,967 GWh (CEC, 2007b).

Peak electricity demand, expressed in megawatts (MW), measures the largest electric power requirement during a specified period, usually integrated over one hour. A single MW is enough power to meet the expected electricity needs of 1,000 typical California homes (CEC, 2003b). Peak demand is important in evaluating system reliability, determining congestion points on the electrical grid, and identifying potential areas where additional transmission, distribution, and generation facilities may be needed. California's peak demand typically occurs in August between 3:00 p.m. and 5:00 p.m. High temperatures lead to increased use of air conditioning, which in combination with industrial loads, commercial lighting, and office equipment comprise the major demand for electricity consumption in the peak demand period in the state (CEC, 2000). In 2008, peak electricity demand for California is predicted to be about 288,967 GW, while the peak demand is projected at 320,178 MW in 2016. The California Independent State Operator (Cal ISO) controls the electrical grid that distributes about 82 percent of the electricity consumed in the state with the remainder being distributed by municipal utilities.

Electricity Generation and Demand Outlook

Studies have been conducted by the CEC to predict the short- and long-term outlooks for electricity supply and demand balance in California. According to its 2003 staff report titled, *California's Electricity Supply and Demand Balance over the Next Five Years*, the CEC believes that the near-term outlook for supply adequacy is promising. In the Cal ISO-controlled grid where supply is expected to outpace demand by approximately 6,000 MW, which includes an operating reserve of 5,707 MW, (CEC, 2003c), a 16 percent operating margin[2] was estimated for summer 2003 assuming a 1-

[1] Electric energy is measured in watts (W): 1,000 watts is a kilowatt (kW); 1,000 kilowatts is a megawatt (MW); 1,000 megawatts is a gigawatt (GW). Electric consumption over time is measured in kilowatt-hours (kWh), megawatt-hours (MWh), and gigawatt-hours (GWh).

[2] Operating Margin is the percentage by which demand outpaces supply; includes a 7 percent operating reserve in the calculation (CEC, 2003b).

in-2 year peak temperature condition. According to CEC staff, a statewide planning reserve margin of 8.8 percent is projected as far out as August 2008 when statewide supply capacity is anticipated to be 64,669 MW, outpacing a statewide projected demand of 59,459 MW (CEC, 2003c). The statewide planning reserve margin differs from the operating margin by not including the 7 percent operating reserve in the calculation, and does not account for forced outages nor includes spot market purchases. It is used in extended planning horizons (CEC, 2003a). The apparent decline in margins between the summers of 2003 and 2008 stems from the fact that the planning horizon for electric power resource additions is usually only two to three years out and does not necessarily indicate a downward trend in generating capacity. Demand projection assumes a normal summer. A hot summer increases projected demand to 62,914 MW, which corresponds to a 3 percent planning reserve margin.

This short planning horizon interjects uncertainty into the assessment of supply and reserve margin in 2030, the study year for the BEP and SVRTP alternatives. However, the state has added substantial generating capacity in the last 5 years and it is reasonable to assume it will continue to add capacity. Between 2000 and February 2003, California licensed and added 18 new power plants, which have contributed 4,980 MW to the statewide generating capacity. Power plants representing an additional 3,106 MW of generating capacity were anticipated to come online between February 2003 and August 2003 (CEC, 2003d). Statewide demand in 2012 would most likely be around 64,845 MW, assuming normal summer temperatures (CEC, 2002b). Using the growth trend that fits CEC demand predictions through 2018, published in the *2008–2018 Electricity Outlook*, demand for electricity in 2030 can be estimated to be on the order of 330,000 GW.[3] The Cal ISO estimates that net additions of domestic electricity generation capacity and electricity imports of 1,000 to 1,500 MW/year will be necessary to maintain current operating margins (Cal ISO, 2002b).

Transmission Outlook

Transmission capacity refers to the maximum amount of power that can be carried from the generating source to the utility provider and is a key component in the electrical power delivery system. In the years since the start of the electricity crisis, the transmission capabilities of some portions of the state's electrical grid have occasionally been inadequate to transmit electricity at a rate that satisfies the quantities of electricity demanded. This phenomenon is known as a transmission bottleneck. An example of one such bottleneck occurs through what is known as Path 15, a major transmission line between Northern and Southern California. As an example, the widely publicized bottleneck in northern California is known as Path 15. According to the Western Area Power Administration (WAPA), PG&E increased the rating of Path 15 from 3,900 MW to

[3] Calculation based on CEC demand projections from 2002 to 2012 for normal temperature years, published in *2002 – 2012 Electricity Outlook* (California Energy Commission, 2002b). Projection to 2030 assumes an average annual growth rate of about 2.0 percent with a range from between 1.5 percent and 3.9 percent. This projection is for comparison purposes only.

