Technical Memorandum

Summary of scwd^2 Energy and GHG Reduction Approach

Date: October 15, 2012

Purpose: Summary of completed components of **scwd^2** Energy Minimization and Greenhouse Gas Reduction Plan to support EIR Section 5.5, Air Quality.

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1. INTRODUCTION

1.1 Project Background

In 2007, the City of Santa Cruz Water Department (City) and Soquel Creek Water District (District) partnered, forming **scwd²**, to evaluate the feasibility of constructing a regional reverse osmosis seawater desalination plant to supplement water source for both agencies. Initiation of **scwd²** followed decades of study on behalf of both agencies to build comprehensive and integrated water supply and conservation portfolios. Seawater desalination was independently identified by the City's Integrated Water Plan (IWP, 2005) and District's Integrated Resources Plan (IRP, 2006) as the most prudent and feasible source of supplemental supply.

Both integrated plans aim to ensure a reliable high-quality supply of water while protecting public health and safety. Supplemental supply provides a fraction of the demand needs for both agencies with the remaining demand being met by the other components of the plan. The integrated water plans for both agencies include the following primary components:

- **Conservation** – Permanently reduce water demand and increase water use efficiency to obtain the greatest public benefit from available supplies.
- **Curtailment** – Further reduce water use by up to 15 percent through temporary water restrictions during times of drought.
- **Supplemental Supply** – Construct a 2.5 million gallon per day (MGD) desalination plant to provide supplemental supply.

Over the last several years since the adoption of the IWP and IRP, the need for supplemental supply for both agencies has been further vetted and defined by changing conditions. The proposed **scwd²** Regional Seawater Desalination Project (Project) will provide up to 2.5 MGD of potable water to supplement threatened existing water supply sources. Development and use of the desalination plant and related facilities is being pursued by both agencies through an operational agreement which defines in what conditions the Project will be used for both agencies. This supplemental water will help the District meet its annual water needs as it reduces groundwater withdrawals of the over-drafted Soquel-Aptos area to prevent seawater intrusion. This supplemental water will also help the City meet the water needs of its service area during meteorological and hydrological drought periods[1]. In addition, supplemental water may be required as a result of a finalized and adopted Habitat Conservation Plan with Federal and state regulators should surface water reductions be required to protect endangered species[2].

1.2 Energy Study Process and Timeline

In May of 2009, the City of Santa Cruz, on behalf of **scwd²**, contracted with CH2MHill to develop an Energy Minimization and Greenhouse Gas Reduction Plan (Energy Plan) for the proposed Project. While CH2MHill's contract was terminated before a final Energy Plan was drafted, **scwd²** staff has been actively engaged in the study of the energy and GHG implications of the Project since that time. In January of 2011, the **scwd²** Task Force approved a scope of work prepared by the **scwd²** Technical Advisor, Kennedy/Jenks,

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[1] Meteorological Drought: "A period of abnormally dry weather sufficiently prolonged for the lack of water to cause serious hydrologic imbalance in the affected area." (Huschke, R.E., ed., 1959, Glossary of meteorology: Boston, American Meteorological Society, 638 p.)

Hydrologic Drought: "A period of below average water content in streams, reservoirs, Groundwater aquifers, lakes and soils." (Yevjevick Vujica, Hall, W.A., and Salas, J.D., eds., 1977, Drought research needs, in Proceedings of the Conference on Drought Research Needs, December 12-15, 1977, Colorado State University, Fort Collins, Colorado, 276 p.)

[2] See April 5, 2011 Santa Cruz City Council Habitat Conservation Plan Update

to formally manage the remainder of the energy study process (to be referred to as Energy Study). To accommodate for potential future regulatory and carbon reduction technology changes, **scwd²** staff will draft the final Energy Plan document upon successful completion of EIR certification and prior to Project Approval.

1.3 Purpose and Goals of Energy Minimization and Greenhouse Gas Reduction Plan

The energy requirement of seawater desalination and associated greenhouse gas emissions (GHGs) are among the key issues in the evaluation of the proposed Project. **scwd²** is committed to thoroughly studying and managing these potential effects. As noted above, an Energy Minimization and Greenhouse Gas Reduction Plan is being prepared by **scwd²** to ensure that advanced and energy efficient desalination technologies and approaches are identified and incorporated into the proposed project design, and to identify additional energy efficiency, renewable energy, and GHG reduction projects and programs to offset all or a portion of the direct and indirect GHG emissions associated with the Project (K/J TM1).

The Energy Plan will:

- Describe current GHG regulatory requirements and guidelines.
- Describe process taken to select GHG reduction objective of net carbon neutral for both agencies. Net carbon neutral means that there would be no net increase in GHG emission over existing conditions in the City and District service areas due to the collection and treatment of potable water.
- Calculate the estimated energy demands and GHG emissions from each agency's comprehensive water supply portfolio under existing conditions and after the Project is implemented, which include the Project and traditional supplies.
- Compare these emissions with the selected net carbon neutral GHG reduction objective to determine the amount of GHGs that is required to be reduced.
- Identify specific projects that will be pursued by either/both agencies to reduce GHGs and achieve the net carbon neutral objective.
- Develop an adaptation and contingency mechanism (aka Annual True-Up Approach) that will address how each agency will ensure adequate GHG reduction given potential changes in project performance, regulatory requirements, and other unforeseen conditions.

The Energy Plan ultimately will serve multiple purposes and inform several aspects of the Project evaluation. Specifically, elements of the Energy Plan contained in this technical memorandum will inform the EIR on the technical aspects of the energy and GHG effects of the Project. The Energy Plan, when complete, will guide agency policy makers in evaluating and selecting future GHG reduction projects and programs, and serve as an application reference document for permitting agencies requiring an energy and GHG reduction plan.

The Energy Plan will follow the content and requirements established by the California Coastal Commission during permitting for the Carlsbad desalination project. These include "a protocol for how to assess, reduce and mitigate the GHG emissions of applicants," and require the Energy Plan to be organized in the following manner:

1. Identification of the amount of indirect GHGs due to the Project's electricity use;
2. On-site and Project-related measures planned to reduce emissions; and
3. Off-site mitigation options to offset the remaining emissions to the adopted objective.

While the Energy Plan will lay the ground work for managing the GHG emissions of the Project, the City and the District will ultimately be responsible for developing their individual GHG reduction strategy for meeting their net carbon neutral GHG reduction objective.

1.4 Purpose of this Technical Memorandum

This Technical Memorandum distills all relevant information from the in-progress Energy Plan that is needed to support the EIR and will be broken into the following sections:

- Review of the relevant regulations and policies for desalination energy, greenhouse gases and climate change.

