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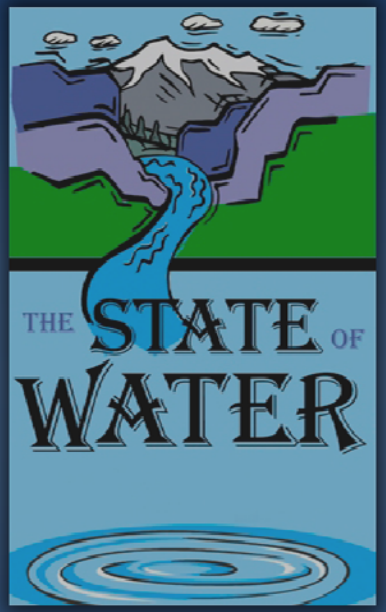
Climate Action Plans



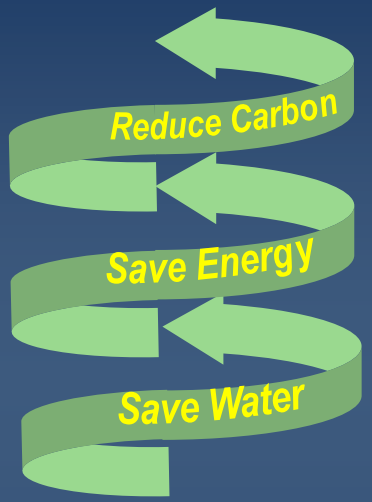
Alan Zelenka

Energy Services Leader

Eugene, Oregon

The Water-Energy-Carbon Nexus

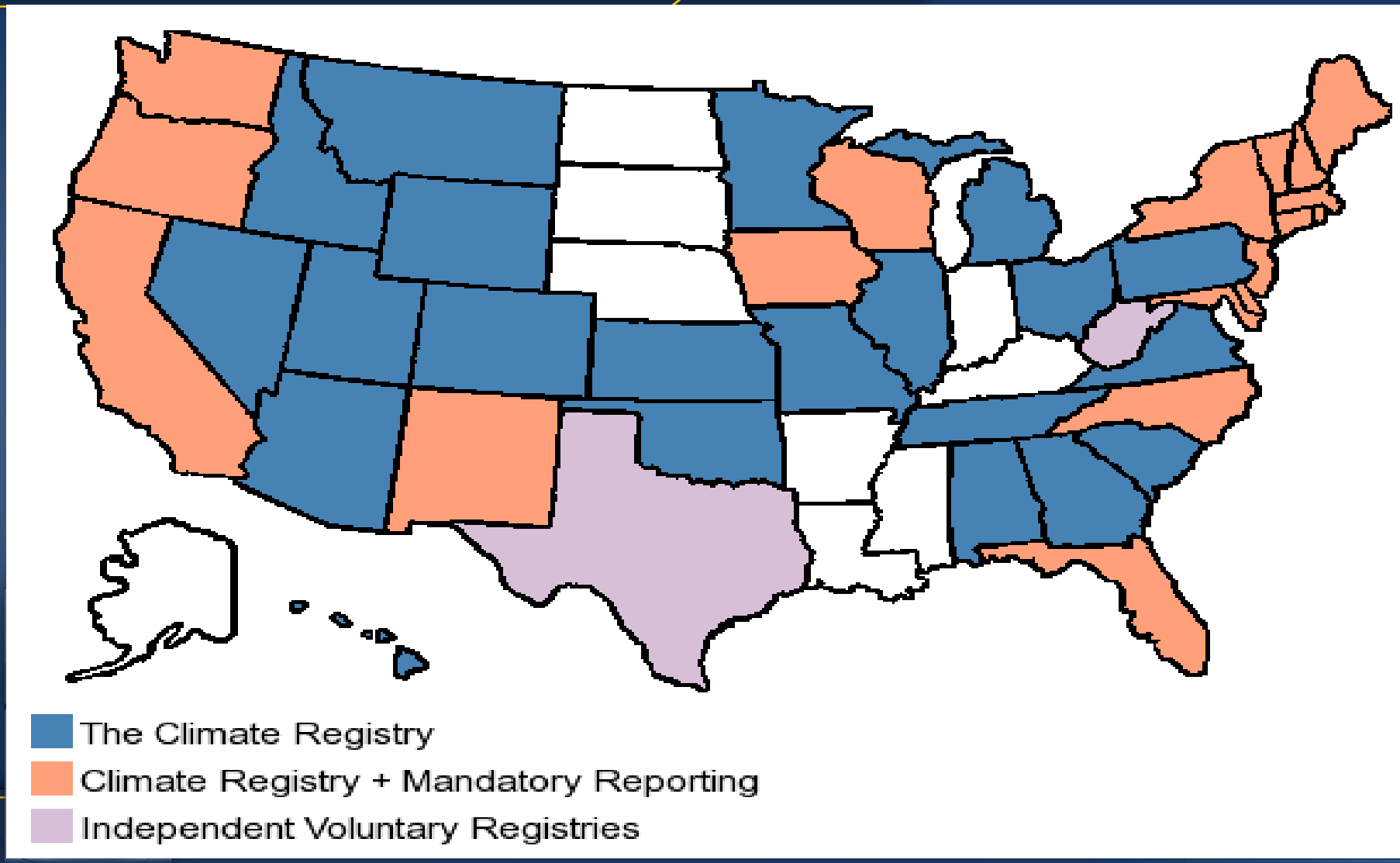
- **Energy is needed to produce potable clean water**
- **Energy production creates carbon emissions**
- **Saving or creating water reduces energy consumption, lowers carbon emissions, and saves money!**
- **To navigate the carbon world you need to do a GHG Inventory and a Climate Action Plan**



