4.0 ENVIRONMENTAL IMPACT ANALYSIS

D. GREENHOUSE GAS EMISSIONS

INTRODUCTION

This section addresses greenhouse gas emissions associated with construction and operation of the proposed Glenarm Repowering Project and the potential for impacts on global climate change. The analysis also addresses project consistency with applicable federal, state, regional, and local plans and regulations.

Analysis in this section is based on the *Greenhouse Gas Impact Assessment Technical Report* prepared by PCR Services Corp. for the proposed project (May 2012) and provided in **Appendix D** of this Draft EIR. The City is seeking a permit to construct and operate a new combustion turbine, Unit GT-5, using one of two possible power-generating equipment configurations from different turbine manufacturers. As part of the Clean Air Act permitting process, the project is subject to New Source Review (NSR) and Prevention of Significant Deterioration (PSD) program requirements. Oversight of compliance with both programs has been delegated to the South Coast Air Quality Management District (SCAQMD). The analysis prepared for these permits is incorporated into this technical report and Draft EIR section.

1. ENVIRONMENTAL SETTING

a. Regulatory Framework

In an effort to stabilize greenhouse gas (GHG) emissions and reduce impacts associated with climate change, international agreements, as well as federal and state actions, were implemented beginning as early as 1988. The international, federal, state, regional, and local government agencies discussed below work jointly, as well as individually, to address GHG emissions through legislation, regulations, planning, policy-making, education, and a variety of programs.

(1) Federal Regulations

Kyoto Protocol and Copenhagen Accord

The United States participated in the United Nations Framework Convention on Climate Change (UNFCCC) (signed on March 21, 1994). The Kyoto Protocol is a treaty made under the UNFCCC and was the first international agreement to regulate GHG emissions. It has been estimated that if the commitments outlined in the Kyoto Protocol are met, global GHG emissions could be reduced by an estimated 5 percent from 1990 levels during the first commitment period of 2008–2012 (UNFCCC, 1997). It should be noted that although the United States is a signatory to the Kyoto Protocol, Congress has not ratified the Protocol and the United States is not bound by the Protocol's commitments.

In anticipation of providing an updated international treaty for the reduction of GHG emissions, representatives from 170 countries met in Copenhagen in December, 2009 to ratify an updated UNFCCC agreement (Copenhagen Accord). The Copenhagen Accord, a voluntary agreement between the United States, China, India, and Brazil, recognizes the need to keep global temperature rise to below 2°C and obliges signatories to establish measures to reduce greenhouse gas emissions and to prepare to provide help to

poorer countries in adapting to climate change. The countries met again in Cancun in December, 2010 and adopted the Cancun Agreements, which reinforces and builds upon the Copenhagen Accord. The nations agreed to recognize country targets, develop low-carbon development plans and strategies, and report inventories annually. In addition, agreements were made regarding financing for developing countries and technology support and coordination among all nations. Several conferences of the parties have taken place since Copenhagen; however, a successor to the Kyoto Protocol has yet to be established.

Climate Change Technology Program

The United States has opted for a voluntary and incentive-based approach toward emissions reductions in lieu of the Kyoto Protocol's mandatory framework. The Climate Change Technology Program (CCTP) is a multi-agency research and development coordination effort (which is led by the Secretaries of Energy and Commerce) that is charged with carrying out the President's National Climate Change Technology Initiative.

United States Environmental Protection Agency

The United States Environmental Protection Agency (USEPA) is responsible for implementing federal policy to address global climate change. The federal government administers a wide array of public-private partnerships to reduce GHG intensity generated by the United States. These programs focus on energy efficiency, renewable energy, methane and other non-CO₂ gases, agricultural practices, and implementation of technologies to achieve GHG reductions. The USEPA implements several voluntary programs that substantially contribute to the reduction of GHG emissions. Programs include: the State Climate and Energy Partner Network that allows for the exchange of information between federal and state agencies regarding climate and energy, the Climate Leaders program for companies, the Energy Star labeling system for energy-efficient products, and the Green Power Partnership for organizations interested in buying green power. All of these programs play a significant role in encouraging voluntary reductions from large corporations, consumers, industrial and commercial buildings, and many major industrial sectors.

In Massachusetts v. Environmental Protection Agency (Docket No. 05–1120), the U.S. Supreme Court held in April of 2007 that the USEPA has authority to regulate greenhouse gases, and the USEPA's reasons for not regulating this area did not fit the statutory requirements. As such, the U.S. Supreme Court ruled that the USEPA should be required to regulate CO_2 and other greenhouse gases as pollutants under Section 202(a)(1) of the federal Clean Air Act (CAA).

The USEPA issued a Final Rule for mandatory reporting of GHG emissions in October of 2009. This Final Rule applies to fossil fuel suppliers, industrial gas suppliers, direct GHG emitters, and manufactures of heavy-duty and off-road vehicles and vehicle engines, and requires annual reporting of emissions. The Final Rule was effective December 29, 2009, with data collection beginning January 1, 2010, and the first annual reports due in March, 2011. This rule does not regulate the emission of GHGs; it only requires the monitoring and reporting of greenhouse gas emissions for those sources above certain thresholds (USEPA, 2009). USEPA adopted a Final Endangerment Finding for the six defined GHGs on December 7, 2009. The Endangerment Finding is required before USEPA can regulate GHG emissions under Section 202(a)(1) of the CAA in fulfillment of the U.S. Supreme Court decision.

On May 13, 2010, the USEPA issued a Final Rule that establishes a common sense approach to addressing greenhouse gas emissions from stationary sources under the CAA permitting programs. In the first phase of

the Rule (January 2011-June 2011), only sources currently subject to the New Source Review Prevention of Significant Deterioration (PSD) permitting program (i.e., those that are newly-constructed or modified in a way that significantly increases emissions of a pollutant other than GHGs) are subject to permitting requirements for their GHG emissions under PSD. For these projects, only GHG increases of 75,000 tons per year (tpy) $\rm CO_2e$ or more need to determine the Best Available Control Technology (BACT) for their GHG emissions. This final rule sets a threshold of 75,000 tons per year for GHG emissions. Similarly for the operating permit program, only sources currently subject to the program are subject to Title V requirements for GHG. In the second phase of the rule (July 2011-June 2013) new construction projects that exceed a threshold of 100,000 tpy and modifications of existing facilities that increase emissions by at least 75,000 tpy will be subject to permitting requirements. Additionally, operating facilities that emit at least 100,000 tpy will be subject to Title V permitting requirements (USEPA, 2010). New and existing industrial facilities that meet or exceed that threshold will require a permit under the New Source Review Prevention of Significant Deterioration (PSD) and Title V Operating Permit programs. This rule took effect January 2, 2011.

(2) State Regulations

California Air Resources Board

The California Air Resources Board (CARB), a part of the California Environmental Protection Agency (CalEPA), is responsible for the coordination and administration of both federal and State air pollution control programs within California. In this capacity, CARB conducts research, sets State ambient air quality standards (California Ambient Air Quality Standards (CAAQS)), compiles emission inventories, develops suggested control measures, and provides oversight of local programs. CARB establishes emissions standards for motor vehicles sold in California, consumer products (such as hairspray, aerosol paints, and barbecue lighter fluid), and various types of commercial equipment. It also sets fuel specifications to further reduce vehicular emissions. CARB has primary responsibility for the development of California's State Implementation Plan (SIP), for which it works closely with the federal government and the local air districts. The SIP is required for the State to take over implementation of the Clean Air Act.

Executive Order S-3-05

California Governor Arnold Schwarzenegger announced on June 1, 2005, through Executive Order S-3-05, the following GHG emission reduction targets:

- By 2010, California shall reduce GHG emissions to 2000 levels;
- By 2020, California shall reduce GHG emissions to 1990 levels; and
- By 2050, California shall reduce GHG emissions to 80 percent below 1990 levels.