- The existing energy consumption and indirect GHG emissions for both agencies' collection, treatment and distribution of existing water sources. The existing conditions are based on information gathered for 2010, the year that the Notice of Preparation for the pending EIR was issued for the Project. (Existing direct emissions are not readily calculated or available for the existing systems and are considered negligible).

- The maximum energy and GHG emissions (indirect and direct) associated with operations of the Project.

- The energy minimizing devices that would be incorporated into the Project design.

- GHG reduction requirement to meet the selected objective of net carbon neutral.

- Basis for identifying, assessing and recommending feasible and reliable GHG reduction projects and programs that could ultimately be pursued to achieve the GHG reduction objective of the two agencies. This will include a discussion on the formation of an Energy Study Technical Working Group (ETWG), the process taken to narrow down the identified GHG reduction projects and programs, and the feasibility of each project to adequately reduce the GHGs associated with the Project.

- Annual indirect and direct GHG emission reduction accounting procedures and Annual True-Up Approach.

2. DESALINATION ENERGY AND GHG REGULATIONS AND POLICIES

The regulatory and legislative guidelines for desalination energy and GHG emissions are complex and varied. Agencies pursuing desalination must rely on direction from the California Environmental Quality Act, legislative guidelines, legal precedence, and regulatory agencies to define energy minimization and GHG reduction requirements and other potential measures. The following section describes current applicable energy minimization and GHG reduction guidelines regarding seawater desalination. These guidelines frame the study and management of the energy consumption and associated GHG emissions of the Project.

2.1 California Environmental Quality Act

The California Environmental Quality Act (CEQA) requires that the potential environmental impacts of proposed projects be evaluated. The City and District are required to complete an Environmental Impact Report (EIR) that must include an estimation of the reasonable worst-case GHG emissions associated with the Project. The EIR must evaluate the GHG emissions and determine whether the Project would:

- Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment, or

- Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of GHGs.

Overall, the evaluation of GHG emissions in an EIR must determine whether a project's incremental contribution to global climate change would be cumulatively considerable. If so, the impact would be considered significant under CEQA.

During the CEQA environmental review process, agencies typically rely on evaluating the environmental impact of a Project on a particular resource area by comparing the effect to a qualitative or quantitative threshold of significance (TOS). The recently amended CEQA Guidelines do not identify a threshold of significance for project-related GHGs; rather, it requires the lead agency to consider whether project emissions exceed a threshold of significance that the lead agency determines applies to the project. Lead agencies (such as the City and District for the proposed Project) can develop their own thresholds or rely on thresholds that have previously been adopted or recommended by other agencies or experts.

Currently, thresholds that have been adopted vary based on agency and region. However, no GHG threshold of significance has currently been adopted in the Santa Cruz region. The Monterey Bay Unified Air Pollution Control District (MBUAPCD) currently does not have thresholds but is in the process of considering a range of potential thresholds.

Furthermore, thresholds that have been adopted in neighboring regions may or may not apply to the evaluation of the Project. The nearby Bay Area Air Quality Management District (BAAQMD) has a threshold of 10,000 metric tons of equivalent carbon emissions (MT CO_2) per year for stationary sources or 1,100 MT CO_2 for non-stationary sources. The San Joaquin Valley Air Pollution Control District (SJVAPCD) guidance states that a project is "less than significant" if Best Performance Standards are implemented, or otherwise a project must demonstrate a 29-percent reduction in GHG emissions, from business-as-usual, consistent with emission reduction targets established in California's Air Resources Board's (CARB) Assembly Bill 32 (AB 32) Scoping Plan (for more information about AB 32, see Section 2.2).

The **scwd²** CEQA and permitting consultants, URS Corporation and Dudek respectively, were tasked with researching the feasibility of using an existing or developing a new TOS in the evaluation of GHG emissions of the proposed Project. Their work, outlined in the referenced Memoranda, identified the considerable obstacles and limitations associated with either of those alternatives. Therefore, the EIR will not identify a numerical TOS for GHG emissions. Instead, the approach will be to minimize the energy requirement of the Project as feasible and also to identify a group of potential and feasible GHG reduction projects and programs that could be implemented to ensure that no net increase in GHG emissions would result from the Project. This objective is called "No GHG Increase". It is sometimes also referred to as "net carbon neutral".

2.2 AB 32 and City of Santa Cruz Climate Action Plan

In 2006, Governor Schwarzenegger signed into law California Assembly Bill 32: Global Warming Solutions Act (AB 32). AB 32 sets reduction objectives for direct emitters of GHGs and requires mandatory reporting only for facilities with direct emissions greater than 25,000 metric tons, facilities with 1MW or more cogeneration, and other specific facilities that do not apply to the proposed Project. Therefore, the proposed Project does not have any specific AB 32 compliance requirements.

However, while the Project is not required to comply with AB 32 directly, the City of Santa Cruz voluntarily complies with certain aspects of AB 32. In 2010, the California Air Resources Board (CARB), which is tasked with implementing AB 32, prescribed GHG reduction objectives to regional governments. These prescriptions are the regional benchmarks from which to track local reductions (City of Santa Cruz

Climate Action Program, 2012). Although most of the municipal reduction recommendations are currently voluntary, City's may elect to initiate Climate Action Programs to set local reduction objectives and reduction standards. These objectives and standards can include the 2008 CARB Climate Change Scoping Plan water energy efficiency programs and water supply related GHG reductions.

In a proactive response to the CARB recommendations and as part of their 2030 General Plan process, the City of Santa Cruz initiated a Climate Action Program to set baseline emissions for Santa Cruz municipal GHGs and to develop a comprehensive reduction plan to meet and exceed the prescribed AB 32 objectives. The adopted Climate Action Program sets a goal to reduce City-wide GHG emissions 30% by 2020 and 50% by 2050 (compared to 1990 levels). The addition of desalination as a supplemental supply has the potential to increase the energy requirement to collect and treat potable water and, as a result, increase GHG emissions if the Project is approved and built. Therefore, as with any new project being pursued by the City, understanding how operations the Project fits into the goals established by AB 32 and the City of Santa Cruz Climate Action Program is essential.

2.3 Resource Agencies and Permitting Requirements

The Project will be required to apply for permits from various regulatory and resource agencies. The California Coastal Commission (CCC) and California State Lands Commission (CSLC) have jurisdiction over aspects of the Project and will likely require the evaluation and reduction of energy consumption and GHG emissions at some level.

