Climate Change and Energy in the California-Baja California Border Region

GNEB

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September 2015

Main Points

- CA-BC border region is a dynamic region with a growing population and expanding economy. (more than 3 million on CA side and 3 million on BC side). Population projected to grow to over 9 million by 2020.

- Area is almost totally dependent for its energy and water from sources outside the region, with some exceptions (geothermal, solar, wind).

- Water and energy are inextricably linked; almost 30% of California's electricity is used to move and manage water and wastewater.

- From an energy (and water) perspective, the region can be viewed as consisting of two zones: a *western zone* and *eastern zone,* roughly bisected by a north-south mountain range.

- The western zone consists of San Diego County on the CA side and the municipios of Tijuana, Rosarito, Ensenada, Tecate. The eastern zone consists of Imperial County on the CA side and the muncipio of Mexicali on the BC side.

Western Zone

- **Power** sector on CA side dominated by imported natural gas and imported renewables (mostly solar and some wind) and by petroleum products (gasoline and diesel) in the transportation sector. Utility is SDG&E, private, investor owned

- **Power** on BC side is also dominated by natural gas imported from US. There is a single, large power plant at Rosarito powered by natural gas imported from US. There is some diesel for power generation. Utility is CFE, federally owned.
  - Note: LNG facility near Ensenada not operating because LNG more much more expensive than imported pipeline gas from US.
  - Note: Baja California power grid *not* connected to Mexican system. Only connected to CA system via several connection points along border.

- **Water** supply for CA side (San Diego County) is mostly imported (83%). Imported sources are the Colorado river and northern California (reclaimed water is defined by CWA as local supply although it is imported, used, and reclaimed).

- **Water** supply for BC side comes mostly from Colorado river via aqueduct from Mexicali region. Some local rainfall storage (Rodriguez Dam).

Eastern Zone

- **Power** for CA side (Imperial County) derived from imported natural gas, local renewables and geothermal. Utility is IID, community owned.

- **Transportation** on both sides of the border heavily dependent on petroleum products (gasoline, diesel, jet fuel) imported from outside the region. Some electric and natural gas vehicles on CA side, but very small fraction of vehicle fleet.

- **Water** supply CA side (Imperial County) comes mostly from Colorado river. Imperial County has water rights to 3.1 million acre feet with a population of only 180,000. Rest of Southern California receives. 1.3 million acre feet. But, Imperial County is a also major agriculture producing region.

- **Water** for BC comes mostly from Colorado river. Mexico allocated 1.5 million acre feet by treaty and subsequent agreements. Some groundwater and rainfall capture.

Effects of climate change on CA-BC border region

- increased average, maximum and minimum temperature
- increased number of days with temperature greater than 100^0 F
- decreased precipitation and decreased Colorado river flows
- increased drought
- sea level rise
- Increased occurrence and spread of infectious disease.

Implications

- Climate change (CC) will decrease water supplies to both sides of CA-BC border region
- CC will stress existing energy systems due to:
  - demographic shift to inland regions requiring more air conditioning
  - energy-intensive water supplies e.g., desalination, recycled waste water, water imports.
- CC will increase demand for energy which could result in increased GHG emissions from fossil fuels

Possible Responses

- Recognize that *supply and demand* for both water and energy are inextricably linked.
- Supply can be “increased” by reducing demand.
- Demand can be reduced or managed by
  - increasing energy efficiency in buildings and transport sector
  - recycling of water and wastewater
  - Introducing concept of “demand side management” (DSM) into the water sector. It is well known in the energy sector.
  - “smart grid” for water?
  - innovation in agriculture for reducing water use
  - Continue growth of renewable energy resources on both sides of border

Desalination

- Public pressure will increased for more use of desal partly because public sees unlimited supply of water.
- Currently, desal water is most expensive and has considerable negative env. effects.
- *BUT*, technology will become more efficient (reducing energy costs) and env impacts may be mitigated.
- Besides high energy use, desal also needs extensive pipe line infrastructure to transport water from coast to inland regions.
- *However,* it is hard to imagine that desal will not play an important role in the region's future.
- Therefore, we should research and learn as much as possible about all aspects of desal, both in California and Baja California

