Climate Change and the Water-Energy Nexus: Statewide Opportunities to Reduce Greenhouse Gases and Adapt to a Changing Climate

The Water-Energy Team is one of eleven sector working groups under the Climate Action Team (CAT). Each group is tasked with implementing the various measures contained in the Air Resources Board's (ARB) 2008 Scoping Plan and the 2009 Adaptation Strategy. The Water-Energy Team (WETCAT) integrates regulation with State and Federal agency support for planning, research, data analysis, technical tools, and funding to leverage regional projects and programs to 1) achieve large water and energy savings and efficiencies; 2) reduce greenhouse gas emissions; and 3) reduce or eliminate risks from changing hydrological and ocean conditions. The WETCAT believes mitigating and adapting to climate change will occur most efficiently at the regional level where local water and energy agencies can efficiently pool resources and know-how to address issues that will inevitably cross local boundaries. State and federal agencies must play a strong role through planning, regulation, research and pilot projects; and by providing technical assistance, data gathering/analysis, and financial support to the most effective regionally-driven efforts. Following is a summary of the important programs in each of these areas.

Planning

California Water Plan: The California Water Plan provides a framework for the State's water management in the future. The Plan is updated every five years. In addition to water use changes driven by population and socioeconomic factors, Update 2009 presented analyses on how changes in temperature and precipitation patterns driven by climate change could affect water use in California by 2050. Update 2009 adopted the approach developed for the CAT 2009 to establish climate change scenarios. The 12 climate-change scenarios used for the CAT 2009 were derived from six GCMs (Global Climate Models) and two GHG emission scenarios.

Development of Water Plan Update 2013 due December 31, 2013, will quantify how future population and socioeconomic scenarios together with climate change scenarios may affect the water demands and water supply conditions and describe strategies that can be used to adapt to climate change. The updated Water Plan will include an implementation plan for recommendations, development of the California Water Management Progress Report, Sustainability Indicators, and Finance Plan. As part of the Sustainability Indicators effort, the increased energy use resulting from decreased groundwater levels may be assessed and the water footprint of production to that of consumption may be evaluated as an indicator of sustainable water use.

Key agencies: DWR and state agencies under the State Agency Steering Committee

Integrated Energy Policy Report: As required by statute, the California Energy Commission conducts "assessments and forecasts of all aspects of energy industry supply, production, transportation, delivery and distribution, demand, and prices." These assessments and forecasts are used to develop energy policies that conserve resources, protect the environment, ensure energy reliability, enhance the state's economy, and protect public health and safety." (Pub. Res. Code § 25301(a)). The assessments and recommended policies are contained in the Integrated Energy Policy Report, produced and adopted by the California Energy Commission every two years and an update every other year.

As one of the largest energy use sectors, the energy impacts associated with water delivery, treatment and use are considered. Over the last several cycles of the IEPR, the nexus between the water and energy sectors has been a focal point of the policy discussions and will continue to be so as needed to ensure that management of these two resources are coordinated.

Key agency: CEC

CPUC Water Action Plan 2010: Building upon the CPUC's initial 2005 Water Action Plan, the 2010 Plan continues the two fold goal of applying regulatory best practices from the investor-owned energy utilities to the investor-owned water utilities and to place water conservation at the top of the loading order as the best, lowest-cost supply. The CPUC has decoupled sales from revenues, instituted tiered rate structures, and updated water conservation rules and water service standards for its regulated investor-owned water utilities. As a result, investor-owned water utility conservation budgets have increased multiple times. A schedule has been established for general rate case filings, low-income ratepayer assistance programs are in place, and water/energy nexus programs have started.

Key agency: CPUC

Integrated Regional Water Management (IRWM): The IRWM Program is a collaborative effort to manage all aspects of water resources at a regional scale. IRWM differs from traditional approaches to water resource management by integrating all facets of water supply, water quality, flood/stormwater, and habitat management. A main focus of IRWM planning is diversification of a region's water portfolio so that multiple resource management strategies are employed in meeting future water supply, water quality, and environmental needs. IRWM Plans are currently being developed and implemented for regions covering approximately 90 percent of the state's population.

Key agencies: DWR, SWRCB, CPUC, Regional Water Management Groups

Strategic Growth Council (SGC): The SGC, which was created in 2008, is a cabinet level committee tasked with advising the Governor and Legislature on sustainable community development and to manage grants that support the same purpose. The SGC is charged with coordinating the activities of state agencies to: improve air and water quality, protect natural resources and agriculture lands, increase the availability of affordable housing, improve infrastructure systems, promote public health, and assist state and local entities in the planning of sustainable communities and meeting AB 32 goals. The SGC is therefore well positioned to support and facilitate water-energy programs and projects requiring coordination of multiple State agencies.