With regard to the CCC, Section 30253 of the Coastal Act indicates that "new development shall… minimize energy consumption." Guidance from the CCC in a March 2004 document entitled "Seawater Desalination and the California Coastal Act" also indicates that "energy consumption of new development be minimized." Although there are references to energy minimization in the Coastal Act, it does not specifically discuss GHG emission reductions (K/J TM1).

The CSLC has permitting authority over the wastewater outfall which will include the brine discharge as well as the seawater intake if the intake structure is not located within CSLC sovereign lands granted back to the City. While the CSLC does not have any specific policies or regulations pertaining to energy minimization and GHG reduction for new development projects, they rely on the CEQA evaluation to determine the significance of the energy and GHG effect. SLC would require, under their lease agreement, adequate mitigation if the GHG effect is determined to be significant.

Regardless of their specific jurisdiction, the CCC and CSLC have included energy minimization and GHG reduction in their permit requirements for other proposed California desalination projects in Carlsbad and Huntington Beach. Both projects, pursued by a private firm, Poseidon Resources, adopted a net carbon neutral GHG reduction objective. For the purpose of the **scwd²** Project, a net carbon neutral objective would mean that the Project would not increase the indirect and direct emissions associated with both agency's water supply portfolios from existing conditions. (See Section 3 for additional information about existing conditions.)

3. SCWD² SELECTED GHG REDUCTION APPROACH

Upon reviewing the current applicable energy minimization and GHG reduction guidelines as described above, staff quantified the not-to-exceed system-wide (all water sources considered, including desalination) target level of GHG emissions associated with an AB 32, City CAP and net carbon neutral objective. The following table outlines these target level emissions for the City and District. Direct emissions of the existing water supply systems will not be included as they are considered negligible.

Table 3-1: AB 32, City CAP and Net Carbon Neutral Reduction Target (Not To Exceed) Levels		
Potential GHG Reduction Objective	Annual GHG Reduction Target Level ($MT/yr\ CO_2$)	
	City	District
AB 32	1,524	871
City CAP	1,066	N/A
Net Carbon Neutral	846	536

Source: K/J Source: K/J Energy Projections and Potential Greenhouse Gas Reduction Goals

After several months of careful analysis and interpretation, the governing bodies of both agencies adopted a net carbon neutral reduction objective for the Project. Therefore, the CEQA analysis will measure the GHG emissions of the Project in relation to the net carbon neutral not to exceed target levels. See February 21, 2012 District Board meeting, February 28, 2012 City Council meeting, and March 21, 2012 **scwd²** Desalination Task Force meeting staff reports and minutes for more information on adoption of net carbon neutral objective.

4. EXISTING 2010 ENERGY CONSUMPTION AND GHG EMISSIONS

As mentioned in the previous section, the energy and GHG effects of the Project will be assessed in relation to existing conditions for both agencies. Under CEQA, the evaluation in the EIR needs to determine the extent to which the project would increase or reduce GHG emissions as compared to the existing environmental setting at the time that the Notice of Preparation (NOP) for the EIR was published, which was in 2010 for the Project. Specifically, metered annual flows and PG&E electrical consumption were compiled from 2010. The published 2010 PG&E Emissions Factor, 444.46 lbs CO^2/MWh, is used to determine the existing indirect GHG emissions associated with each agency's traditional water supply collection and treatment.[3]

The 2010 NOP year will be considered the CEQA existing condition for the Project in all calculations. Based on the following equations (to be referenced as Energy Equation and GHG Equation), the existing treated water supply, energy and indirect emissions for both agencies are documented in Table 4-1.

Energy Equation: $$TE\left(\frac{MWh}{Yr}\right) = TWS\left(\frac{MG}{Yr}\right) \times \frac{1{,}000\ kgal}{MG} \times PF\ \left(\frac{kWh}{kgal}\right) \times \frac{1\ MWh}{1{,}000\ kWh}$$

GHG Equation: $$GHGs\ (MT\ CO2) = TE\ \left(\frac{MWh}{Yr}\right) \times EF\left(\frac{lbs\ CO2}{MWh}\right) \times \frac{1\ MT\ CO2}{2{,}204.6\ lbs\ CO2}$$

Where:

$TE_{surface\ or\ ground}$ = Total energy (calculate separately for type of supply: surface and ground water)

$TWS_{surface\ or\ ground}$ = Total water supplied from source

$PF_{surface\ or\ ground}$ = Power Factor for each supply source

GHGs = Total indirect greenhouse gas emissions

EF =PG&E GHG Emissions Factor (2010 for existing conditions)

[3] PG&E's published Emissions Factor for 2010 is noted interchangeably as CO2/MWh and CO2e/MWh. For the purpose of the technical memorandum, CO2/MWh will be used for the Emissions Factor.

Table 4-1: Existing Treated Water Supply, Energy and Power Factors								
Agency	$TWS_{surface}$ (MGY)	$TE_{surface}$ (MWh/Y)	$PF_{surface}$ (kWh/Kgal)	TWS_{ground} (MGY)	TE_{ground} (MWh/Y)	PF_{ground} (kWh/Kgal)	GHGs Indirect Emissions (MT CO_2)	Total Combine Existing 2010 Emissions (MT CO_2)
City	3047	3753	1.23	151	431	2.85	844	1378
District	0	0	0	1332	2647	1.99	534	

5. MAXIMUM ENERGY AND GHG EMISISON PROJECTIONS

Direct emissions attributed to the construction and annual operations of the Project will not be calculated in this report. These emissions will generally be the result of the operations of typical construction equipment, testing of emergency generators, commuter vehicles, delivery trucks, and other on-site mobile sources. However, all of the direct emissions associated with the construction and annual operations of the Project will be estimated in the EIR, compiled and included in the Project's Energy Plan and Annual True-Up Approach. More information on the true-up process is included in Section 6.

The calculations of the energy and indirect GHG emission projections for the Project running at full capacity require the integration of a number of assumptions. As indicated previously, the EIR evaluation will determine the extent to which the project would increase or reduce GHG emissions as compared to the existing environmental setting. The addition of desalinated product water to the water supply portfolios of both agencies results in changing operations of traditional sources (e.g., reduced groundwater pumping) that, in turn, reduce energy use and GHG emissions of those traditional sources. Therefore, in order to provide a comparison of the effects of the project against existing conditions under CEQA, the GHG emissions associated with the total water supply portfolio of each agency in 2010 (surface and groundwater production) will be compared to the GHG emissions associated with the total water supply portfolio (surface, groundwater and supplemental desalination production) in the assumed start year, 2016. Using this approach, the net increase in energy use and associated GHG emissions can be determined. The analysis will center on two possible supply production scenarios: normal/average rainfall conditions and drought conditions. The projected energy and GHG emissions associated with both agencies' water supply portfolios will be calculated based on the same Energy Equation and GHG Equation outlined in Section 3 above for existing conditions, with estimated 2016 flows and PG&E emissions factor.