5,400 MW in 2004. Many transmission links are currently being upgraded, and new routes are being constructed to increase reliability throughout the state.

Natural Gas

PG&E is the main gas utility in the SVRT corridor. PG&E is not a producer of natural gas but purchases natural gas from various suppliers and distributes gas to residential and commercial/industrial users through its local network. About 67 percent of PG&E's natural gas supplies come from Canada and 10 percent from California (PG&E Corp, Annual Report, various years). The major natural gas inter- and intrastate pipelines that deliver natural gas to PG&E are controlled by relatively few pipeline companies, but access to their pipelines is afforded to all qualifying suppliers.

The State of California has become less of a source of natural gas supply, as its available resources are depleted. Throughout North America and elsewhere, however, natural gas reserves are considered plentiful and adequate to sustain production for many years. According to the U.S. Department of Energy, Energy Information Administration, U.S. proven reserves of wet natural gas were 164 trillion cubic feet in 1999, with technically recoverable reserves almost eight times this figure (U.S. Natural Gas Markets: Recent Trends and Prospects for the Future, May 2001, USDOE, Energy Information Administration). Annual natural gas production in the U.S. varies from 19 to 22 trillion cubic feet. In addition to U.S. reserves, there are substantial reserves in Canada.

Other Petroleum-Based Fuels

Despite short-term volatility in gasoline and diesel fuel prices, the petroleum fuels market is competitive, with a number of potential suppliers and distributors. Supply over the next 15 to 20 years is not considered a critical problem. Distribution of fuel is by a number of methods, from pipelines to railroads to trucks. As oil reserves diminish, higher prices are likely to encourage shifts to alternative fuels. The risks in the mid-term are primarily in the production of oil, which can be disrupted by political events.

4.6.3 REGULATORY CONSIDERATIONS

Corporate Average Fuel Economy Standards

Corporate Average Fuel Economy (CAFE) standards are federal regulations that are set to reduce energy consumed by on-road motor vehicles. The standards specify minimum fuel consumption efficiency standards for new automobiles sold in the U.S. The current standard for passenger cars is 27.5 miles per gallon (mpg). The 1998 standard for light trucks was 20.7 mpg (Competitive Enterprise Institute, 1996). In 2007, the National Highway Traffic Safety Administration issued a final rule for CAFE standards for model-year 2011 light trucks that codified a standard of 24.0 mpg; this is now in effect (USDOT, 2002a).

Transportation Equity Act for the 21st Century

The Transportation Equity Act for the 21st Century, passed in 1998, is intended to protect and enhance communities and the natural environment as development occurs in the transportation sector. It builds on the initiatives established in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), which was the previous major authorizing legislation for surface transportation. The ISTEA identified planning factors for use by the Metropolitan Planning Organizations (MPOs), including MTC, in developing transportation plans and programs. Under the ISTEA, MPOs are required to "protect and enhance the environment, promote energy conservation, and improve quality of life" and are required to consider the consistency of transportation planning with federal, state, and local energy goals (USDOT, 2002b).

California Code of Regulations, Title 24, Part 6, Energy Efficiency Standards

Title 24, Part 6 of the California Code of Regulations (CCR), *Energy Efficiency Standards*, promotes efficient energy use in new buildings constructed in California. The standards regulate energy consumed for heating, cooling, ventilation, water heating, and lighting. The standards are enforced through the local building permit process.

AB 32—Global Warming Solutions Act of 2006

In response to concern related to the potential consequences of greenhouse gas emissions and climate change, the state of California has committed to reduce its global warming emissions to 2000 levels by 2010 (11 percent below business as usual), to 1990 levels by 2020 (25 percent below business as usual), and 80 percent below 1990 levels by 2050.

AB 32 codifies the state's goal by requiring that the state's global warming emissions be reduced to 1990 levels by 2020. This reduction will be accomplished through an enforceable statewide cap on global warming emissions that will be phased in starting in 2012. In order to effectively implement the cap, AB 32 directs the California Air Resources Board (CARB) to develop appropriate regulations and establish a mandatory reporting system to track and monitor global warming emissions levels.

Additionally, AB 32 requires that CARB use the following principles to implement the cap:

- Distribute benefits and costs equitably.
- Ensure that there are no direct, indirect, or cumulative increases in air pollution in local communities.
- Protect entities that have reduced their emissions through actions prior to this regulatory mandate.
- Allow for coordination with other states and countries to reduce emissions.

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