Cross-Border Cooperation

- Opportunities exist for cross-border sharing of energy and water, but significant barriers exist.
- Very large desal plant (200 M gallons/day) being discussed at Rosarito site. Portion of output slated for California (Otay Mesa). Planning is advanced.
- Joint canal to bring water from Colorado to western zone of region?
- Large renewable energy projects where power flows across border in both directions.
- Climate action plan for border region?

California-Baja California Border Population

	1980	1990	2000	2010	2020
California Border	1,953,956	2,607,319	2,941,502	3,355,351	3,889,001
Baja California Border	1,002,459	1,400,873	2,188,899	3,424,592	5,343,687
Total	2,956,415	4,008,192	5,130,401	6,779,943	9,232,688

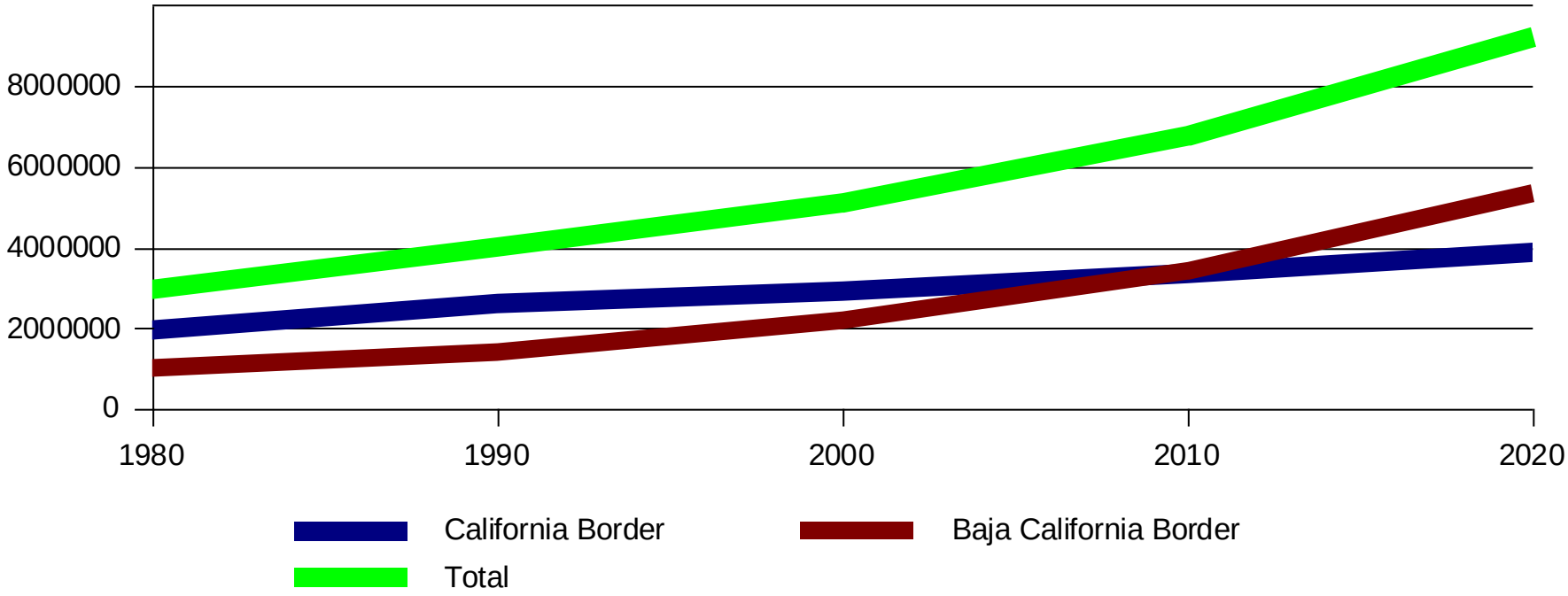
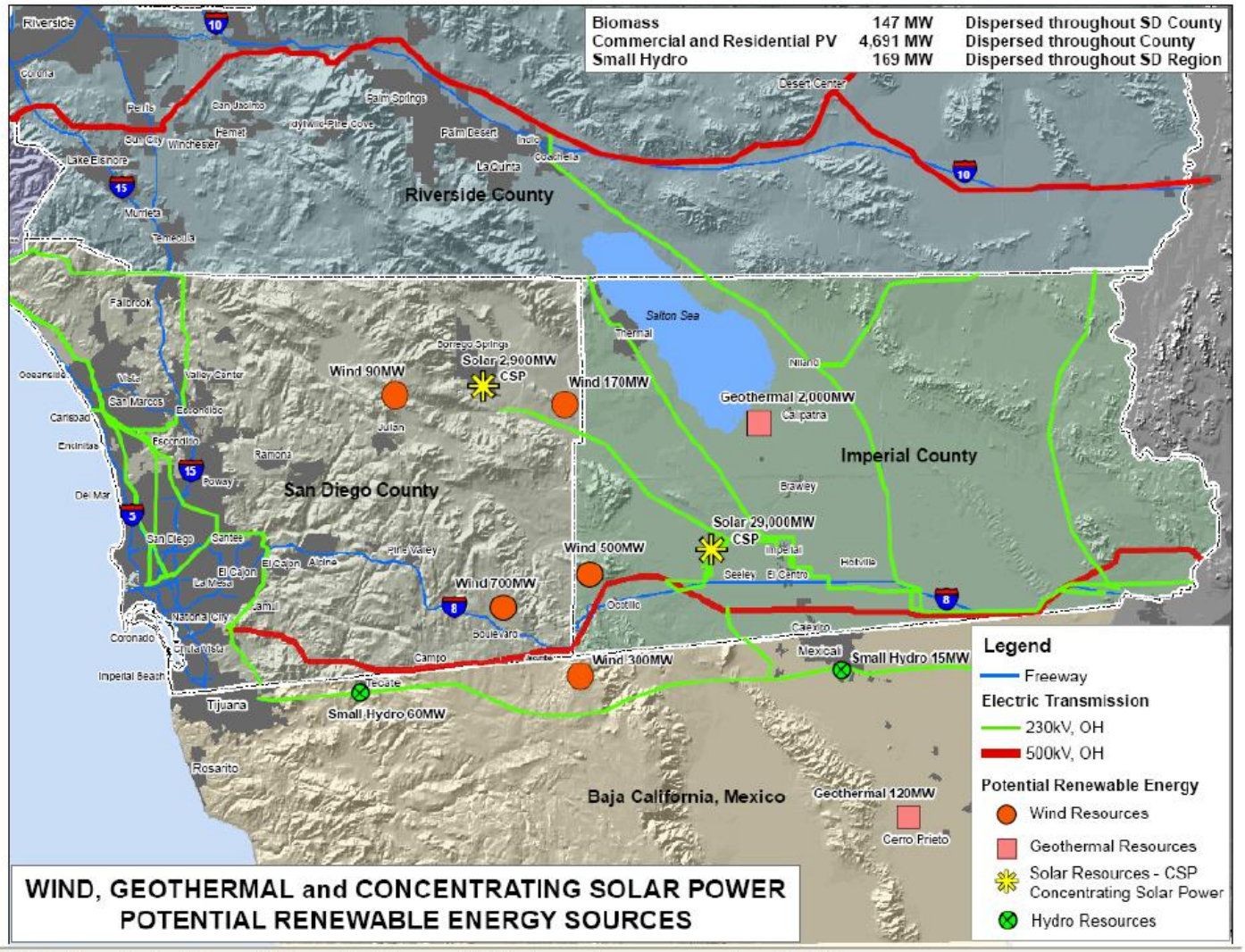