Each variable of the equations for the future condition (2016) will be defined in the following subsections.

5.1 Future Demand Projections

To calculate the total projected flow from each source (surface water, groundwater, and supplemental desalination), expected 2016 system-wide demand is estimated using each agency's published 2010 Urban Water Management Plan (UWMP) system-wide demands. No modifications will be made for additional conservation or growth, over those assumed in the UWMPs. Years in between published five year increments are calculated assuming a linear relationship between data points.

Table 5-1: Future Demand Projections, 2015-2020						
Agency	**Projected System-Wide Demand (MGY)**					
	2015*	**2016**	**2017**	**2018**	**2019**	**2020***
City	3,684	3,717	3,749	3,782	3,814	3,847
District	1,450	1,446	1,443	1,439	1,435	1,432

Source: 2015 and 2020 numbers taken from District and City 2010 UWMPs.

5.1.1 Normal/Average Rainfall Conditions

Under normal or average rainfall conditions, demand is expected to be consistent with each agency's UWMP demand projection for 2016.

5.1.2 Drought Conditions

System-wide demands will decrease in drought because of an assumed 15% curtailment requirement. Curtailment would happen typically between May and October, months that on average account for approximately two thirds of the total annual demand for both agencies. Therefore, it is assumed that system-wide demand would decrease accordingly if 2016 is designated a meteorological or hydrologic drought year.

Table 5-2: Projected 2016 Demand, Normal and Drought		
Agency	**Projected System-Wide Demand (MGY)**	
	2016 Normal	**2016 2nd Year Drought**
City	3,717	3,346
District	1,446	1,289

5.2 Future Supply Projections

5.2.1 Desalination Priority of Use Allocation

If the Project is approved and constructed, each agency would meet the projected 2016 demands with a combination of traditional supply sources and supplemental desalinated water. For the purpose of the CEQA worst-case analysis, it is assumed that the Project would be running at full capacity (2.5 MGD) for the 365 days in 2016, resulting in a total desalination supply of 913 MG. Because the Project would be running at full capacity, it is further assumed that the District would reduce groundwater pumping accordingly and the City would reduce surface water diversions accordingly to meet system-wide demand. This may or may not be the actual approach taken to supply water to customers in the future, but it does provide a worst-case analysis, based on the capacity of the Project.

The desalination production flow attributed to each agency during normal rainfall and drought years will follow the Priority of Use Schedule outlined in the operational Memorandum of Agreement (MOA) adopted by **scwd²** in 2010. Given the distinct water supply challenges facing each agency, the City and District intend to utilize the Project at different times. The operational MOA assigns the priority of use of the Project to each agency on an annual basis based on climate conditions. Generally, the City would have first priority during dry months and the District would have first priority during wet months. The purpose of the MOA is two-fold: to assign independent or shared first priorities and to designate the maximum production flow rate that the agency may elect to utilize during their respective first and second priority allocation. The following table summarizes the annual operational MOA priority of use schedule.

Table 5-3: Project Production Priority of Use Schedule in MGD						
	January	**February**	**March**	**April**	**May**	**June**
1st Priority Quantity	Soquel Creek 2.5	Soquel Creek 2.5	Soquel Creek 2.5	Shared: 1.25 each	Santa Cruz 2.5	Santa Cruz 2.5
2nd Priority Quantity	Santa Cruz 2.5	Santa Cruz 2.5	Santa Cruz 2.5	Shared: 1.25 each	Soquel Creek 2.5	Soquel Creek 2.5
	July	**August**	**September**	**October**	**November**	**December**
1st Priority Quantity	Santa Cruz 2.5	Santa Cruz 2.5	Santa Cruz 2.5	Santa Cruz 2.5	Shared: 1.25 each	Soquel Creek 2.5
2nd Priority Quantity	Soquel Creek 2.5	Soquel Creek 2.5	Soquel Creek 2.5	Soquel Creek 2.5	Shared: 1.25 each	Santa Cruz 2.5

Source: 2010 **scwd²** Memorandum of Agreement

5.2.2 Desalination Supply: Normal and Drought Conditions

For the purpose of the worst-case CEQA analysis described above, under normal/average rainfall conditions, the District is expected to utilize the Project at maximum capacity for the entire year. This would result in a total allocation of 913 MG of desalinated water to the District for 2016.

For the purpose of the worst-case CEQA analysis, under drought conditions, both agencies are expected to utilize the Project at their maximum first priority allotment for the entire year. This would result in a total allocation of 378 MG for the District and 535 MG for the City for 2016.

Under typical or average operating conditions, the City and District expect to utilize and operate the Project at roughly half capacity. The City would operate the Project at full capacity during its first priority allocation, resulting in approximately 535 MG of desalination treated supply for typical drought years. The District would operate the Project at half capacity year round (if the City elects to not exercise its first priority allocation), resulting in approximately 456 MG of desalinated treated supply for average rainfall years.

5.2.3 Treated Water Supply: Normal and Drought Conditions

With the Project running at full capacity, the traditional sources of surface water and groundwater will be reduced accordingly to meet future demands. The following table outlines the expected annual production flows for all sources, including desalination, for a 2016 normal and drought year.

Table 5-4: Worst-Case Treated Water Supply: Normal and Drought Conditions 2016				
Source	Non-drought Flow (MGY)		Drought Supply (MGY)	
	City	District	City	District
Surface	3547	NA	2601	NA
Groundwater	170	534	210	911
SWRO Project	0	912	535	378
Total	3717	1446	3346	1289

Source: Total flows under normal conditions taken from City and District 2010 UWMPs

5.3 2016 Supply Source Power Factors

The Power Factors for surface water and groundwater sources are noted above in Table 4-1 and in Table 5-5 below. For the purpose of the CEQA analysis, it is assumed that the 2016 Power Factors for traditional sources will remain at 2010 existing levels. The desalination Power Factors for normal (standard) design and high efficiency design were calculated and outlined in CH2MHill's Technical Memorandum #1: Santa Cruz SWRO Energy Consumption Estimate Normal (Standard) Efficiency Design and Technical Memorandum #2: Santa Cruz SWRO Energy Consumption Estimate High-Efficiency Design (CH2MHill, 2009). An additional estimate for distribution pumping (energy required to accommodate the new supplemental supply of desalinated water in both the City and District water distribution and transmission infrastructure) has been added to the CH2MHill's estimations. All Power Factor estimations are used solely to approximate the energy associated with each agency's water supply portfolio in 2016 given potential future demand conditions. These estimations are used, in part, to calculate the total GHG emissions associated with the Project. The actual indirect emissions associated with the Project, once it becomes operational, will be calculated by using annual electrical consumption and the published PG&E Emissions Factor. The annual accounting and True-Up Approach is further described in Section 6.