The first California Climate Action Team (CCAT) Report to the Governor in 2006 contained recommendations and strategies to help meet the targets in Executive Order S 3-05. The 2010 CCAT Biennial Report, finalized in December, 2010, expands on the policy oriented 2006 assessment. The new information detailed in the CCAT Biennial Report includes development of revised climate and sea-level projections using new information and tools that have become available in the last two years; and an evaluation of climate change within the context of broader social changes, such as land-use changes and demographic shifts (CCAT, 2010). The action items in the report focus on the preparation of the Climate Change Adaptation Strategy, required by Executive Order S-13-08, described below.

Senate Bill 107 and Senate Bill 2, Renewable Portfolio Standard (RPS)

In 2002, Senate Bill 1078 established the RPS standard requiring that electric retail suppliers, including electrical corporations, community choice aggregators and electric service provides purchase 20 percent of their energy from renewable energy sources by the year 2017. Senate Bill 107, enacted in 2006, accelerated the renewable energy source limit of 20 percent by the year 2010. Senate Bill 2, enacted in 2011, mandates investor-owned utilities to increase procurement from renewable sources to 33 percent of their total portfolio by the year 2020, and expanded applicability publicly owned utilities, which were previously not included in the RPS. Jointly established by the California Public Utilities Commission (CPUC) and the California Energy Commission, the RPS program also enforces compliance, reviews and approves each investor-owned utility's renewable resource procurement plant, establishes standard terms and conditions used in the utilities' contracts for renewable energy, and calculates market price referents for non-renewable energy to serve as standards for renewable energy prices.

SB 1368, Emission Performance Standards (EPS)

Signed into law in September 2006, SB 1368 requires power plants to meet emissions performance standards (EPS) before becoming eligible for long-term investments in baseload generation by the State's utilities. The California Energy Commission (CEC) and CPUC jointly established a standard of 1,100 lbs CO₂ per megawatt-hour for baseload generation owned by public utilities. Further, publicly owned utilities must post notices of public deliberations on long-term investments on the California Energy Commission website. SB 1368 also formalizes a public process for determining whether proposed investments are compliant with the EPS, including: requests by a utility for evaluation by the Commission of proposed procurements; requests by a utility for a proposed investment's exemption from the EPS; requirement that a utility submits a compliance filing on behalf of a proposed investment; and requests by any party for the Commission to investigate a utility's compliance with the EPS.

Assembly Bill 32, The Global Warming Solutions Act of 2006

In 2006, the California State Legislature adopted AB 32, the California Global Warming Solutions Act of 2006, focusing on reducing GHGs in California. GHGs as defined under AB 32 include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. AB 32 required CARB to adopt rules and regulations directing State actions that would achieve greenhouse gas emissions equivalent to 1990 Statewide levels by 2020. On or before June 30, 2007, CARB was required to publish a list of discrete early action GHG emission reduction measures that would be implemented to be made enforceable by 2010. The law further required that such measures achieve the maximum technologically feasible and cost effective reductions in GHGs from sources or categories of sources to achieve the Statewide greenhouse gas emissions limit for 2020.

CARB published its Final Report for Proposed Early Actions to Mitigate Climate Change in California in October, 2007. This report described recommendations for discrete early action measures to reduce GHG emissions as part of California's AB 32 GHG reduction strategy. Resulting from this are three new regulations proposed to meet the definition of "discrete early action greenhouse gas reduction measures," including the following: a low carbon fuel standard; reduction of HFC 134a emissions from non-professional servicing of motor vehicle air conditioning systems; and improved landfill methane capture (CARB, 2007d). CARB estimates that by 2020, the reductions from those three measures would be approximately 13 - 26 million metric tons (MMT) CO_2e .

Under AB 32, CARB has the primary responsibility for reducing GHG emissions. In 2007, CARB released a report entitled *California 1990 GHG Emissions Level and 2020 Emissions Limit* that determined the Statewide levels of GHG emissions in 1990 to be 427 MMT CO₂e.¹ Additionally, in December 2008, CARB adopted the *Climate Change Scoping Plan*, which outlines the State's strategy to achieve the 2020 GHG limit. As part of the Scoping Plan, a GHG emissions inventory was performed demonstrating that California will need to reduce CO₂e emissions by 169 MMT or approximately 28.5 percent from the State's projected 2020 emissions level of 596 MMT CO₂e. This Scoping Plan proposes a comprehensive set of actions designed to reduce overall greenhouse gas emissions in California, achieve the goal of AB32, improve the environment, reduce dependence on oil, diversify energy sources, save energy, create new jobs, and enhance public health. The plan emphasizes a cap-and-trade program, but also includes discrete early actions.²

Under the *Climate Change Scoping Plan*, approximately 85 percent of the State's GHG emissions are subject to the cap-and-trade program where covered sectors are placed under a declining emissions cap. The emissions cap incorporates a margin of safety whereby the 2020 emissions limit will still be achieved even in the event that uncapped sectors do not fully meet their anticipated emission reductions. Emissions reductions will be achieved through regulatory requirements and the option to reduce emissions further or purchase allowances to cover compliance obligations. It is expected that emission reductions from the cap-and-trade program will account for a significant portion of the reductions required by AB 32. PWP is an entity covered by the cap-and-trade program and is thus subject to compliance obligations.

Senate Bill 97

SB 97, enacted in 2007, amended the California Environmental Quality Act (CEQA) to clearly establish that GHG emissions and the effects of GHG emissions are appropriate subjects for CEQA analysis. It directed the California Office of Planning and Research (OPR) to develop revisions to the State CEQA Guidelines "for the mitigation of GHG emissions or the effects of GHG emissions" and directed the Resources Agency to certify and adopt these revised State CEQA Guidelines by January, 2010. The revisions were completed in March, 2010 and codified into the California Code of Regulations and became effective within 120 days pursuant to CEQA. The amendments provide regulatory guidance for the analysis and mitigation of the potential effects of GHG emissions.

Executive Order S-13-08

On November 14, 2008, Governor Schwarzenegger issued Executive Order S-13-08, the Climate Adaptation and Sea Level Rise Planning Directive, to provide clear direction on how the State should plan for future climate impacts. Executive Order S-13-08 calls for the implementation of four key actions to reduce the vulnerability of California to climate change:

- Initiate California's first Statewide Climate Change Adaptation Strategy (CAS) that will assess the State's expected climate change impacts, identify where California is most vulnerable, and recommend climate adaptation policies;
- Request that the National Academy of Sciences establish an expert panel to report on sea level rise impacts in California in order to inform State planning and development efforts;

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¹ California Air Resources Board, Staff Report: California 1990 Greenhouse Gas Emissions Level and 2020 Emissions Limit, (2007).

² California Air Resources Board, Climate Change Scoping Plan: A Framework for Change, (2008).

 Issue interim guidance to State agencies for how to plan for sea level rise in designated coastal and floodplain areas for new and existing projects; and

Initiate studies on critical infrastructure projects and land-use policies vulnerable to sea level rise.

The 2009 CAS Report summarizes the best known science on climate change impacts in the State to assess vulnerability, and outlines possible solutions that can be implemented within and across State agencies to promote resiliency. This is the first step in an ongoing, evolving process to reduce California's vulnerability to climate impacts (California Natural Resources Agency, 2009a).

California Code of Regulations (CCR) Title 24, Part 6

CCR Title 24, Part 6: California's Energy Efficiency Standards for Residential and Non-residential Buildings (Title 24) were first established in 1978 in response to a legislative mandate to reduce California's energy consumption. The standards are updated periodically to allow consideration and possible incorporation of new energy efficiency technologies and methods. Since use of fossil fuels to produce energy results in GHG emissions, energy efficient buildings that use less energy result in less GHG emissions as well.

