

**Inland Empire Utilities Agency's (IEUA)  
Water-Energy Nexus:  
Combining Energy Efficiency and Water Efficiency**

Presented by:  
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**ACEEE 3<sup>rd</sup> National Conference on  
Energy Efficiency as a Resource**

IEUA's LEED Platinum Headquarters

Location map

## IEUA Profile: Municipal Water District

- Regional wholesale distributed water and wastewater treatment for 7 cities, two water districts, and two water companies
  - Imported water supply distribution
  - Four regional wastewater treatment plants
  - Two non-reclaimable wastewater sewer pipeline systems
  - One reverse osmosis desalination plant (joint power authority)
  - Biosolids and organics management, the State's first completely-enclosed composting facility (under construction)
  - Recycled water program
  - Water conservation program
  
- Serve 242 square miles of drought challenged Chino Basin
  - Desert climate zone of So. CA averages 13" rainfall per year
  
- High urban growth (part of Santa Ana River Watershed)
  - Annual population growth between 1990 and 2000 > 3% per year
  - Population 780,000 projected to grow to 1.0 million by 2025
  - Conversion of agricultural lands to urban use will increase municipal and industrial demand for water

3

## Water Demand/Supply Balance Projections

	1990	2005	2025
<b>Population</b>	<b>515,100</b>	<b>788,000</b>	<b>1,050,000</b>
<b>Water Demand</b>	<b>206,100 AF</b>	<b>221,000 AF</b>	<b>330,000 AF</b>
<b>Groundwater</b>	<b>180,000</b>	<b>182,800 AF</b>	<b>188,000 AF</b>
<b>Desalter</b>		<b>7,000 AF</b>	<b>25,000 AF</b>
<b>Imported Water</b>	<b>32,083 AF</b>	<b>75,000 AF</b>	<b>70,000 AF</b>
<b>Surface Water</b>	<b>15,000</b>	<b>13,500 AF</b>	<b>13,500 AF</b>
<b>Recycled Water</b>	<b>n/a</b>	<b>5,600 AF</b>	<b>45,000 AF</b>
<b>Projected Conservation</b>	<b>n/a</b>	<b>5,000 AF</b>	<b>33,000 AF</b>

4

## IEUA's Service Area is within the Chino Basin

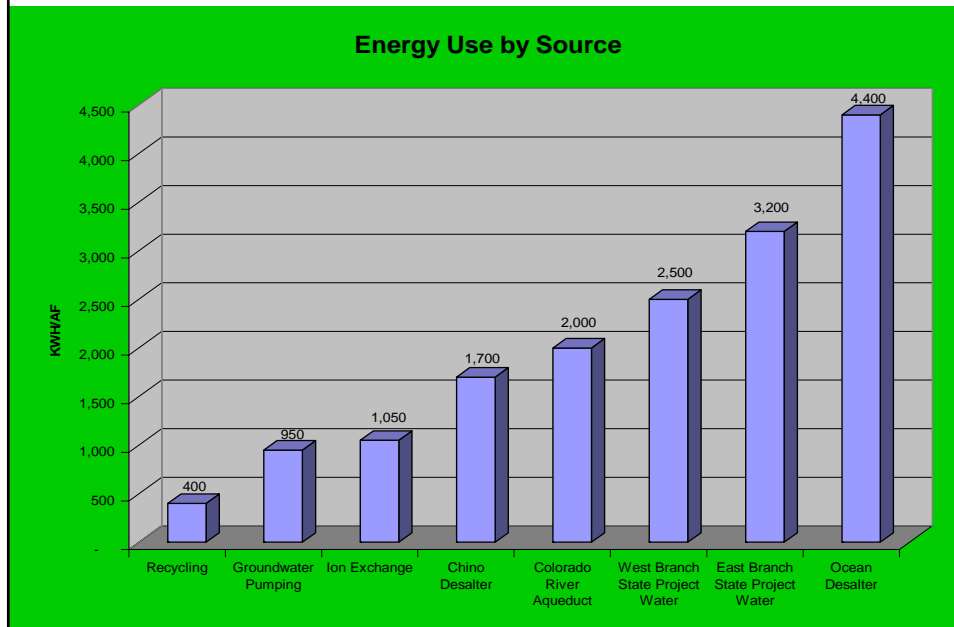
5

## IEUA's Water+Energy Nexus

- Energy is a significant component of the cost of IEUA's water supplies (ranges from 400 to 3,200 kW per AF)
- The 2000/01 California Power Crisis created significant risks, both to public health & safety, and to water ratepayers
  - *IEUA responded by adopting a policy of energy self-sufficiency*
  - *IEUA received "Flex Your Power" award for energy reduction programs*
  - *IEUA re-evaluated water supply options in light of energy requirements*