The following table outlines the estimated Power Factors for all water sources including desalination. A discussion on the desalination Power Factor is included below.

Table 5-5: Supply Source Power Factors		
Source	Power Factors (kWh/kgal)	
	City	District
Surface	1.23	N/A
Groundwater	2.85	1.99
SWRO Project	15.00	15.00

Source: K/J Source: K/J Energy Projections and Potential Greenhouse Gas Reduction Goals

5.3.1 Normal (Standard) and High Efficiency Design Power Factors

In their Technical Memorandum #1 dated June 16, 2010, CH2MHill outlined the design assumptions included in their normal efficiency design power factor calculations. The assumptions included: "normal efficiency" unit processes, rotating machinery, motors and variable speed controllers. A direct-coupled Pelton Wheel, which has been adopted as standard design technology, would be utilized for energy recovery.

As noted in the memo, "The energy consumption estimate was conducted inclusive of all major energy consuming components of a typical desalination system, including an open seawater intake, raw water conveyance, pretreatment, desalination, post-treatment, concentrate discharge/disposal, filter backwash processing and dewatering, and conveyance to the existing water distribution system." **scwd²** plans on designing the Project with high-efficiency processes as available and feasible. In general, the high-efficiency design components will include: energy recovery devices of higher efficiency than the standard Pelton Wheel, variable speed pumps, high efficiency motors and enhanced reverse osmosis membrane materials. CH2MHill assumed certain high-efficiency design features would be included in the Project, which is the basis for the high-efficiency design power factor as referenced in their Technical Memorandum #2 dated (June 16, 2010). With these design features incorporated the desalination Power Factor of 15 kWh/kgal will be used for the Project, which is considered fairly conservative and within the accepted range for high-efficient desalination design. The Annual True-Up Approach, as described in Section 7, will address any differences between projection assumptions and actual design conditions with regard to desalination Power Factors as estimated by CH2MHill.

Table 5-6 Desalination Power Factors

Design Type	Power Consumption (kWh/yr)	Power Factor (kWh/kgal)
Standard Efficiency	11,193,600	20.44
High Efficiency	8,053,920	14.71

Source: CH2MHill TM1 and TM2

5.3.2 Distribution Pumping Power Factor

Additional or variable pumping will likely be required to accommodate the new supplemental supply of desalinated water in both the City and District water distribution and transmission infrastructure. The additional pumping is assumed to be exclusively at the existing Morrissey Pump Station within the City service area and the McGregor Pump Station in the District service area. Both of these pump stations would be upgraded with the Project. The estimated additional energy associated with upgrades to the Morrissey and McGregor Pump Stations is approximately 0.02 KWh/kgal. However, required additional distribution pumping could exceed this estimated value. To be conservative, the high-efficiency desalination Power Factor of 14.71 kWh/kgal (see Table 5-6 above) will be rounded up to 15.00 kWh/kgal. This figure will be used to incorporate any additional unforeseen pumping requirements that may occur with the Project. (K/J TM1)

5.4 Energy Consumption Projections

Total energy consumption projections are calculated using the Energy Equation presented in Section 3 above.

With total flows from each supply source as noted in Table 5-4 as well as the calculated Power Factors for surface water, ground water and desalination, the resulting total 2016 energy requirements for both agencies' total water supply portfolios are noted below in Table 5-7.

Table 5-7: Energy Consumption Projections for 2016							
Normal/Average Rainfall Conditions				Drought Conditions			
City	Flow (MGY)	Power Factor (kWh/kgal)	Total Energy (MWh/yr)	City	Flow (MGY)	Power Factor (kWh/kgal)	Total Energy (MWh/yr)
Surface	3547	1.23	4369	*Surface*	2601	1.23	3204
Groundwater	170	2.85	485	*Groundwater*	210	2.85	599
SWRO Project	0	15.00	0	*Desal*	535	15.00	8025
Total	3717		4854	*Total*	3346		11,828
District	Flow (MGY)	Power Factor (kWh/kgal)	Total Energy (MWh/yr)	District	Flow (MGY)	Power Factor (kWh/kgal)	Total Energy (MWh/yr)
Surface	0	N/A	0	*Surface*	0	N/A	0
Groundwater	534	1.99	1061	*Groundwater*	911	1.99	1810
SWRO Project	912	15.00	13,680	*Desal*	378	15.00	5670
Total	1446		14,741	*Total*	1289		7480

5.5 Maximum Indirect Emission Projections and Reduction Requirements

Estimated 2016 indirect GHG emissions are calculated using the GHG Equation presented in Section 3 above.

The estimated 2016 PG&E Emissions Factor was taken from PG&E's Greenhouse Gas Emission Factors Info Sheet, which was last updated on April 8, 2011. According to PG&E, by using the California Public Utilities Commission (CPUC) GHG Calculator, they expect their 2016 Emissions Factor to decrease to 370 lbs CO_2/MWh to meet AB 32 objectives.

Based on an Emissions Factor of 370 lbs CO_2/MWh, the maximum net increase in indirect GHG emissions is outlined in the table below.