The CEC adopted Updated Title 24 Standards in 2008 and they went into effect on August 1, 2009. These changes affect Building Energy Efficiency Standards, in order to:

- Provide California with an adequate, reasonably priced, and environmentally sound supply of energy;
- Respond to AB 32, the Global Warming Solutions Act of 2006, which mandates that California must reduce its GHG emissions to 1990 levels by 2020;
- Pursue California energy policy, which states that energy efficiency is the resource of first choice for meeting California's energy needs;
- Act on the findings of California's Integrated Energy Policy Report (IEPR) that concludes that the Standards are the most cost effective means to achieve energy efficiency, expects the Building Energy Efficiency Standards to continue to be upgraded over time to reduce electricity and peak demand, and recognizes the role of the Standards in reducing energy related to meeting California's water needs and in reducing GHG emissions;
- Meet the West Coast Governors' Global Warming Initiative commitment to include aggressive energy efficiency measures into updates of State building codes; and
- Meet the energy efficiency goals of Executive Order S-20-04, which established California's Green Building Initiative. The Executive Order seeks to improve the energy efficiency of nonresidential buildings through aggressive standards toward the target of a 20 percent reduction in building energy use from a 2003 baseline by the year 2015.

(3) Regional Regulations

Southern California Air Quality Management District (SCAQMD)

The City of Pasadena is located in the South Coast Air Basin (SoCAB). Air emissions are regulated by the South Coast Air Quality Management District. The SCAQMD is responsible for promoting and improving the air quality of the SoCAB. This is accomplished though air quality monitoring, evaluation, education, implementation of control measures to reduce emissions from stationary sources, permitting and inspection

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of pollution sources, enforcement of air quality regulations, and by supporting and implementing measures to reduce emissions from motor vehicles. After AB 32 was passed, SCAQMD formed a Climate Change Committee along with a Greenhouse Gases CEQA Significance Thresholds Working Group and the SoCal Climate Solutions Exchange Technical Advisory Group. On September 5, 2008, the SCAQMD Board approved the SCAQMD Climate Change Policy, which outlines actions the District will take to assist businesses and local governments in implementing climate change measures, decrease the agency's carbon emissions, and provide information to the public regarding climate change. On December 5, 2008, the Board approved interim CEQA GHG significance thresholds for stationary sources for which the SCAQMD serves as Lead Agency, and related rules, and plans. The District also adopted a tiered approach for determining significance. Tiers 1 and 2 indicate that projects that are exempt from CEQA or consistent with an approved local GHG reduction plan can be found to be less than significant. Tier 3, the primary tier the Board will use for determining significance, has a screening significance threshold designed to capture 90 percent of sector GHG emissions (SCAQMD, 2008).

(4) Local Regulations

City of Pasadena Green Building Standards

In acknowledgment that land use and GHG emissions are interrelated, the City of Pasadena incorporated the California Green Building (CALGreen) Standards Code, with amendments in Chapter 14.04.500 et seq. in its Municipal Code. The City's ordinance requires applicable projects to comply with specified provisions to reduce energy consumption such as the use of low slope cool roofs and exceeding energy efficiency targets beyond regulatory requirements. The ordinance also supports the use of the United States Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED®) Green Building Rating System as a standard for which a project may be measured as a green building. The ordinance allows applicable projects the flexibility to comply with voluntary measures to achieve a certain number of equivalent LEED points. According to the amended CALGreen Standards Code, projects that are required to comply with Tier 1 standards include municipal buildings of 5,000 square feet or more of new construction while Tier 2 standards apply to new municipal buildings or municipal renovations of 15,000 square feet or more. The proposed administrative/control room would be approximately 18,000 square feet; therefore, it would be required to comply with Tier 2 standards. According to the CALGreen standards, nonresidential buildings should achieve at least a 15 percent reduction in energy usage when compared to the State's mandatory energy efficiency standards. The Tier 2 standards encourage, but do not require, nonresidential buildings to achieve a 30 percent reduction. Section 14.04.578 requires that Tier 2 projects achieve an equivalent of 50 LEED points through compliance with required and voluntary measures.

City of Pasadena Green City Action Plan

Pasadena set ambitious goals for becoming a sustainable community through the adoption of the Green City Action Plan, modeled after the United Nations Urban Environmental Accords, in 2006. This plan outlined the 21 urban environmental accord actions listed below. The status of each action (achieved, likely, or undetermined) was reported in the *2010 Green Report* and is indicated in parentheses after the action number. "Achieved" means the goal has been met, "likely" means it should be reached by the target year, and "undetermined" means there is data, reports, or parameters missing to make a determination.

Energy

• **Action 1 (achieved):** Increase the use of renewable energy to meet 10 percent of the City's peak electric load within seven years.

- **Action 2 (undetermined):** Reduce the City's peak electric load by 10 percent within seven years through energy efficiency, shifting the timing of energy demands and conservation measures.
- **Action 3 (likely):** Reduce GHG emissions by 25 percent by 2030, and include a system for accounting and auditing these emissions.

Waste Reduction

- Action 4 (likely): Achieve zero waste to landfills and incinerators by 2040.
- **Action 5 (likely):** Reduce the use of disposable, toxic, or nonrenewable products by at least 50 percent in seven years.
- **Action 6 (achieved):** Implement "user-friendly" recycling and composting programs, with the goal of reducing by 25 percent per capita solid waste disposal to landfill and incineration in seven years.

Urban Design

- Action 7 (achieved): Mandate a green building rating system standard that applies to all new municipal buildings.
- Action 8 (achieved): Advance higher density, mixed use, walkable, bikeable and disabled accessible neighborhoods which coordinate land use and transportation with open space systems for recreation and ecological restoration.
- Action 9 (achieved): Create environmentally beneficial jobs in low-income neighborhoods.

Urban Nature

- **Action 10 (undetermined):** Ensure that there is an accessible public park or recreational open space within 1/2 kilometer of all residents by 2015.
- Action 11 (achieved): Conduct an inventory of existing canopy coverage in the City; and, then establish a goal to plant and maintain canopy coverage in not less than 50 percent of all available sidewalk planting sites.
- **Action 12 (achieved):** Protect critical habitat corridors and other key habitat characteristics from unsustainable development.

Transportation

 Action 13 (achieved): Expand affordable public transportation coverage to within 1/2 kilometer of all City residents in ten years.

 Action 14 (likely): Phase down sulfur levels in diesel and gasoline fuels, use advanced emission controls on all public fleets to reduce particulate matter and smog-forming emissions from those fleets by 50 percent in seven years.

• **Action 15 (likely):** Implement a policy to reduce the percentage of commute trips by single occupancy vehicles by 10 percent in seven years.

Environmental Health

- Action 16 (likely): Every year, identify one product, chemical or compound that is used within the City that represents the greatest risk to human health and reduce or eliminate its use by the municipal government.
- Action 17 (likely): Support the public health and environmental benefits of locally grown organic foods. Ensure that 20 percent of all City facilities (including schools) serve locally grown and organic food within seven years.
- Action 18 (undetermined): Establish an Air Quality Index (AQI) to measure the level of air pollution and set the goal of reducing by 10 percent in seven years the number of days categorized in the AQI range as "unhealthy" or "hazardous."

Water

- Action 19 (likely): Develop policies to increase adequate access to safe drinking water, aiming at access for all by 2015. For cities, such as Pasadena with potable water consumptions greater than 100 liters per capita per day, UNUEA requires adoption and implementation of policies to reduce consumption by a minimum of 10 percent by 2015.
- Action 20 (likely): Protect the ecological integrity of the City's primary drinking water sources (i.e., aquifers, rivers, lakes, wetlands and associated ecosystems).
- Action 21 (likely): Adopt municipal wastewater management guidelines and reduce the volume of untreated wastewater discharges by 10 percent in seven years through the expanded use of recycled water and the implementation of a sustainable urban watershed planning process that includes participants of all affected communities and is based on sound economic, social and environmental principles.