Climate Action Plan Steps

1. **Conduct a GHG Inventory & Reporting**
2. **Identify & Evaluate GHG Mitigation Options**
3. **Chose Best & Most Cost-Effective Options**
4. **Implement the Plan**
5. **Annually Update & Renew the Plan**

States with Mandatory Reporting



Oregon Climate Change Law

- HB 3543 - August 2008
- Establishes GHG reduction goals
  - 10% below 1990 levels by 2020
  - 75% below 1990 levels by 2050
- Created the Global Warming Commission
  - Recommend ways to achieve the reduction goals
  - Examine implementation of a cap & trade system
  - Monitor impacts of global warming
- Created Oregon Climate Change Research Institute
  - Climate change research
  - Information clearinghouse
  - Technical assistance to local governments
  - Support the Global Warming Commission

Oregon Mandatory Reporting Law

- EQC adopted reporting rules on October 23, 2008
- Begins in 2010 for previous year's emissions if emissions are 2,500 MTCO2e or more
- Affect 150-250 permitted facilities in Oregon
- All Title V and selected ACDP categories
- Certain *non-permitted* facilities must register and report emissions of GHGs beginning in 2011
  - Landfills and wastewater treatment plants (maybe)
  - Electric generating units
  - Electricity and natural gas transmission and distribution systems

From DEQ Nov 08 Workshop

Washington Climate Change Law

- **HB 2815 signed into law in 2008**
- **Establishes GHG reduction goals**
  - **1990 levels by 2020**
  - **25% below 1990 levels by 2035**
  - **50% below 1990 levels by 2050**
- **Increase the number of green jobs from 8,400 (2004) to 25,000 by 2020**
- **Decrease expenditures on imported fuel by 20% by 2020**
- **Plan to meet the targets & list promising strategies**
- **Cap & Trade legislation for 2012**

Washington Mandatory Reporting Law

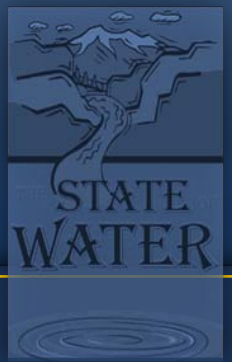
- ECY to draft mandatory reporting rules
- Operations with emissions initially > 20,000 MTCO2e (second year >10,000 MTCO2e)
  - refineries, pulp and paper mills, cement kilns, some lumber mills, large food processors, and entities using fossil fuels to generate power, steam, heat or cooling
- Fleets > 2,500 MTCO2e
- Report 6 Kyoto GHGs, Direct & Indirect emissions
- Use The Climate Registry (TCR) protocols
- Report in 2010 for 2009 emissions

Greenhouse Gas Inventory

Purpose: Identify and quantify GHG emissions

GHG Inventory Steps:

1. **Use Recognized Protocols**
2. **Quantify Direct Emissions**
   - **Process, Stationary & Mobile Combustion, Imported & Fugitive**
3. **Quantify Indirect Emissions**
   - **Purchased Electricity with Emissions Factor**
4. **Reporting Your GHG Inventory**



Identification of GHG Reduction Projects

- **Direct Emissions Reductions**
  - **Fossil Fuel Use Reductions**
  - **Efficiency Measures & Process Changes**
  - **Avoided Emissions (special cases only)**
- **Indirect Emissions Reductions**
  - **Energy Efficiency**
  - **Renewables**
  - **Carbon Offset Projects**
  - **Renewable Energy Credits (RECs)**

Evaluating GHG Reduction Projects

- **Calculate the GHG reductions for each project**
- **Calculate the cost & benefits of each GHG reduction project**
- **Develop decision criteria for selecting the "best" options**
- **GHG reduction projects must be:**
  - **Additional**
  - **Real & Quantifiable**
  - **Permanent**
  - **Verifiable**
  - **Control & Ownership**

Case Study: Carlsbad Desalination Plant

- **Location: City of Carlsbad, CA**
- **50 MGD (~$300 Million Capital Cost)**
- **Largest and first major desal plant in California**
- **Water purchased by 9 local agencies**
- **Co-located with electric power plant with existing intake from lagoon**
- **Displaces imported water from Northern California**
- **Volunteered to become Carbon Neutral!**
- **CAP as a Permit Condition with SLC & CCC**

Poseidon's Carlsbad Desalination Plant

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Carbon Footprint: Two Key Metrics

- **Energy Use by the Project (MWh)**
  - **Initial from engineering estimate**
  - **Actual from utility billing data**
  - **May change over time**
- **Emissions Factor for Electricity Used**
  - **Emissions Factor is the pounds of CO_2 per MWh of electricity used**
  - **Utility EF or default EF**
  - **Will change over time**

Project Energy Use

- **A typical desalination plant of this size will use 31.3 aMW of power or 274,400 MWh**
- **<u>Definitions</u>:**
  - **“Power” is a generic term**
  - **“Energy” = 1,000 KWh = 1 MWh**
    - **aMW = 8760 hrs/yr x MWh**
  - **“Demand” = 1,000 KW = 1 MW**

Net Carbon Footprint Calculation

- **Carlsbad's Gross Carbon Footprint is 97,165 metric tons of $C0_2$**
  - **Using SDG&E Emissions Factor of 781 pounds of $C0_2$ per MWh of delivered system power**
  - **274,400 MWh X 781 pounds = 214 million pounds of $C0_2$ per year**
  - **Divided by 2204.6 pounds per <u>metric</u> ton**
  - **Equals 97,165 metric tons of $C0_2$ per year**

Comparing Utility Emissions Factors
(CCAR Annual Emission Reports)

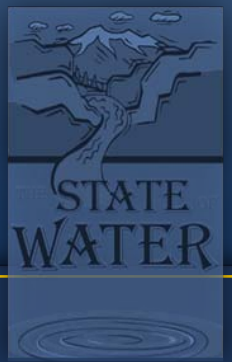
Utility	Report Year	Emission Factor (Lbs of CO_2/MWh)
SDG&E	2006	781
SDG&E	2005	546
SDG&E	2004	614
PG&E	2006	456
PG&E	2005	489
PG&E	2004	566
SCE	2006	641
SCE	2005	666
SCE	2004	679

Net Carbon Footprint Calculation

- **Carlsbad's Gross Carbon Footprint is 97,165 metric tons of $C0_2$ per year**
- **High Efficiency Energy Recovery Device reduces electricity consumption by 10%**
- **ERD reduces the plant's carbon footprint by 10,001 metric tons of $C0_2$**
- **This makes the Carlsbad Desalination Plant's new carbon footprint 87,164 metric tons per year of CO_2**

Carlsbad's Climate Action Plan Elements

- **Commitment is to reduce net carbon emissions to zero through implementing some or all of the following measures:**
  1. **Efficient Efficiency & Energy Recovery Device**
  2. **Avoided Emissions from Imported Water**
  3. **Avoided Emissions from Recovery of CO_2**
  4. **Avoided Emissions from Reducing Energy Needs for Water Reclamation**
  5. **LEED-type Green Building Design**
  6. **On-Site Rooftop Solar PV Project**
  7. **Sequestration from Wetlands Mitigation Project**
  8. **Carbon Offset Projects or RECs**