Table 5-8: Maximum Indirect GHG Emission Projections and Reduction Requirements, 2016			
Normal Conditions		Drought Conditions	
City	Indirect Emissions (MT CO^2)	City	Indirect Emissions (MT CO^2)
Surface	733	*Surface*	538
Groundwater	81	*Groundwater*	101
SWRO Project	0	*SWRO Project*	1347
Total	814	*Total*	1986
District	Indirect Emissions (MT CO^2)	District	Indirect Emissions (MT CO^2)
Surface	0	*Surface*	0
Groundwater	178	*Groundwater*	304
SWRO Project	2296	*SWRO Project*	952
Total	2474	*Total*	1256
Combined 2016 Water Supply Emissions	**3288**	**Combined 2016 Supply Emissions**	**3242**
2010 Existing Emissions	**1378**	**2010 Existing Emissions**	**1378**
Total Maximum GHG Reduction Requirement to Achieve Net Carbon Neutral	**1910**	**Total Maximum GHG Reduction Requirement to Achieve Net Carbon Neutral**	**1864**

6. GREENHOUSE GAS REDUCTION PROJECTS AND PROGRAMS

In addition to designing a high-efficient desalination facility, GHG reduction projects and programs in some combination will be implemented to reduce the GHG emissions of the Project. The GHG reduction project and program analysis was carefully documented in Kennedy/Jenks Technical GHG Reduction Project Assessment Process Report, prepared in September, 2012 (K/J TM2). The overarching goal of the evaluation was to identify real, verifiable and permanent GHG reduction projects and programs to ensure their feasibility in achieving the net carbon neutral reduction objective established for the Project. Because of the importance of this task, **scwd²** convened an Energy Study Technical Working Group (ETWG) to provide independent, scientific review and guidance on the identification, assessment and selection of potential GHG reduction projects. The ETWG included:

- James Barsimantov, Ph.D. (UCSC; EcoShift Consulting, Principal)
- Shahid Chaudry (California Energy Commission, Program Manager for Energy Efficiency Program)
- Ross Clark (City of Santa Cruz, Climate Change Coordinator; Santa Cruz County Commission on the Environment, Commissioner)
- Brent Haddad, Ph.D. (UC Santa Cruz, Founder/Director of Center for Integrated Water Research)
- Dan Haifley (O'Neill Sea Odyssey, Executive Director; Santa Cruz County Commission on the Environment, Commissioner)

- Lon House, Ph.D. (Water and Energy Consulting, Founder; UC Davis Energy Institute, Co-director of Hydro Power)

Other members of the community provided insight and feedback in addition to the ETWG. These participants included:

- Paul Brown (Recent UC Santa Cruz graduate)
- Joe Jordan (Ecology Action, Board Member)
- Kirsten Liske (Ecology Action, Vice President)
- Shawn McEachin (UC Santa Cruz student and ETWG intern)
- Rick Meyer (Home Energy Saving Analysts)
- Roxanna Pourzand (UC Santa Cruz student and ETWG intern)

The ETWG and additional community members brought a diverse set of expertise and perspectives to create an important intersection of technical and policy knowledge. Their collective evaluation of the potential GHG reduction projects and programs provided an additional level of scrutiny to the Energy Study process. The participation of the ETWG not only assisted staff and the Energy Study technical consultants in making sound judgments and recommendations, but also gave decisions-makers confidence in the process results.

6.1 GHG Reduction Project and Program Selection Process

The methodology followed to identify, assess and ultimately narrow down and select GHG reduction projects and programs is documented in K/J TM2. Summarized herein are the key process components and findings documented in K/J TM2 and manner in which the ETWG collaborated with staff and consultants to make decisions.

In general, the GHG reduction project and program selection process included the following steps:

- Assembly of an Energy Study Technical Working Group to provide guidance and feedback on the selection methodology and merits of the identified potential projects and programs.
- Identification of potential GHG reduction projects and programs using standardized eligibility criteria.
- Evaluation and assessment of potential GHG reduction projects and programs using standardized evaluation criteria.
- Condensation and grouping of potential GHG reduction projects and programs by applying weighted criteria and performing sensitivity analyses.
- Selection of preferred GHG reduction projects and programs.

6.1.1 ETWG GHG Reduction Project and Programs Workshops

The ETWG met on two different occasions to evaluate and select potential GHG reduction projects and programs. During two full-day workshop sessions, staff, consultants, ETWG members and other community participants (**scwd²** Energy Team) worked collaboratively to discuss and evaluate feasible projects.

During both sessions, the **scwd²** Energy Team came to consensus on the process for assessing, grouping and ultimately selecting potential projects. The culmination of the work was a group of 11 identified GHG reduction projects and programs which can, in many different combinations, effectively reduce the GHG effect of the Project to acceptable levels to meet the net carbon neutral objective of the Project.

6.1.2 Identification of Potential GHG Reduction Projects and Programs

Understanding the importance of implementing localized projects to the maximum extent feasible, the **scwd²** Energy Team identified potential GHG reduction projects and programs first within the Project facility boundary (Project boundary) and then searched outward to incorporate agency, regional, statewide and nationwide opportunities.

Within the Project boundary, **scwd²** is committed to minimizing energy consumption within the Project treatment operations by implementing similar types of efficiency design projects to those outlined in Section 5.3.1. In addition to maximizing treatment energy efficiency, additional potential GHG reduction projects and programs were compiled using standardized eligibility criteria.

To first be eligible for consideration, the potential GHG reduction projects and programs must meet the regulatory compliance (or eligibility) criteria as outlined in AB 32. In general, the same eligibility criteria are required in the voluntary GHG market. For the **scwd²** Desalination Program, although it is not expected that potential GHG reduction projects developed by the City or District would be traded beyond the program, it is recommended that each reduction project be treated as if it were going to qualify as a compliance reduction, and meet the established eligibility requirements. Also, any third-party reduction offsets or renewable energy credits purchased from the voluntary GHG market would need to meet regulatory compliance eligibility standards.

For the purpose of the **scwd²** Desalination Program Energy Study evaluation, potential GHG reduction projects and programs were only considered if they met the six eligibility criteria developed for the offset regulatory compliance market as described above. These eligibility criteria, which are further defined in K/J TM2 memo, include:

1. Additionality
2. Quantifiable
3. Enforceable
4. Real
5. Permanent
6. Verifiable

With those criteria in mind, the **scwd²** Energy Team identified nearly 50 potential projects for consideration. See K/J TM2 for additional detail on the 50 projects. For the purpose of the Energy Study, potential GHG reduction projects and programs were typically one of three types: water and energy efficiency projects, renewable energy generation projects, and GHG reduction/offset projects.

Water and energy efficiency projects and programs have existed and been put into practice for over thirty years. These types of projects and programs reduce energy and indirectly reduce GHG emissions by improving the efficiency of systems and equipment in our homes and businesses. These types of projects include: pump and motor replacement, refrigerator and hot water heater replacement, and water conservation programs.

Renewable energy projects typically generate energy without use of fossil fuels. These types of projects include: solar and wind energy, new hydroelectric, and micro-turbines. Some renewable projects use bio-fuels or fossil fuels more efficiently to reduce GHG emissions. These types of projects include: methane capture energy, waste to energy, or fuel cells that run off natural gas.