Pasadena Water and Power Integrated Resource Plan

In 2009, Pasadena Water and Power (PWP) prepared an *Integrated Resource Plan* (IRP) in which it established the Preferred Resource Plan to manage the supply and demand sides of power consumption in Pasadena. The IRP stipulates implementation of energy efficiency and load management programs to curb demand. It also proposes the construction of an efficient combined-cycle plant to replace existing aging and inefficient units located in Pasadena's municipal power plant. The IRP was recently updated (March 2012) to account for the decline in demand and economic downturn since 2008, the cap-and-trade program for GHGs, and to establish the path to meeting and exceeding the Statewide 33 percent Renewable Portfolio Standard (RPS) established by the California Renewable Energy Resources Act (Senate Bill X1-2). The primary objective for the replacement of existing Unit B-3 is to ensure the reliability of locally produced

power, to be used when local demand exceeds import capacity, in the event of loss or reduction of imported power from the grid, or when it is financially preferable for the City to produce power locally.

b. Existing Conditions

(1) Overview of Greenhouse Gases

Global climate change refers to changes in average climatic conditions on Earth as a whole, including changes in temperature, wind patterns, precipitation and storms. Historical records indicate that global climate changes have occurred in the past due to natural phenomena; however some data indicate that the current global conditions differ from past climate changes in rate and magnitude; thus, the current changes in global climate have been attributed to anthropogenic (human-caused) activities by the Intergovernmental Panel on Climate Change (IPCC).³ GHGs trap heat in the atmosphere, which in turn heats the surface of the Earth. Without human intervention, the Earth maintains an approximate balance between the GHG emissions in the atmosphere and the storage of GHGs in the oceans and terrestrial ecosystems. CO2 is the most abundant GHG in the atmosphere, and represents 77 percent of total GHG emissions.⁴ GHGs are the result of both natural and anthropogenic activities. Forest fires, decomposition, industrial processes, landfills, and consumption of fossil fuels for power generation, transportation, heating, and cooking are the primary sources of GHG emissions. In the State of California, the transportation sector is the greatest source of GHG emissions, accounting for 38 percent of total GHG emissions in 2004, the latest year for which data are available.⁵ The State of California has been at the forefront of developing solutions to address global climate change and reduce anthropogenic GHG emissions.

The Federal Government and State of California recognized that anthropogenic GHG emissions are contributing to changes in the global climate, and that such changes are having and will have adverse effects on the environment, the economy, and public health. These are cumulative effects of past, present, and future actions worldwide. While worldwide contributions of GHG emissions are expected to have widespread consequences, it is not possible to link particular changes to the environment of California or elsewhere to GHG emitted from a particular source or location.

State law defines GHG to include the following compounds: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6) (CEQA Guidelines, section 15364.5; Health and Safety Code, section 38505(g)). The most common GHG that results from human activity is carbon dioxide, followed by methane and nitrous oxide. Because GHGs have variable potencies, a common metric of carbon dioxide equivalents (CO₂e) is used to report their combined potency. The potency each GHG has in the atmosphere is measured as a combination of the volume of its emissions and its global warming potential (GWP)⁶, and is expressed as a function of the potency with respect to the same mass of CO₂. Methane, for example has a GWP of 21, while nitrous oxide has a GWP of 310. Thus, by

Intergovernmental Panel on Climate Change (IPCC), Fourth Assessment Report, The Physical Science Basis, Summary for Policy Makers, (2007).

IPCC, Fourth Assessment Report, Synthesis Report, (2007).

California Air Resources Board, Greenhouse Gas Emissions Inventory Data: 2004 GHG emissions by Sector, (2008).

The potential of a gas or aerosol to trap heat in the atmosphere.

multiplying the amount in metric tons of each individual gas by their respective GWP, all GHGs can be reported in the common unit of metric tons⁷ of CO_2e (MT CO_2e).

(2) Effects of Global Climate Change

The scientific community's understanding of the fundamental processes responsible for global climate change has improved over the past decade, and its predictive capabilities are advancing. However, there remain significant scientific uncertainties, for example, in predictions of local effects of climate change, occurrence of extreme weather events, effects of aerosols, changes in clouds, shifts in the intensity and distribution of precipitation, and changes in oceanic circulation. Due to the enormous complexity of the Earth's climate system, the uncertainty surrounding climate change may never be completely eliminated. Because of these uncertainties, there continues to be significant debate over which increased concentrations of GHGs are responsible for climate change, and over the appropriate actions to limit and/or respond to climate change.

The IPCC, in its Fourth Assessment Report (FAR), stated that "it is likely that there has been significant anthropogenic warming over the past 50 years." However, it is impossible to identify a single development project as the cause of future specific climate change impacts due to the global nature of climate change. Also in the FAR, the IPCC holds that the impacts of future climate change will vary across regions. While "large-scale climate events have the potential to cause very large impacts," the impacts of future climate change will be mixed across regions.

According to the CARB, some of the potential impacts in California of global warming may include loss in snow pack, sea level rise, more extreme heat days per year, more high ozone days, more large forest fires, and more drought years (CARB, 2007). Below is a summary of some of the potential effects, reported by an array of studies that could be experienced in California as a result of global warming and climate change:

Air Quality

Higher temperatures, conducive to air pollution formation, could worsen air quality in California. Climate change may increase the concentration of ground-level ozone, but the magnitude of the effect, and therefore, its indirect effects, are uncertain. If higher temperatures are accompanied by drier conditions, the potential for large wildfires could increase, which, in turn, would further worsen air quality. However, if higher temperatures are accompanied by wetter, rather than drier conditions, the rains would tend to temporarily clear the air of particulate pollution and reduce the incidence of large wildfires, thus ameliorating the pollution associated with wildfires. Additionally, severe heat accompanied by drier conditions and poor air quality could increase the number of heat-related deaths, illnesses, and asthma attacks throughout the State (CEC, February 2006).

Water Supply

Uncertainty remains with respect to the overall impact of global climate change on future water supplies in California. Studies have found that, "Considerable uncertainty about precise impacts of climate change on

⁷ One metric ton (MT) equals 1,000 kilograms or 2,204 pounds. Note, one 'short ton' is 2,000 pounds.

Intergovernmental Panel on Climate Change (IPCC), Fourth Assessment Report, The Physical Science Basis, Summary for Policy Makers, (2007).

California hydrology and water resources will remain until we have more precise and consistent information about how precipitation patterns, timing, and intensity will change" (Kiparsky et al., 2003). For example, some studies identify little change in total annual precipitation in projections for California (California Climate Change Center, 2008). Other studies show significantly more precipitation (Climate Change and California Water Resources (DWR, 2006)). Even assuming that climate change leads to long-term increases in precipitation, analysis of the impact of climate change is further complicated by the fact that no studies have identified or quantified the runoff impacts such an increase in precipitation would have in particular watersheds.⁹ Also, little is known about how groundwater recharge and water quality would be affected (Ibid.). Higher rainfall could lead to greater groundwater recharge, although reductions in spring runoff and higher evapotranspiration could reduce the amount of water available for recharge (Ibid.).

The California Department of Water Resources (DWR, 2006) report on climate change and effects on the State Water Project (SWP), the Central Valley Project, and the Sacramento-San Joaquin Delta, concludes that "[c]limate change will likely have a significant effect on California's future water resources-[and] future water demand."¹⁰ It also reports that "much uncertainty about future water demand [remains], especially [for] those aspects of future demand that will be directly affected by climate change and warming. While climate change is expected to continue through at least the end of this century, the magnitude and, in some cases, the nature of future changes is uncertain" (DWR, 2006). The relationship between climate change and its potential effect on water demand is not well understood (DWR, 2006). DWR adds, "[i]t is unlikely that this level of uncertainty will diminish significantly in the foreseeable future." Still, changes in water supply are expected to occur, and many regional studies have shown that large changes in the reliability of water yields from reservoirs could result from only small changes in inflows (Kiparsky 2003; DWR 2005; Cayan 2006, Cayan, D., et al, 2006).

Hydrology

As discussed above, climate changes could potentially affect: the amount of snowfall, rainfall and snow pack; the intensity and frequency of storms; flood hydrographs (flash floods, rain or snow events, coincidental high tide and high runoff events); sea level rise and coastal flooding; coastal erosion; and the potential for salt water intrusion. Sea level rise can be a product of global warming through two main processes: expansion of sea water as the oceans warm, and melting of ice over land. A rise in sea levels could result in coastal flooding and erosion and could jeopardize California's water supply. Increased storm intensity and frequency could affect the ability of flood-control facilities, including levees, to handle storm events.