Key agencies: Cal/EPA, BTHA, CHHS, OPR, CNRA

Regulation

Renewable Energy Production: Renewable energy production is a key activity in the reduction of greenhouse gases. Certain opportunities exist to develop renewable energy resources co-located at water system infrastructure sites, including but not limited to in-conduit hydroelectric and biogas

generators. The WETCAT Scoping Plan measures included taking actions that lead to developing renewable energy projects on lands associated with California's state and local water infrastructure. To better understand this opportunity and any constraints that are currently preventing such development, the CEC, CPUC, the Association of California Water Agencies (ACWA) and several energy and water utilities surveyed water agencies with interest or capacity in developing renewable energy supplies associated with their facilities. The results of this effort identified several specific issues that can be addressed to facilitate greater renewable development at numerous sites statewide.

Key Agencies: CEC, CPUC, local/regional water agencies

Energy Efficiency: In September, 2009, the CPUC approved $3.1 billion for 2010-2012 Energy Efficiency Utility Programs to produce utility-estimated gross energy savings of 10,000GWh of electricity, 1982 peak MW (equivalent to avoiding nearly four 500 megawatt power plants), and 200 million therms of natural gas. These savings are estimated to avoid 4.9 million tons of CO2 emissions and create between 15,000 and 18,000 skilled green jobs. Using the Commission-approved California Energy Efficiency Strategic Plan Update of 2011, the CPUC will work with the investor-owned energy utilities and other market actors to implement the latter energy efficiency programs targeting the residential sector including low income households, as well as the commercial, industrial, agricultural, and heating, ventilation and air conditioning (HVAC) sectors. At present, both public/municipal and investor-owned water utilities are eligible to participate in particular aspects of the agricultural, commercial, and industrial energy efficiency programs as large-scale energy utility customers thereby offering the conjoined savings of water and energy in certain applications such as water and energy audits designed to identify and fund opportunities for leak loss detection and water systems improvement.

Key Agency: CPUC

Appliance and Building Standards: Since 1974, the Energy Commission has been tasked with establishing energy efficiency performance standards for appliances and California buildings. In recent years, the authority of the Energy Commission to set standards that also save water has been clarified and expanded (e.g., The Water Conservation in Landscaping Act of 2006 (Assembly Bill [AB] 1881, Laird, Chapter 559, Statutes of 2006) requires the Energy Commission, among other things and to the extent funds are available, to set performance standards and labeling requirements for landscape irrigation equipment to reduce consumption of energy or water.) As part of its current scoping process, the Energy Commission is considering what water-related energy efficiency opportunities should be pursued in the upcoming standards proceedings.

Key Agency: CEC

Recycled Water: The SWRCB adopted a Water Recycling Policy in 2009, to streamline permitting of recycled water projects, which in most regions will reduce GHG emissions compared with imported water and diversify the local water supply options. The policy established a mandate to increase recycled water use by 500,000 acre feet per year by 2030. In late 2010, the CPUC opened a year-long rulemaking to set a comprehensive policy framework for promoting the cost effective production and/or retailing of recycled water by Investor-Owned Water and Sewer Utilities.

DPH, with support from the SWRCB, will finalize regulations over the next few years for direct injection of recycled water into groundwater and for blending in reservoirs prior to distribution.

Key agencies: SWRCB, DPH, CPUC

Water Conservation: reduces demand for both water and energy, and thus serves to both mitigate and adapt to climate change. In November 2009 the goal to achieve a 20 percent reduction in urban per capita water use in California by 2020 became law. Agricultural entities are also required to apply efficient water management practices to reduce demand. In 2010, DWR developed a Methodologies Report for reducing urban per capita water use, and adopted a regulation for Industrial Process Water as required by SBX7-7. In 2011, DWR developed a methodology for calculating the urban water use target of SBX7-7.

By 2012, DWR will develop a regulation for agricultural water measurement and will also develop guidebooks to assist urban and agricultural water suppliers to prepare water management plans and comply with SBX7-7.

Key agencies: DWR, SWRCB, CPUC, CEC, DPH, ARB

Urban Storm Water Capture and Use: Like flood control, storm water in urban environments is largely treated as a safety and water quality risk, yet it can be a valuable water asset and can reduce dependence on imported water and related GHG emissions. Some counties and cities in the state have developed ordinances to encourage storm water capture and use; Regional Water Boards and the State Water Board are including hydro-modification elements in their storm water regulatory programs.

Key agencies: SWRCB, Regional Water Quality Boards, DWR, counties, cities

Research and Pilot Projects

Embedded Energy in Water Programs: At the end of 2009, the CPUC completed three pilot programs to test the potential to achieve meaningful energy efficiency savings while saving water or making water systems more efficient. For example, the CPUC's Embedded Energy in Water Calculator uses evaluated water savings and agency energy data to reliably estimate associated energy savings and program cost-effectiveness. In June of 2011 the CPUC released a draft report on whether embedded energy in water programs should be added to the mainstream energy efficiency portfolios. A wrap-up survey of the programs will be published later in 2011.