GHG reduction or offset projects directly reduce or offset GHG emissions by reducing the amount of fuel consumed, eliminating refrigerant GHGs, or adsorbing GHGs. Examples of GHG offset projects include: reductions in the use of fleet vehicle fuel, truck stop electrification that permits trucks to stop idling, and cooling system monitoring and maintenance programs to reduce chlorofluorocarbon (CFC) and perfluorocompound (PFC) releases, and carbon sequestration in forests or wetlands.

6.1.3 Evaluation and Assessment of Potential GHG Reduction Projects and Programs

During its first full-day workshop that took place in June 2011, the **scwd²** Energy Team confirmed project eligibility and used an overall project evaluation process as a guide to narrow the list of projects. The objective of the workshop was to prepare a short-list of approximately 10 to 15 potential GHG reduction projects and programs for further, more detailed evaluation. The overall evaluation criteria included:

1. Local Considerations
2. Energy Production, Energy Savings and GHG Reduction
3. Technical Maturity
4. Sustainability
5. Reliability and Operational Complexity
6. Cost / Cost Effectiveness

A list of 16 GHG reduction projects and programs was identified by the **scwd²** Energy Team for detailed evaluation. A detailed Project Assessment was drafted using a common template for each of the 16 identified projects to measure its feasibility to meet the **scwd²** Desalination Program GHG reduction objective of net carbon neutrality. The 16 projects are tabulated below and are available on the **scwd²** website at http://www.scwd2desal.org/Page-Energy.php.

Table 6-1: 16 Potential GHG Reduction Projects and Programs

PA #	Project Title
Water and Energy Efficiency Projects	
1	Additional Water Conservation Activities
2	Recycled Water Projects
3	Residential/Commercial Energy Efficiency and Renewables Rebates/Incentives
4	Graywater and Rainwater Programs
5	Improved Digester Mixing System at Santa Cruz WWTP
6	Energy Audit Recommended Improvements at Santa Cruz WWTP
7	Pump and Motor Efficiency Improvement Program
Renewable Energy Projects	
8	Food Waste to Energy Project
9	Renewable Energy Purchase Programs

Table 6-1: 16 Potential GHG Reduction Projects and Programs	
PA #	**Project Title**
10	Local Solar Projects
11	Fuel Cells
12	Microhydro at Graham Hill WTP and Newell Creek Dam
13	Hydropower Project at Lake Nacimiento
GHG Reduction and Offset Projects	
14	GHG Offset Purchases
15	Fleet Fuel Reduction Program
16	Carbon Dioxide Addition for Post-Treatment

6.1.4 Project Assessment Scoring and Ranking

The **scwd²** Energy Team developed evaluation criteria weightings and sensitivity analysis to illustrate the effectiveness of each of the 16 favorable projects to meet net carbon neutral objective and narrow the favorable projects to a manageable number of approximately 10.

The weightings were applied to each criterion to create a total score for each project. The total score identified the favorability of the project, with a higher score reflecting greater favorability. The Energy Team identified a proposed weighting range for each evaluation criterion. Based on feedback and approval from the Task Force, the range for each criterion was refined to a recommended weighting that reflected the priorities of the **scwd²** desalination program and its stakeholders.

A sensitivity analysis was conducted to understand the effect of shifting the weighting for each criterion. Projects that retained high scores under all or most sensitivity analyses were selected, and projects that had low scores were set aside.

The recommended weightings and sensitivity analyses are tabulated below.

Table 6-2: 16 Weightings and Sensitivity Analysis					
Evaluation Criteria	**Proposed Energy Team Weighting Range**	**Task Force Recommended Weighting**	**Sensitivity Analyses**		
			Cost-Focused	**Local-Focused**	**Other/Balanced**
Local Benefit	15 to 20%	20%	10%	50%	20%
Energy Produced or GHG Reduced	10 to 15%	10%	5%	10%	15%
Technical Maturity	15 to 25%	10%	5%	10%	15%
Sustainability	10 to 15%	5%	2.5%	2.5%	10%
Reliability and Operational Complexity	5 to 10%	5%	2.5%	2.5%	5%
Cost/Cost Effectiveness	15 to 50%	50%	75%	25%	35%
Total		**100%**	**100%**	**100%**	**100%**

6.1.5 Selection of 11 Feasible GHG Reduction Projects and Programs

During its second full-day workshop, the **scwd²** Energy Team reviewed and debated the results of the sensitivity analyses and selected 11 projects. The 11 projects were chosen because they are considered real, verifiable and permanent GHG reduction projects and programs. Each of the 11 projects was considered feasible to acquire, implement, and demonstrate reliable GHG reduction potential. They represent a range of feasible options that the decision-making bodies can ultimately consider to achieve the adopted objective of net carbon neutrality. Detailed analysis and discussion of individual project feasibilities are documented in K/J TM2. The 11 Projects are tabulated below:

Table 6-3: 11 ETWG Selected Projects and Programs		
Project Title	**Annual GHG Reduction Potential**	**Lifecycle GHG Reduction Cost ($/MT)**
Water and Energy Efficiency Projects		
High efficiency washing machine rebates (accelerated program)	453	600
Commercial and Residential Solar Incentive Program	246	~0
Implement advanced mixing technologies at SCWWTP	266	-45
Implement additional energy savings at SCWWTP	329	-215
Improve pump & motor efficiency (accelerated program)	29	980
Renewable Energy Projects		
Program to convert food waste to energy at SCWWTP	810	276
Invest in renewable energy projects instead of purchasing power from PG&E	Variable (as required)	Variable (as required)
Install local solar projects	750	580
Install micro-hydropower turbine at Graham Hill WTP and Newell Creek Dam	147	-390
GHG Reduction and Offset Projects		
Use Recovered CO_2 from local sources for desal process	70	475
Purchase certified GHG Offsets	Variable (as required)	15-50
Total GHG Reduction Potential	**At least 3,100 MT**	

Notes:
Assume Emissions Factor of 641 lbs CO2/MWh. Actual GHG reduction capacity will be contingent on the PG&E Emissions Factor for each year.
Negative lifecycle costs reflect a cost savings over the lifespan of the Project.

The 11 projects are not a definitive list of the projects and programs that could be implemented if the Project is approved and constructed. Rather, the above list represents a range of feasible projects and programs that the decision-making bodies can ultimately consider to achieve the adopted objective of net carbon neutral. Other feasible projects, if identified in the future, could also be considered.

An accounting and True-Up Approach will be implemented as part of the Energy Plan to ensure that the net carbon neutral objective is met annually. This accounting and true-up mechanism is outlined in the following section.