Global climate change refers to changes in average climatic conditions on Earth as a whole, including changes in temperature, wind patterns, precipitation and storms. Historical records indicate that global climate changes have occurred in the past due to natural phenomena; however some data indicate that the current global conditions differ from past climate changes in rate and magnitude. There continues to be significant scientific uncertainty concerning the extent to which increased concentrations of GHGs have caused or will cause climate change, and over the appropriate actions to limit and/or respond to climate change.

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⁹ California Climate Change Center (2006).

¹⁰ California Department of Water Resources,

(3) Greenhouse Gas Inventory

Worldwide anthropogenic emissions of GHGs were approximately 40,000 million metric tons of $CO_{2}e$, including ongoing emissions from industrial and agricultural sources, but excluding emissions from land use changes (i.e., deforestation, biomass decay) (IPCC, 2007). CO_{2} emissions from fossil fuel use accounts for 56.6 percent of the total emissions of 49,000 million metric tons $CO_{2}e$ (includes land use changes) and all $CO_{2}e$ emissions are 76.7 percent of the total. Methane emissions account for 14.3 percent and $N_{2}O$ emissions for 7.9 percent (IPCC, 2007).

Total U.S. GHG emissions in 2008 were 6,958 million metric tons CO₂e, or about 14 percent of worldwide GHG emissions. Overall, total U.S. emissions have risen by 14 percent from 1990 to 2008. However, U.S. emissions decreased by 2.9 percent (211.3 MMT CO₂e) between 2007 and 2008, due in large part to the record high costs of petroleum fuels that occurred in 2008. Electricity demand declined in 2008 for the same The primary GHG emitted as the result of human activities in the United States was CO₂, representing approximately 85.1 percent of total GHG emissions. The largest source of CO₂, and of overall GHG emissions, was fossil fuel combustion. Methane (CH_4) emissions, which have declined from 1990 levels, resulted primarily from enteric fermentation associated with domestic livestock, decomposition of wastes in landfills, and natural gas systems. Agricultural soil management and mobile source fossil fuel combustion were the major sources of N₂O emissions. The emissions of substitutes for ozone depleting substances and emissions of HFC-23 (trifluoromethane or CHF₃) during the production of HCFC-22 (chlorodifluoromethane or CHClF₂) were the primary contributors to aggregate HFC (hydrofluorocarbons) emissions. Electrical transmission and distribution systems accounted for most SF₆ (sodium hexafluoride) emissions, while PFC (perfluorocarbons) emissions resulted from semiconductor manufacturing and as a by-product of primary aluminum production. The residential and commercial end-use sectors accounted for 21 percent and 19 percent, respectively, of CO₂ emissions from fossil fuel combustion in 2008. Both sectors relied heavily on electricity for meeting energy demands, with 71 and 79 percent, respectively, of their emissions attributable to electricity consumption for lighting, heating, cooling, and operating appliances. The remaining emissions were due to the consumption of natural gas and petroleum for heating and cooking.

California is a substantial contributor of global GHGs as it is the second largest contributor in the United States and the fourteenth largest in the world (AEP, 2007 and CARB, 2011). **Table 4.D-1**, 1990 and 2008 Net Total GHG Emissions for the State of California, identifies and quantifies Statewide anthropogenic GHG emissions and sinks (CARB, 2007 and 2010). Based upon the 2008 GHG inventory data (the latest year available) compiled by the CARB (CARB, 2008), California produced 474 MMT CO2e. The major source of GHG in California is transportation, contributing 37 percent of the State's total GHG emissions. Electricity generation is the second largest source, contributing 25 percent of the State's GHG emissions (CARB, 2008). Most, 85 percent, of California's 2008 GHG emissions (in terms of CO₂e) were carbon dioxide produced from fossil fuel combustion, with 2.5 percent from other sources of CO₂, 6.0 percent from methane, and 2.8 percent from nitrous oxide (CARB, 2008). California emissions are due in part to its large size and large population.

Pasadena Water and Power maintains a record of fuel usage and emissions for existing equipment. Existing GHG emissions from Unit B-3 were calculated based on fuel usage data from 2010 and 2011. Average GHG emissions from Unit B-3 are 28,198 tons per year CO_2e

Table 4.D-1

1990 and 2008 Net Total GHG Emissions for the State of California

Category	Total 1990 Emissions (MMTCO₂e)	Percent of Total 1990 Emissions	Total 2008 Emissions (MMTCO₂e)	Percent of Total 2008 Emissions
Transportation	150.7	35%	174.99	37%
Electric Power	110.6	26%	116.35	25%
Commercial	14.4	3%	14.68	3%
Residential	29.7	7%	28.45	6%
Industrial	103.0	24%	92.66	20%
Recycling and Waste			6.71	1%
High GWP			15.65	3%
Agriculture	23.4	5%	28.06	6%
Forestry	0.2	<1%	0.19	<1%
Forestry Sinks	-6.7		-3.98	
Total	425.3	100%	473.76	100%
Source: CARB, 2007, 2010				

2. ENVIRONMENTAL IMPACTS

a. Thresholds of Significance

On December 30, 2009, the Office of Planning and Research transmitted proposed California Environmental Quality Act Guidelines Amendments for Greenhouse Gas Emissions were adopted by the Natural Resources Agency. Notably, the amendments did not establish a threshold of significance; instead lead agencies are called on to establish significance thresholds for their respective jurisdictions. The California Environmental Quality Act Guidelines Amendments also clarified "that the effects of greenhouse gas emissions are cumulative, and should be analyzed in the context of California Environmental Quality Act's requirements for cumulative impact analysis."

Appendix G of the State *CEQA Guidelines* provides sample checklist questions for use in an Initial Study to determine a project's potential for environmental impacts. The most recent amendments relating to climate change and GHG emissions encourage lead agencies to consider many factors in performing a CEQA analysis, but preserve the discretion granted by CEQA to lead agencies in making their own determinations based on substantial evidence. Based on the *CEQA Guidelines*, a project would normally have a significant impact if it would:

- Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment, based on any applicable threshold of significance; or
- Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

CEQA leaves the determination of significance to the reasonable discretion of the lead agency and encourages lead agencies to develop and publish thresholds of significance to use in determining the significance of environmental effects. Since the City has not established applicable project-level CEQA GHG thresholds, the SCAQMD's *Interim CEQA GHG Significance Thresholds for Stationary Sources, Rules and Plans* are the guiding document used for determining project significance in this analysis (SCAQMD, 2008).

GHG-1 Generate greenhouse gas emissions, either directly or indirectly, that in conjunction with other global greenhouse gas emissions may have a substantial adverse physical effect on the environment.

GHG emissions from the proposed project are compared to the following numeric thresholds to determine significance under the first criterion listed above.

10,000 MT CO₂**e per year.** This is adopted from the recommended SCAQMD's Interim Thresholds document for industrial development projects; projects below this threshold are considered less than significant. If the project emits over 10,000 MT CO_2 e per year, the project may produce significant impacts.

1,100 lb CO₂ per megawatt-hour. Jointly established by the CEC and CPUC, the intent of this threshold is to promote the continued development of power plants to meet the State's growing energy demands while advancing power generation practices that minimize GHG emissions.

GHG-2 Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

The City of Pasadena Green Building Standards incorporates the mandatory portions of the State's CALGreen Code into its building permit process as well as amendments as listed in Chapter 14.04.500 et seq.. Thus, if the project is designed in accordance and not in conflict with these policies and regulations, it would result in a less than significant impact, since it would be consistent with the overarching State regulations on GHG reduction (AB 32).

b. Methodology

Various guidance documents, such as the California Climate Action Registry (CCAR) General Reporting Protocol (version 3.1, January 2009), the Local Government Operations Protocol (LGOP) (version 1.1, May 2010), the Draft Community-wide GHG Emissions Protocol under development by the Association of Environmental Professionals (AEP) and the International Council for Local Environmental Initiatives (ICLEI), propose sound and largely consistent methodologies for preparing GHG inventories. However, these methodologies have been developed for varying purposes and not specifically for CEQA. Relying on these guidance documents, this analysis defines direct and indirect emissions as follows:

■ **Direct Emissions:** Direct sources of GHG emissions from the proposed project include the consumption of natural gas for the production of power in Unit GT-5 and the consumption of natural gas on-site for water and space heating related to the new control room.