Key agency: CPUC

Co-Digestion Economic Analysis Tool (CoEAT): EPA is developing a tool that assesses the economic feasibility of food waste and fats, oils, and grease (FOG) co-digestion at wastewater treatment plants for the purpose of biogas production. EPA also developed a Waste to Biogas Mapping Tool which was created to connect organic waste producers and potential users (e.g. wastewater treatment facilities) for the purpose of biogas production through co-digestion.

Key agency: USEPA

Public Interest Energy Research Program (PIER): PIER's Environmental Area (or PIER-EA) was developed with a broad mandate to research the environmental effects of energy technology and energy production, delivery, and use in California. The ultimate goal of this program area is to enhance California's overall environmental quality. Legislation to continue this program is now being considered.

Key agencies: CEC, Resources

Flood Management: Changes in the timing and form of precipitation and associated runoff will impact operations and the hydrologic statistics used in flood planning, design, and forecasting activities. Traditional impacts analyses are not functional for flood management because of the event-based nature of floods and the fact that those event processes are not well-represented in global climate models. As a consequence, there is a need to create adaptive capacity for flood management to meet the challenges posed by climate change.

DWR is developing a pilot project with the US Army Corps of Engineers to determine the impact of potential climate change on Central Valley Hydrology Study (CVHS) products. The project will help inform the State of next steps to incorporate climate change into CVHS products. By 2012, DWR will: 1) develop hydrologic tools and products, including an updated Bulletin 195 for rainfall-depth-duration-frequency curves, that will include a 20th century trend analysis and methods to monitor for change in extreme precipitation statistics; and 2) compile catalogs of past observed atmospheric rivers and determine possible future characteristics of atmospheric rivers. By 2013, DWR will: 1) complete a modeling project for the Northern Sierra to determine how current and future storms can interact with the topographic characteristics of watersheds of the American, Yuba, and Feather Rivers to produce modeled flood flows sensitive to storm wind flow velocity profiles and directions; 2) install approximately $11 million in new monitoring instrumentation to observe elements of extreme precipitation events and monitor elevation transects of the snowpack.

Key agency: DWR

Sea level Rise Study: As called for by Executive Order S-13-08 and the State's Climate Adaptation Strategy, the National Research Council (NRC) has convened a panel to estimate future amounts of sea level rise in 2030, 2050, and 2100. DWR is acting as the project manager for this study of West Coast sea level rise. Until this study is complete in 2012, several State agencies, under the auspices of the Coastal and Ocean Subgroup of the Governor's Climate Action Team (CO-CAT) have developed interim guidance on sea level rise to guide agency decision-making. OPC plans to update its existing interim guidance periodically, changing the role of the guidance document from temporary to that of an ongoing document. Completion of NRC's report is expected in early 2012, at which time decisions would be made regarding adoption of its findings through an update of current interim guidance. Individual State agencies will need to decide how to apply NRC's findings and the CO-CAT guidance specifically to their own programs.

Key agencies: DWR, OPC, SWRCB, DOT, CEC, Oregon, Washington, Army Corps, USGS, NOAA

California-Federal Agency Climate Adaptation Working Group: DWR has established an informal California-federal agency climate adaptation working group, which is largely focused on research activities. Several new federal programs—such as the Department of the Interior Climate Science

Centers, the National Oceanic and Atmospheric Administration (NOAA) Climate Service, and NOAA's California pilot project for the National Integrated Drought Information System—offer the opportunity to partner on mutually beneficial activities, which we expect to develop over the next several years. DWR, for example, is funding tree-ring reconstructions of streamflow in the Sacramento-San Joaquin and Klamath River basins for drought planning purposes, an effort that could be expanded with a federal funding contribution.

Federal partnership opportunities exist in the emerging research area of climate and hydrology non-stationarity, extreme events, and adaptation approaches, a topic key for flood management and stormwater applications. DWR is now convening several workshops with federal agencies and academic researchers to identify specific useful research projects, and will seek funding sources/collaborations for promising applications. It is expected that seasonal to annual weather forecasting will be one component of the research approaches for dealing with non-stationarity.