Carlsbad's Climate Action Plan Elements

Carbon Mitigation Option	metric tons of CO_2/year
Gross Carbon Footprint	97,165
Energy Efficiency and ERD	-10,001
Avoided Emission from Imported Water	-67,506
Avoided Emissions from Recovery of CO2	-2,100
Avoided Emissions from Reduce Water Reclamation Energy	-690
Green Building Design	-177
On-Site Solar PV Project	-275
Wetland Sequestration	-188
Carbon Offsets & RECs	-16,228
Net Carbon Footprint	0

Comparing Carbon Canyon Recycled Water Program to State Water Project

- **Serves Cities of Chino and Chino Hills**
- **Oldest part of IEAU recycled Water System**
- **Recycled Water Use**
  - **2,600 AF of recycled water use in 2004**
  - **Predicted to increase to 13,000 AFY by 2020**
  - **Applications include agriculture, golf course and landscape irrigation, industrial process and cooling water, manufacturing, construction, and control.**

Feature article in WE&T Magazine
November 2008

Hidden Potential

Recycled water and the water–energy–carbon nexus

Dawn Taffler, Dawn Lesley, and Alan Zelenka

There is an undeniable nexus among water, energy, and greenhouse gas (GHG) emissions, or carbon. A substantial amount of energy is used to divert, convey, treat, deliver, and dispose of water in California. The water sector uses 19% of California's electricity and 32% of its natural gas. When we reduce energy use, we also reduce GHG emissions. Recent concerns about such emissions and their contribution to climate change have created new opportunities to promote water recycling as a means to conserve energy.

This article illustrates these connections by calculating the energy use and associated GHG emissions of a recycled-water project at Inland Empire Utilities Agency (IEUA; Chino, Calif.). To estimate the GHG reductions, we compare the energy use for recycled water to the energy required to import the same amount of water from the California State Water Project (SWP) to the same location. However, since carbon emissions from a recycled-water project will be site-specific, the calculated unit GHG reductions for recycled-water use may not be extrapolated to other projects or locations. The intent is to present a methodology for this type of water-energy–carbon analysis.

A significant amount of energy is required to pump SWP water from the San Joaquin Delta in Northern California over the Tehachapi Mountains to customers in Southern California. A recent study comparing the energy required to deliver water supplies in California shows that recycling water requires dramatically less energy than delivering surface water (Dennen, A. *et al.*, "California's Energy–Water Nexus: Water Use in Electricity Generation," *Southwest Hydrology*, September–October 2007). In cases where the surface water is imported, the difference can be a factor of four or more.

Potable water often is used for applications that do not need water treated to drinking water standards. For example, landscape irrigation, industrial washwater, and other nonpotable demands can be met by using recycled water instead of potable water. This use of recycled water reduces the pressure on drinking water supply and treatment systems while simultaneously saving energy.

An energy investment has already been made in the infrastructure to convey water to wastewater treatment facilities. Furthermore, regulations require wastewater agencies to protect human health and environmental quality through wastewater treatment. For a relatively small additional investment, these agencies can produce effluent treated to California's

Carbon Canyon Water Recycling Facility produces recycled water for agriculture, golf course and landscape irrigation, and industrial processes.
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Carbon Footprint Comparison

Option	MWh	Emissions Factor (lb CO_2/ MWh)	lb CO_2	Metric Tons CO_2
Imported SWP Water	8,470	915	7,750,000	3,520
Recycled Carbon Canyon Water	1,560	950	1,482,000	670
		Difference =	5,946,190	2,850
			Percent Reduction =	81%
			Metric Tons/AF =	1.1

3 Ways to Save with a Recycled Water Project

- **Energy Savings**
  - ***Saving 6,900 MWh of electricity (in this case)***
  - ***Nearly 3,000 metric tons CO_2 (in this case)***
- **Carbon Emissions Reductions**
  - ***Equivalent to taking 600 cars off the road***
  - ***Would have an offset value of ~$20,000***
- **Cost Savings**
  - ***At 12¢ per kWh, this would have cost $828,000***

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Thank you for your time!