7. ANNUAL REDUCTION APPROACH, ACCOUNTING PROCEDURE AND TRUE-UP APPROACH

To ensure, with 100% confidence, that the components of the Energy Plan will have the ability to meet the net carbon neutral objectives for the lifespan of the Project, a standardized accounting procedure and True-Up Approach will be implemented and exercised on an annual basis. For the purpose of the CEQA evaluation, it is assumed that both agencies will meet the net carbon neutral objective with the purchase of certified offsets. However, both agencies may assemble a feasible and reliable portfolio of energy minimization and GHG reduction projects and programs to replace some or all of the GHG credit from certified offset purchases. This document will analyze one potential approach that can be adequately vetted and assessed to be included in the EIR. This approach or a different approach may be adopted by each agency during the Project approval process or as conditions of regulatory permits. However, additional CEQA documentation may be necessary if the reduction portfolio changes.

7.1 Optional Reduction Portfolio

As indicated above, for the purpose of the CEQA evaluation, it is assumed that both agencies will meet the net carbon neutral objective with the purchase of certified offsets. A feasible and reliable energy minimization and greenhouse gas reduction portfolio was also assembled as a viable option to the above approach to meet the Project's GHG reduction objective. The portfolio includes:

- Installation of photovoltaic panels on the available roof space of the desalination facility (K/J TM2: Project Assessment 10, CDM Smith Memo).
- Installation of micro-hydro turbines at Graham Hill Water Treatment Plant (GHWTP) and Newell Creek Dam (K/J TM2: Project Assessment 12).
- Existing photovoltaic panels at the Graham Hill Water Treatment Plant.
- The purchase of certified offsets.

As demonstrated in Table 5-8, to meet the Project objective of net carbon neutrality, a maximum 1907 MT of CO^2 must be reduced in 2016, the assumed start year of the Project. The following table demonstrates the GHG reduction potential of the above outlined optional portfolio to meet this specific objective.

Table 7-1: 16 GHG Reduction Portfolio Performance	
2016 Total Maximum GHG Reduction Requirement to Achieve Net Carbon Neutral (MT CO^2)	**1910**
GHG Reduction Project	**Total Reduction (MT)**
PV Panels on Desalination Facility	50
Micro-hydro at GHWTP and Newell Creek Dam	84
PV Panels at GHWTP	25
Certified offset purchase	1751
Total Indirect GHG Emissions in 2016 After Portfolio Implementation	**0**

Source: K/J TM2

Note: Total Reduction assumes a PG&E Emissions Factor of 370 lbs CO2/MWh

The outlined portfolio was chosen to demonstrate the ability of one portfolio option of the 11 **scwd²** Energy Team selected projects and programs to meeting the net carbon neutral objective of the Project. The selected projects are considered feasible to implement, offer time-tested GHG reduction and can be assessed within the Project EIR document for their own environmental impact potential. As planning and design of the Project progresses, it will be imperative to re-evaluate the feasibility and reduction potential of all 11 identified and selected projects and engage in further research to identify new technologies that may offer favorable options and results. The identification of a potential reduction approach for CEQA does not hinder each agency's ability to implement different GHG reduction projects and programs in the future. Rather, as mentioned above, it simply demonstrates the feasibility of the **scwd²** Energy Team endorsed Energy Plan components to meet the net carbon neutral objective.

7.2 GHG Accounting Approach

Direct and indirect emissions associated with the Project will be accounted for and reduced each year of operation. The recommended accounting approach will ensure accurate data is collected and the GHG emissions of the Project are reduced to acceptable levels each year. The overall accounting process will use the following equation.

Total Reduction Requirement = Future Year Water Supply Portfolio GHGs – 2010 Water Portfolio GHGs

Where:

Total Reduction Requirement = GHG reduction portfolio performance standard (level at which GHG reduction projects and programs must reduce to meet Net Carbon Neutrality)

Future Year Water Supply Portfolio = surface and ground water indirect emissions and desalination indirect and direct emissions.

2010 Water Supply Portfolio = surface and ground water indirect emissions

7.2.1 2010 Water Supply Portfolio

Existing emissions and Power Factors for traditional supply sources for both agencies are outlined in Table 4-1. The total 2010 existing indirect GHG emissions for both agencies combined is 1381 MT CO^2.

7.2.2 Future Year Water Supply Portfolio

In practice, future indirect emissions will be accounted for by compiling the annual PG&E meter readings for all water supply sources (surface, ground and desalination) and applying the published PG&E Emissions Factor for that year. This process will have to take place in arrears as PG&E's annual Emissions Factors typically take 12-14 months to be tabulated, confirmed by a third party, and published. Annual direct emissions associated with the Project will be estimated and added to the reduction equation.

Given the potential of an increased energy requirement to collect and treat traditional water supply sources in the future (future regulatory requirements may change surface or ground water treatment methods requiring additional energy), it is recommended that the traditional source Power Factor be calculated and noted each year to ensure the onus falls on the agencies, rather than the Project, to manage that potential impact. Practically speaking, if in any given year, the traditional source Power Factor is greater than the 2010 Power Factor, than measures should be taken to alleviate the burden of the additional traditional source energy consumption on the Project. This can be done by utilizing the Energy and GHG Equations.

Comparing the GHGs calculated by metered water supply flows and 2010 Power Factors to GHGs calculated with the standard method of reading the annual PG&E meters and applying the Emissions Factor alleviates the issue of changing future energy requirements for traditional water sources.

7.2.3 Total Reduction Requirement

GHG reduction portfolio projects and programs must be measured annually to determine their GHG emission reduction performance. For example, if implemented, the solar photovoltaic and the micro-hydro turbine electrical meters will be read annually and emission reductions will be calculated by applying the PG&E Emissions Factor. The purchase of certified offsets will be accounted for by a third party verification process to ensure GHG reduction.

7.3 Annual True-Up Approach

As with all long-term planning efforts, a number of educated assumptions must be made to estimate future conditions. The Energy Study made the following assumptions that will be confirmed and updated once the Project is operational.

1. Desalination Power Factor
2. Feasibility and performance standard of 11 **scwd²** Energy Team selected GHG reduction projects and programs that could be considered for implementation
3. Future PG&E Emissions Factors
4. Operation of the Project at full capacity to provide a worst-case analysis
5. Extent of use of traditional sources

Given the potential for any of those assumptions to change, a true-up contingency process will be utilized if, in any year, the implemented GHG reduction portfolio does not meet the net carbon neutral objective. If that situation were to arise, additional certified offsets will be purchased to make up the difference.

The projects annual GHG True-Up Report will be prepared and submitted to the appropriate regulatory agencies and kept on file at the City and District.

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