• **Indirect Emissions:** Indirect sources of GHG emissions related to the proposed project include the consumption of fossil fuels for the transportation of workers and supplies, energy needed to treat and supply water, and those associated with solid waste.

CARB believes that consideration of so-called indirect emissions provides a more complete picture of the GHG footprint of a facility: "As facilities consider changes that would affect their emissions – addition of a cogeneration unit to boost overall efficiency even as it increases direct emissions, for example – the relative impact on total (direct plus indirect) emissions by the facility should be monitored. Annually reported indirect energy usage also aids the conservation awareness of the facility and provides information" to CARB to be considered for future strategies by the industrial sector. For these reasons, CARB has proposed requiring the calculation of direct and indirect GHG emissions as part of the AB 32 reporting requirements. Additionally, OPR directs lead agencies to "make a good-faith effort, based on available information, to calculate, model, or estimate GHG emissions from a project, including the emissions associated with vehicular traffic, energy consumption, water usage and construction activities." Therefore, direct and indirect emissions were calculated, as appropriate, for the proposed project. Since potential impacts resulting from GHG emissions are long-term rather than acute, GHG emissions were calculated on an annual basis.

(1) Construction

Construction activities associated with implementation of the proposed project would emit GHGs. The exact amount of emissions is dependent on the particular construction equipment used and the length of the construction period.

Construction emissions were calculated using the California Emissions Estimator Model ("CalEEMod") version 2011.1.1. Construction GHG emissions are associated with the consumption of fossil fuels in construction equipment and construction-related vehicle trips. Construction emissions were calculated for overall build-out of the proposed project, which includes four major phases: soil remediation, demolition and asbestos abatement, construction of the power generating unit and towers, and construction of the administrative/control room.

The output values used in this analysis were adjusted to be project-specific, based on usage rates of construction equipment, type of fuel, and construction schedule. These values were then applied to the construction phasing assumptions used in the criteria pollutant analysis to generate GHG emissions values for each construction year (refer to **Appendix B** of this Draft EIR). The CalEEMod model outputs CO_2 equivalent (CO_2 e) emissions, which includes CH_4 and N_2O emissions estimated based on the emissions ratios for construction and industrial equipment from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Construction tends to occur over a short duration relative to the overall project lifetime. In order to provide a representative equivalent annual emission rate, the SCAQMD recommends that construction GHG emissions be amortized over a period of 30 years and added to the annual operational emissions.

(2) Operation

Existing Unit B-3 currently burns natural gas to create steam, which turns the turbine and produces electricity. Unit B-3, the oldest operational unit in the power plant, is used intermittently as power demand and other conditions dictate, which can vary widely. Over the last five years, Unit B-3 has operated an

average of approximately 2000 hours per year. The annual average existing emissions (presented in mass emissions below) were calculated based on natural gas consumed, which is accurately metered and tracked.

Unit GT-5 is proposed to be used up to a maximum of 8,760 hours per year, which is the basis of the Potential to Emit (PTE) calculations in the SCAQMD operating permits being sought. In actuality, Unit GT-5 may be used less than 8,760 hours. Nonetheless, as required under CEQA, GHG impacts were assessed based on the PTE. Emissions generated from turbine operations vary depending on operating conditions (startup, shutdown, normal operations, and commissioning). In order to calculate annual emissions, a conservative annual scenario of 750 shutdowns and 750 startups per year (5 startups and shutdowns per day) are assumed in the operating permit application. For the remaining hours of the year, the unit is expected to be running in normal mode or for maintenance activities. Fuel usage and operating parameters are based on manufacturer specifications for both the GE and Rolls Royce configurations.

Mobile source emission calculations associated with operation of the proposed project are based on standard Institute of Transportation Engineers (ITE) trip rates and vehicle miles traveled (VMT) generated from vehicle traffic traveling to and from the Glenarm Plant. As mentioned previously, the project is not expected to result in a significant increase in employee commute trips, and therefore employee-related mobile source emissions are not expected to significantly increase over existing emissions. However, because of the anticipated increase in running time for Unit GT-5 compared to Unit B-3, the need for ammonia and other consumables (i.e. catalyst) used to control stack emissions is expected to increase, resulting in a slight increase in the number of annual truck deliveries. It was estimated that an increase of approximately five (5) truck trips per year would result from the operation of Unit GT-5.

The consumption of fossil fuels to provide heating and hot water also creates GHG emissions. Future fuel consumption rates and water demand for the control room building are estimated based on square footage of the project and default SCAQMD/CalEEMod energy usage rates. With increased on-site power production from Unit GT-5, water needs are expected to increase. Although the water used in the cooling towers is recycled, a small percentage of the water evaporates or is otherwise lost during the process. The annual/daily make-up rate of process water was therefore estimated to be approximately 116,500,000 gallons per year. This water usage number, however, is based on the assumption that the cooling towers would be operating 8,760 hours per year. Detailed calculations are also provided in the permit application.

Embodied energy rates associated with the proposed project's future water supply needs are calculated using factors derived from the CEC. GHG emission factors from the CCAR protocol are then applied to the respective usage rates, to calculate annual greenhouse gas emissions in metric tons. Water and wastewater generated by the project require energy to supply, distribute and treat. Emission factors from the CCAR GRP, Version 3.1 are implemented in calculating the associated GHGs. Because water conveyance associated with the proposed project used historical energy usage rates of the power plant, the emissions calculated are most representative of projected GHG emissions from future water usage.

Emissions from project-generated solid waste handling and disposal is also accounted for in the GHG emissions inventory using CalEEMod. Waste disposal rates for individual land uses were used to estimate the amount of waste generated by the project. GHG emissions from solid waste handling and disposal are calculated based on decomposition of waste into methane based on AP-42, EPA's Compilation of Air Pollutant Emission Factors.

For purposes of this analysis, it is considered reasonable and consistent with criteria pollutant calculations to consider the impacts solely from the incremental increase in activity resulting from the project. Thus, the incremental (net) change in GHG emissions – from the projected increase in on-site consumption of natural gas to produce electricity and space and water heating, the increase in production of waste, and the increase in use of on-road mobile vehicles – were compared to the mass emissions threshold. Operating hours for Unit B-3 are well documented, and therefore only the net increase in GHG emissions associated with the production of electricity was evaluated in this analysis. No new employees are anticipated as part of project implementation, and no increase in employee commute trips is expected. Emissions from the incremental increase in delivery truck trips were included in the analysis. Because the energy efficiency of the current control room is difficult to assess, the existing GHGS from comfort and water heating and waste generation would be highly speculative. Therefore, the total emissions from operating the new control room were conservatively assumed to be net new emissions.

c. Project Design Features

The proposed project would implement several design features which would reduce the consumption of natural resources and the resultant greenhouse gas emissions. The new administrative/control room, which would be housed within the existing Glenarm Building, consolidates administrative, maintenance, and control spaces to maximize use, efficiency, and security and would be designed and constructed to achieve a reduction in energy usage when compared to the State's mandatory energy efficiency standards in accordance with the California Green Building Standards Code, as adopted by the City of Pasadena. Additionally, the proposed Unit GT-5 unit would replace the existing Unit B-3, which is aging and increasingly inefficient. Operation of Unit GT-5 would allow PWP to provide customers with more reliable, efficient, and environmentally sensitive power production. PWP is considering two possible power-generating equipment configurations from different turbine manufacturers: the General Electric (GE) GE LM 6000 PG and the Rolls Royce Trent 60. The selected unit would be located south of the Glenarm Building and, regardless of manufacturer, would include a new gas turbine, steam turbine, once-through steam generator (OTSG), wet-type cooling tower, water storage tanks, electric powered fuel gas compressors, and an electric powered air compressor.