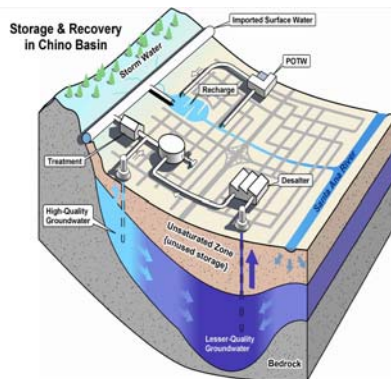
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## The Energy Intensity of IEUA's Water Supplies

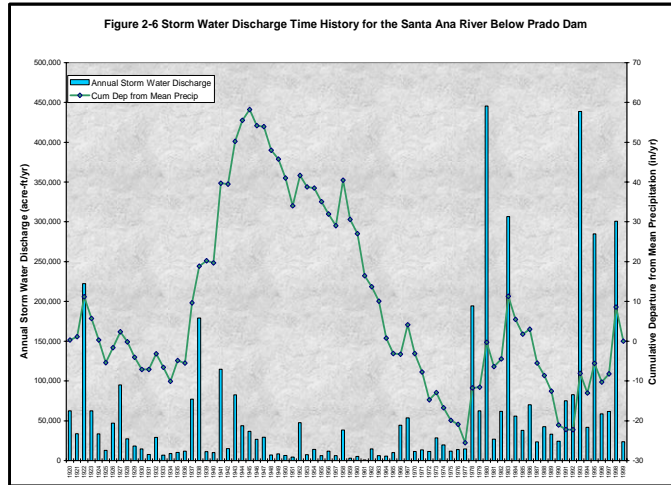


## Water Assets of the Chino Basin

- Groundwater
  - 5-7 Million Acre-feet of Storage – one of the largest groundwater basins in southern California
  - 1 million acre-feet of unused storage capacity currently
  - Safe Yield of 140,000+ Acre-feet per year with capacity to increase
  - Over 800 Active Wells
- High Quality Recycled Water
  - Over 90,000 Acre-feet of water available for reuse
- Storm Water Capture
  - Region now loses over 50,000 acre-feet per year on average of water that historically recharged the Chino Groundwater Basin
- Opportunities for Water Efficiency
  - Over 60% of water use within region is for outdoor irrigation



## Precipitation and Run Off in the Chino Basin over seventy years...



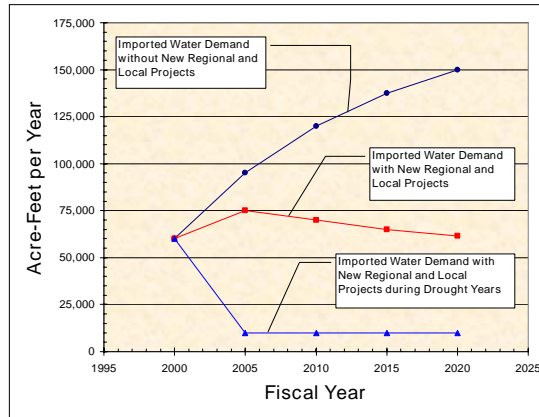
## Integrated Water Resources Program \$350 Million in Capital Projects

- Chino I/II Desalters
  - 25,000 AF/Yr yield
  - \$68 Million
- MWD Conjunctive Use
  - 100,000 AF, 33,000 AF/yr yield
  - \$28.5 million
- Recharge Master Plan
  - 23,000 AF/Yr Storm water
  - 20 - 40 AF/Yr Recycled Water
  - 80 - 120,000 AF/Yr Imported Water
  - \$40 – \$50 million
- Recycled Water
  - 90,000 AF/Yr
  - \$200 million
- Conservation
  - 25,000 AF/Yr
  - \$10 million

## Projected Chino Basin Imported Water Demands

- Without the Integrated Water Management Strategy, the need for expensive imported water is expected to increase from 60,000 acre-feet to over 150,000 acre-feet

- With the implementation of the planned water initiatives, the region will significantly reduce its need for imported water and during dry years almost completely roll off imported water supplies