Key agencies: DWR, NOAA

Delta Levees Special Projects Program- Ecosystem Restoration: Restoration of contiguous tidal marsh habitats at Dutch Slough and Ironhouse Sanitary District property; Subsidence reversal and carbon sequestration research projects on Sherman and Twitchell Islands; Tidal marsh, wetlands and upland habitat restoration on Miens Landing (Suisun Marsh); Delta Habitat Restoration and Invasive Vegetation Removal with Solano County Delta Habitat Restoration Partnership

Key agencies: DWR, NOAA

Investigation of potential ecosystem benefits of restoring degraded meadows in the Sierra Nevada: Montane meadow communities have the potential to play a substantial role in runoff hydrology by reducing early-season peak flows and extending late-season base flows, and also sequester carbon in soils and provide critical wildlife habitat. However, many of the meadows in the Sierra Nevada have been degraded by erosion and no longer provide these ecosystem functions. This three-year research project is investigating the potential effects of restoring meadow communities by: quantifying the acreage of Sierra Nevada meadow communities, assessing the extent and degree of degradation of meadows, and investigating the hydrology of degraded vs. restored meadows. The results will provide hard data to address a potentially cost-effective method of improving water management while simultaneously improving wildlife habitat quality and creating potential carbon sequestration sinks. Final results of investigations will be available in 2013.

Key agencies: USFS, USGS, UC Merced, UC Davis, UN Reno, DWR

Technical Assistance

Climate Change Guidance for Urban and Agricultural Water Management: DWR has developed a report on methodologies for calculating baseline and compliance urban per capita Water Use, and published a guidebook to assist urban water suppliers in preparing Urban Water Management Plans. In 2011, DWR will complete an IRWM Guidebook to assist urban water suppliers in preparing climate change strategies. DWR will also prepare an Agricultural Water Management Planning

Guidebook (no deadline is specified in Legislative Bill SBX7-7) in which the climate change adaptation strategies will also be documented for agricultural water suppliers to use.

Key agencies: DWR**,** CEC**,** USEPA**,** SWRCB

The CA Water and Energy Program (CalWEP): has been established to assist water and wastewater utilities identify and develop energy and water efficiency, and renewable energy projects. To date, 13 water and wastewater agencies have conducted water and energy audits, and the next audit is scheduled in Fresno. A report on these audits will be published in October/November 2011.

Key agency: USEPA

Funding

California Energy Efficiency Programs: As outlined above, the CPUC oversees the portfolio of energy efficiency programs currently administered by the investor-owned energy utilities including energy audits and customized energy efficiency projects implemented by their commercial public /municipal and investor-owned water sector customers. Utilizing both surcharge and energy procurement funds, the Energy Efficiency Program brings approximately $400 million dollars annually to fund energy efficiency programs and projects.

Key agency: CPUC

IRWM Grants: In 2011 and early 2012, DWR will award a total of $30 million in grant funding to support the development, improvement, and enhancement of IRWM plans to address the current plan standards, including a requirement to address climate change adaptation and mitigation.

In 2011, DWR will award approximately $200 million in grant funding to support the implementation of IRWM programs and projects that address the long-term water needs of California; in 2012, DWR plans to award an additional $100 million.

In 2012, DWR will award about $15 million grant funding for Agricultural Water Use Efficiency, energy use efficiency, and GHG emissions reduction.

Key agencies: DWR, SWRCB

Public Goods Charge for Water/Energy: AB 32 charged the WETCAT with developing a Public Goods Charge (PGC) for water/energy. The CPUC and DWR worked with the UC Berkley Goldman School of Public Policy Analysis on a 2010 report that recommended a fee on water to support local IRWM water/energy projects. CPUC will work with the other WETCAT member agencies to evaluate the merits of increasing funding for the AB32 Scoping Plan water and energy measures by evaluating the water utility sector's participation in current energy efficiency programs; through possible amplifications of the existing Energy Efficiency surcharge bringing increased water sector funding to water and energy projects, and/or through the creation of a surcharge solely dedicated to the water utility sector.

Key agencies: CPUC, CNRA, CEC

Public Goods Charge for Energy: The Administration and the legislature are considering renewal of the existing energy PGC program. If water projects are to be considered, a methodology for quantifying cost effectiveness of water/energy projects and flexibility in assigning benefits will be essential. Additionally, most energy efficiency projects are funded through procurement.

Key agency: CPUC

Data/Analysis/Information

Climate Data: Monitoring networks for water resources management were developed for specific purposes related to water management and not necessarily for monitoring climate change. As such, there is concern that we are not collecting the data we need to monitor for and track climate change elements that will have a significant impact on water resources management. Specific needs include augmenting existing networks and creating new monitoring efforts that can incorporate the latest technologies in ground-based and remote sensing instruments.

The State plans to expand existing programmatic activities that engage federally sponsored research into monitoring technologies for water management, through agencies such as the National Oceanic and Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA). DWR also plans to leverage opportunities to work with the US Geological Survey to collecting data that can inform water managers of potential changes in watershed yield due to changing climate conditions. Local entities can engage in this process through participation in citizen monitoring networks as part of their regional water management plans.

Key agency: DWR

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