Due to the size of the project, compliance with the Tier 2 requirements of the Pasadena Green Building Standards is mandatory. Under the Green Building Standards, the renovation of the Glenarm Building to accommodate the control room as proposed under the project would be required to achieve the equivalent of a "Silver" rating from the USGBC's LEED® green building program. Certain objectives and characteristics of the proposed project, as identified in the LEED® Checklist provided by the City of Pasadena Water & Power Department, would aid in reducing its GHG emissions and achieve an equivalent LEED® Silver rating. The following project features, consistent with Pasadena's Green Building Standards, have been accounted for in this analysis.

The proposed project would reuse an existing building which will reduce waste and disposable construction. Any construction waste produced by the project will be reduced by recycling, reclaiming and reusing to reduce 95 percent of the material by weight, from the waste stream and disposal in the landfill. Building materials used will have a high recyclable content, such as structured steel with a 95 percent recycled content, be produced locally or those that contain rapidly renewable materials.

 The project is located close to existing public transportation lines and basic services are available within walking distance.

- The project will make use of low-flow water closets, waterless urinals, and high-efficiency metered faucets to reduce water use by at least 30 percent below baseline level of an equivalent commercial facility.
- The project will reduce lighting power density by at least 20 percent and will evaluate the feasibility of implementing specific controls to dim or switch off lights based on available daylight and occupancy. The most energy efficient and cost effective HVAC equipment will be selected for the project and Energy Star eligible appliances and equipment will be used throughout.

d. Analysis of Project Impacts

GHG-1 Would the project generate greenhouse gas emissions, either directly or indirectly, that in conjunction with other global greenhouse gas emission may have a substantial adverse physical effect on the environment?

Construction

Construction of the proposed project would include four components: soil remediation on the Unit GT-5 site, demolition and asbestos abatement of existing structures on the Unit GT-5 site, construction of the new Unit GT-5, a combined-cycle power generating unit with an estimated gross capacity of 71 MW, and construction of an approximately 18,000-square-foot administrative/control room facility. Unit GT-5 will include a new gas turbine, steam turbine, once-through steam generator (OTSG), a stack approximately 125 feet in height, wet type cooling tower, water storage tanks, electric powered fuel gas compressors, and an electric powered air compressor. One of two existing aboveground aqueous ammonia tanks and associated piping and other equipment on the Broadway Plant would be reconfigured in place on the Broadway Plant to accommodate more dilute concentrations. The administrative/control room would include administrative offices and a control station for existing and proposed power-generation units and would be housed within the southeastern portion of the Glenarm Building. The existing 4,000-square-foot Pump Building on this parcel would be modified to house shops for general maintenance, machine work, and welding. Proposed project activities also include rerouting or relocation of storm drains, underground water lines, electrical lines, and other utilities; removal of existing mechanical equipment; and abatement of asbestos-containing materials (ACMs) and lead-based paint (LBP) as necessary.

Construction activities associated with the proposed project would emit GHGs during the two phases of construction activities which will take approximately 23 months each. Emissions of GHGs from fossil fuel powered on-site construction equipment and off-site vehicles used to transport construction workers and supplies were calculated for each year of project construction in CalEEMod. Results of this analysis are presented in **Table 4.D-2**, *Construction Greenhouse Gas Emissions*. Consistent with SCAQMD guidance, the significance of construction emissions, which are temporary in nature, is determined in conjunction with any long term increases in operational GHG emissions. The SCAQMD generally recommends construction GHG emissions be amortized over a 30-year period, an assumed default project lifetime, and included in the project's annualized operational GHG emissions.

Table 4.D-2

Construction Greenhouse Gas Emissions

	CO₂e (Metric Tons/year) ^a
Year 2013	796
Year 2014	550
Year 2015	7
Construction Total	1,353
Construction (Amortized - 30 years)	45

^a Emissions calculations assume similar construction activities for both GE LM 6000 and Rolls-Royce configurations.

Source: PCR Services Corporation, 2012

Operation

The Glenarm Repowering Project replaces Unit B-3, which is currently used only during peak power demand periods, with Unit GT-5, a new combined-cycle power generating unit with an estimated gross capacity of 71 MW. Although the unit is rated at 71 MW (gross), the unit will not be operating at 100 percent load and efficiency. Actual power output from the turbine is expected to be 65 MW (net), and the PTE emissions are based on the net power production rate. As discussed above, the proposed project will result in an increase in the production of power on-site to meet the City's demand, but is not expected to result in an increase in the number of employees. Unit GT-5 will require additional deliveries of chemicals such as ammonia for NOx control and increased water usage for the cooling tower in comparison to existing Unit B-3 operations.

Mass Emissions

Potential maximum annual GHG emissions of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) for the operation of Unit GT-5 were calculated using the calculation methods and emission factors from the United States Environmental Protection Agency GHG Reporting Regulation. As discussed previously, the worst-case annual operational schedule of 750 shutdowns and startups, and continuous operation (8,760 hours per year) was assumed. GHG emissions from the operation of the 18,000-square-foot administrative/control room were calculated using the CalEEMod Model. Mobile source emissions are not expected to change as the proposed project will not require additional employees over what is currently there. Area sources and natural gas emissions were calculated with CalEEMod outputs. As mentioned previously, two configurations for the combustion turbine (CT) of Unit GT-5 are being considered. Table 5, *Annual Greenhouse Gas Emissions*, presents the estimated GHG emissions for both configurations.

As shown in **Table 4.D-3**, *Increase in Annual Greenhouse Gas Emissions*, the increase in annual GHG emissions resulting from power generation, vehicle, electrical, and natural gas usage associated with operation of the Glenarm Repowering Project were estimated to be 252,658 MT CO_2 e for the GE LM 6000 PG and 254,757 MT CO_2 e for Rolls Royce Trent 60, including amortized construction emissions. This level of increase would exceed the SCAQMD screening threshold of 10,000 metric tons CO_2 e per year, and impacts are considered potentially significant.

Table 4.D-3

Increase in Annual Greenhouse Gas Emissions

Emission Source	GE LM 6000 ^a	Rolls-Royce Trent 60	
	CO₂e (Metric Tons/year)		
Construction (Amortized)	45	45	
Operations			
Power Generation	280,502	282,601	
Electricity	246	246	
Water Conveyance	64	64	
Natural Gas	18	18	
Waste	13	13	
On-Road Mobile Sources	$0_{\rm p}$	0 _p	
Total Annual Operations	280,842	282,941	
Existing Unit B-3 Emissions	28,198	28,198	
Total Net (Amortized Construction + Total Annual Operations)	252,658	254,757	
Above 10,000 tons CO ₂ e annually?	Yes	Yes	

^a Numbers may not add up due to rounding.

Source: PCR Services Corporation, 2012.

Emissions Performance Standard

The proposed new turbine is required to comply with Emissions Performance Standards (EPS) requirements established by SB 1368. The Statewide EPS required by SB 1368 is 1,100 lb CO_2 per MWh. As shown in **Table 4.D-4**, *Compliance with Emissions Performance Standards*, operating either the GE LM 6000 or Rolls Royce Trent 60 CT turbine at its maximum allowable rating of 65MW would remain below the significance threshold of 1,100 lb CO_2 per MWh, and impacts with respect to this standard would be less than significant.

Table 4.D-4

Compliance with Emissions Performance Standards

65	
	65
252,658	254,757
1050	1084
No	No
	1050

Five net new trucks per year, for the delivery of aqueous ammonia, are anticipated.

GHG-2 Would the project conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

As noted above, the State and the City have adopted numerous plans, policies and regulations to lower GHG emissions. Consistency with these applicable promulgated plans and regulations is supportive of the State's goals of obtaining 1990 levels of GHGs Statewide by 2050.