11

## IEUA's Energy Requirements

- Peak Electric Demand currently 9 MW
  - Projected to grow to 25 MW in 2010
- Self Generation Capacity 7.6MW
  - 5.3 MW cogeneration
  - Purchase 200 mcf natural gas for self generation
  - Produce 225,000 cfd digester gas from Dairy Manure digester that is piped 1.5 miles to the Chino Desalter for self generation
- Current Net Energy Requirements 2 MW

Note: IEUA Platinum Headquarters will be 100% energy self sufficient in 2006; Building design and photovoltaic installed on the roof reduced energy requirements to the equivalent of 2 residences

12

## Primary Uses of Energy

- 65 mgd tertiary wastewater treatment
- Wastewater treatment consumption
  - 52% Primary/Secondary
  - 20% Solids handling
  - 28% Tertiary treatment/Disinfection
- 9 mgd groundwater pumping and desalination (will increase to 25 mgd)
- Imported & recycled water distribution

13

## Projected Electric Loads

	Capacity (mgd)	Safety Demand <sup>[1]</sup> (kW)		Avg Demand (kW)		Peak Demand (kW)	
		2002	2010	2002	2010	2002	2010
RP#1	38 mgd	1,077	2,362	2,992	6,560	3,850	7,872
RP#2	30 mgd	283	295	500	819	750	983
Carbon Canyon	11.2 mgd	301	2,275	1,150	6,319	1,550	7,583
Desalter	9 mgd	428	710	1,188	1,971	1,426	2,365
RP#4	7.5 mgd	396	396	1,100	1,100	1,320	1,320
RP#5	15 mgd	0	0	0	3,611	0	4,333
<b>Totals</b>		<b>2,485</b>	<b>7,337</b>	<b>6,940</b>	<b>20,380</b>	<b>8,896</b>	<b>24,456<sup>[2]</sup></b>

[1] Minimal loads essential for health & safety, estimated at 30% of peak demand.

[2] 115% increase in energy requirements from 2002 to 2010 attributable to population growth (increased volume of wastewater treatment) and increased recycled water pumping. Peak demand projected to increase an additional 30% by 2050.

14

	Capacity	Electric Load	Self Generation <sup>[1]</sup>	Digester Gas	Fuel for Cogeneration
<b>RP#1</b>	38 mgd	3,400 kW	2,800 kW	900,000 cfd	70/30 dgas/ngas
<b>RP#2</b>	30 mgd	500 kW	500 kW	200,000 cfd	70/30 dgas/ngas
<b>Carbon Canyon</b>	11.2 mgd	1,200 kW	950 kW	n/a	100% ngas
<b>Desalter</b>	9 mgd	1,200 kW	1,000 kW	300,000 cfd	50/50 dgas/ngas
<b>RP#4</b>	7.5 mgd	1,150 kW	650 kW	n/a	100% ngas
<b>RP#5</b>	15 mgd	1,500 kW	In-service 2006		
<b>Total Treatment Facilities Energy Profile</b>		<b>8,950 kW</b>	<b>5,850 kW</b>	<b>1,400 kcfcd</b>	<b>Dgas/mgas/ngas</b>

[1] Does not include diesel generators

15

## IEUA Energy/Water Strategies

- Incorporate energy efficient best practices into all aspects of IEUA's facilities and system design and operations
  - LEED Headquarters
  - Lighting Efficiency
  - Pump Efficiencies
  - Energy By Design Projects
  - Incorporate Energy Efficiency into Project Design Standards

16



## IEUA Energy/Water Strategies

- Reduce dependence on high energy intensity water supplies
  - Develop and implement end use water conservation programs
  - Develop recycled and local groundwater supplies
  - Work with local developers and other agencies to incorporate sustainability design principles (e.g., water efficient landscapes, water and energy efficient appliances) into new developments

17

## IEUA Energy/Water Strategies

Shift all possible peak loads to partial and off-peak periods

- Incorporate process flexibility into system design to facilitate load shifting (e.g., storage and pipelines that allow detention of flows during peak periods)
- Turn off schedulable processes during peak periods

18

## IEUA Energy/Water Strategies

### Maximize digester gas production and use

- Increase energy content of bio-feedstock in digesters
- Integrated into organics management program for community
- Maximize value of excess methane generation through net metering
- Air quality credits generate additional value (and revenue)
- Added value of high quality soil nutrient
- Water quality, other community benefits

19

## IEUA Energy/Water Strategies

- Develop other local energy resources
  - Install other methane gas generation technologies (gasification)
  - Capture energy value of falling water (hydro in pipelines and outfalls)
  - Use solar power technology (pv potential for recycled water pump stations, wastewater treatment plant processes)

20



## For more information ...

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22