The Glenarm Repowering Project would not conflict with the applicable plans, policies, or regulations established by State, Regional, and City regulations as detailed below. In support of AB32, the State has promulgated specific laws aimed at GHG reductions applicable to the proposed project. Specifically, as detailed above, the proposed Unit GT-5 turbine is consistent with State regulation regarding GHG intensity from new power production. Both the GE and Rolls Royce configurations would results in GHG emission less than 1,100 lb/MWh EPS, and is therefore consistent with State regulations and plans.

A major goal of the IRP is to provide reliable, environmentally responsible electricity service, at competitive and stable rates to PWP customers. Implementation of the proposed project would provide local generation of power using a technology, a natural gas-fired combined cycle turbine, which is less GHG intensive than the existing Unit B-3. Without implementation of the proposed project, PWP would continue to utilize the existing Unit B-3, which has an energy efficiency rating of 12 MMBtu/MWh, while a newer combined-cycle unit would have an efficiency rating of approximately 7 MMBtu/MWh. Thus, existing Unit B-3 results in approximately 70 percent more GHG emissions than a newer combined-cycle unit with the same operating schedule. A new energy efficient unit such as the proposed Unit GT-5 will enable PWP to continue operating at current levels in the future while reducing GHG emissions in accordance with declining allocations under the State's GHG cap-and-trade regulations. Furthermore, Unit B-3 was originally built in 1965 and is based on older technology and has a long start-up time (24 hours).¹¹ Thus, the project would provide for more environmentally responsible electricity service, reliability, efficiency, and would be consistent with and supportive of the City's IRP. Therefore the turbine component of the proposed project is consistent with applicable City plans and State regulations.

Due to the size of the project, compliance with the Tier 2 requirements of the Pasadena Green Building Standards is mandatory. Under the Green Building Standards, the renovation of the Glenarm Building to accommodate the control room as proposed under the project would be required to achieve the equivalent of a "Silver" rating from the USGBC's LEED® green building program. As noted in subsection 2.c, Project Design Features, above, the project will incorporate design features to achieve the "Silver" rating. Thus, the project is consistent with and supportive of the City's Green Building Standards.

By incorporating mandatory and voluntary energy reducing project features such as designing, constructing, and operating the project to obtain LEED certification, the proposed project would result in lower GHG emission rates compared to standards and practices in place when AB 32 was promulgated. Furthermore, given the proposed project features consistency with the City's Green Building Standards the control room component of the project does not conflict with applicable State and City policies, plans, and regulations.

Pasadena Water and Power, Integrated Resource Plan, (2007) 22.

The proposed project would comply with applicable measures to reduce GHG emissions, in support of State law (AB32). Therefore, the proposed project has a less than significant impact with respect to GHG-reducing plans, policies, and regulations.

3. MITIGATION MEASURES

Construction and operation of the proposed project would result in an increase in GHG emissions that exceed SCAQMD's mass emissions thresholds. Therefore, the SCAQMD GHG working group recommends that applicable performance standards be utilized to minimize emissions to the extent feasible. Unit GT-5 is a combined-cycle natural gas fueled power generation unit, which meets the State's EPS and is the best technology available for natural gas fueled power generating equipment. However, there are no feasible mitigation measures available to reduce turbine emissions beyond what is already included in the project design. Impacts would be significant and unavoidable.

Project Design Features, which ensure compliance with City policies as discussed in subsection 2.c, above, represent the best feasible strategies for the control room component of the proposed project. Therefore, no additional mitigation measures are proposed.

Even though emissions from the turbine will meet the State's EPS requirements and the control room building will implement all of the applicable and feasible City's Green Building Ordinance requirements, operational emissions from the Glenarm Repowering Project could cause significant and unavoidable impacts due to the potential for increased use of the new Unit GT-5 over existing Unit B-3 operations.

4. **CUMULATIVE IMPACTS**

According to the California Air Pollution Control Officers Association's (CAPCOA) *CEQA and Climate Change* White Paper, "GHG impacts are exclusively cumulative impacts; there are no non-cumulative GHG emission impacts from a climate change perspective." Thus, unlike the cumulative analyses for many impact areas that address the combined impacts of a proposed project in addition to related projects in a project area, global climate change analysis is inherently a cumulative impact analysis is not specifically dependent on GHG emissions from proximate development activity because of the complex physical, chemical and atmospheric mechanisms involved in global climate change. The project would include numerous Project Design Features to reduce GHG emissions, as well as features that address strategies consistent with the City of Pasadena's Green Building Standards for reducing GHG emissions. The proposed project would be consistent with State and City goals, and, therefore, would be consistent with the AB 32 reduction targets.

Implementation of project design features will ensure that impacts from greenhouse gas emissions are minimized. Even though emissions from the turbine will meet EPS requirements and the control room building will meet the City's Green Building Standards, implementation of the proposed project will result in an increase in locally produced GHG emissions.

Unit GT-5 will be a combined-cycle power generation unit and represents the best available technology alternative available for natural gas fueled power generating equipment. Unit GT-5 is intended to meet the demand of the City's customers and does not represent a net increase in the supply of power within the region or State. The IRP documents that demand has been decreasing, and the City actively encourages measures to reduce peak and total electrical use from its customers. As discussed previously, the primary

objective for the replacement of B-3 is to ensure the reliability of locally produced power, to be used when local demand exceeds import capacity, in the event of loss or reduction of imported power from the grid, or when it is financially preferable to produce power locally. It is anticipated that GT-5 will run considerably less than 8,760 hours per year. In addition, the City is required to produce and provide power to the Statewide grid (for which it is paid) when directed by CAISO. According to the CEC, "new, efficient, natural gas-fired cogeneration and generation promotes the State's efforts to improve GHG electrical generation efficiencies and, therefore, reduces greenhouse gas emissions and the amount of natural gas used by electricity generation." In its 2007 Integrated Energy Policy Report, the CEC noted: 13

New natural gas-fueled electricity generation technologies offer efficiency, environmental, and other benefits to California, specifically by reducing the amount of natural gas used—and with less natural gas burned, fewer greenhouse gas emissions. Older combustion and steam turbines use outdated technology that makes them less fuel- and cost-efficient than newer, cleaner plants.... The 2003 and 2005 IEPRs noted that the state could help reduce natural gas consumption for electric generation by taking steps to retire older, less efficient natural gas power plants and replace or repower them with new, more efficient power plants.

Thus, the proposed project's use of energy more efficiently and the replacement of older existing B-3 unit would further the State's strategy to promote efficiency and reduce fuel use and GHG emissions. From a Statewide perspective, the net GHG emissions for the integrated electricity system will decline when new gas-fired power plants are added to improve the overall efficiency of the electricity system and serve capacity needs more efficiently than the existing system. The proposed project would be more efficient than the existing B-3 unit.

However, conservatively assuming that GT-5 would operate up to its permitted limit of 8,760 hours per year, the proposed project would generate GHG emissions greater than Unit B-3 under existing conditions, as shown in Table 4.D-4. Therefore, the project is considered to have a cumulatively considerable contribution to cumulatively significant GHG emissions.

5. LEVEL OF SIGNIFICANCE AFTER MITIGATION

Implementation and compliance with the City's policies will ensure that project impacts from greenhouse gas emissions are minimized to the extent feasible. Compliance with the State's Emissions Performance Standards and the City's greenhouse gas reduction policies, Green Building Standards, and IRP will ensure consistency with promulgated plans, polices, and regulations governing the reduction of GHG emissions. Nonetheless, the increase in GHG emissions exceeds SCAQMD's mass emission thresholds. Unit GT-5 is a combined-cycle natural gas-fueled power generation unit, which meets the State's EPS and is the best technology available for natural gas fueled power generating equipment. However, there are no feasible mitigation measures available to reduce turbine emissions beyond what is already included in the project design. Therefore, on a project and cumulative basis, the impacts of the Unit GT-5 repower would remain significant and unavoidable.

¹² California Energy Commission, Watson Cogeneration Steam and Electric Reliability Project, Final Staff Assessment, (2011) 4.1-99.

¹³ California Energy Commission, 2007 Integrated Energy Policy Report, (2007) 194.