Figure 1.1: Approximate Locations for Major Renewable Resources in the Region



SAN DIEGO GAS & ELECTRIC
ELECTRIC GENERATION
FACT SHEET

OVERVIEW

San Diego Gas & Electric (SDG&E) supplies customers with electricity generated both locally and outside of the utility's service territory, with local facilities currently capable of generating a total of approximately 3,100 megawatts (MW) of power. SDG&E owns and contracts with generation facilities both within and outside the service territory, and power is also produced in local facilities that are non-utility owned. Local generation is important for local power supply needs due to the voltage support it provides that keeps the electric system running smoothly.

LOCAL GENERATION RESOURCES*

Palomar Energy Center	566 MW
Otay Mesa Energy Center	604 MW
Encina Power Station	964 MW
Peakers (South Bay area)	175 MW
Peakers (El Cajon area)	109 MW
Peakers (Escondido-Pala area)	197 MW
Peakers (Miramar area)	132 MW
Peakers (Kearney Mesa area)	136 MW
Qualifying Facilities**	140 MW
Renewables/Pumped Hydro***	94 MW
Total	3,117 MW

SDG&E-OWNED FACILITIES

Palomar Energy Center
Peakers (Miramar I & II, Cuyamaca)
Desert Star Energy Center (located in Nevada)

GENERATION BY TYPE

SDG&E's 2013 power mix included the following energy resources:

- Renewable: 24%****
  - Biomass & waste: 3.0%
  - Geothermal: 2.0%
  - Small hydroelectric: 0.0%
  - Solar: 4.0%
  - Wind: 15.0%
- Coal: 3.0%
- Large hydroelectric: 0.0%
- Natural gas: 67.0%
- Nuclear: 0.0%
- Oil: 0.0%
- Unspecified: 6.0% (electricity from transactions that are not traceable to specific generation sources)

MEDIA CONTACT

SDG&E Media Relations
877-866-2066 (24 Hours)

*Capacity values are based on current California ISO Net Qualified Capacity Rating that can change from year to year.
**Qualifying facilities are non-utility small alternative, natural gas and renewable sources of energy, including co-generators and other sources.
***Includes Lake Hodges, Kumeyaay and Borrego Solar
****This represents physical power purchased to support SDG&E's system load.

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9/29/2014

POWER CONTENT LABEL

ENERGY RESOURCES	IID POWER* (2013 actual)	IID POWER* (Projected for 2014)	IID POWER* (Projected for 2015)	IID POWER* (Projected for 2016)	2013 CA POWER MIX** (For comparison)
Eligible Renewable	**34.27%**	**22.34%**	**21.42%**	**25.29%**	**18.87%**
–Biomass & Waste	11.46%	11.37%	10.13%	9.92%	2.67%
–Geothermal	6.23%	0.00%	0.11%	2.72%	4.34%
–Small Hydroelectric	7.69%	6.80%	6.78%	6.64%	1.51%
–Solar	4.83%	4.17%	4.39%	6.01%	1.81%
–Wind/Other Mkt Renewables	4.06%	0.00%	0.00%	0.00%	8.54%
Coal	**12.28%**	**18.53%**	**19.27%**	**18.58%**	**7.81%**
Large Hydroelectric	**3.72%**	**3.98%**	**3.97%**	**3.89%**	**7.75%**
Natural Gas	**34.59%**	**40.80%**	**42.00%**	**36.58%**	**44.25%**
Nuclear	**2.88%**	**2.91%**	**2.90%**	**2.83%**	**8.83%**
Other	**0.01%**	**0.11%**	**0.11%**	**0.04%**	**0.01%**
Unspecified Sources of Power	**12.26%**	**11.32%**	**10.32%**	**12.80%**	**12.48%**
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**

* "Unspecified sources of power" means electricity from transactions that are not traceable to specific generation sources.

** Percentages are estimated annually by the California Energy Commission based on the electricity sold to California consumers.

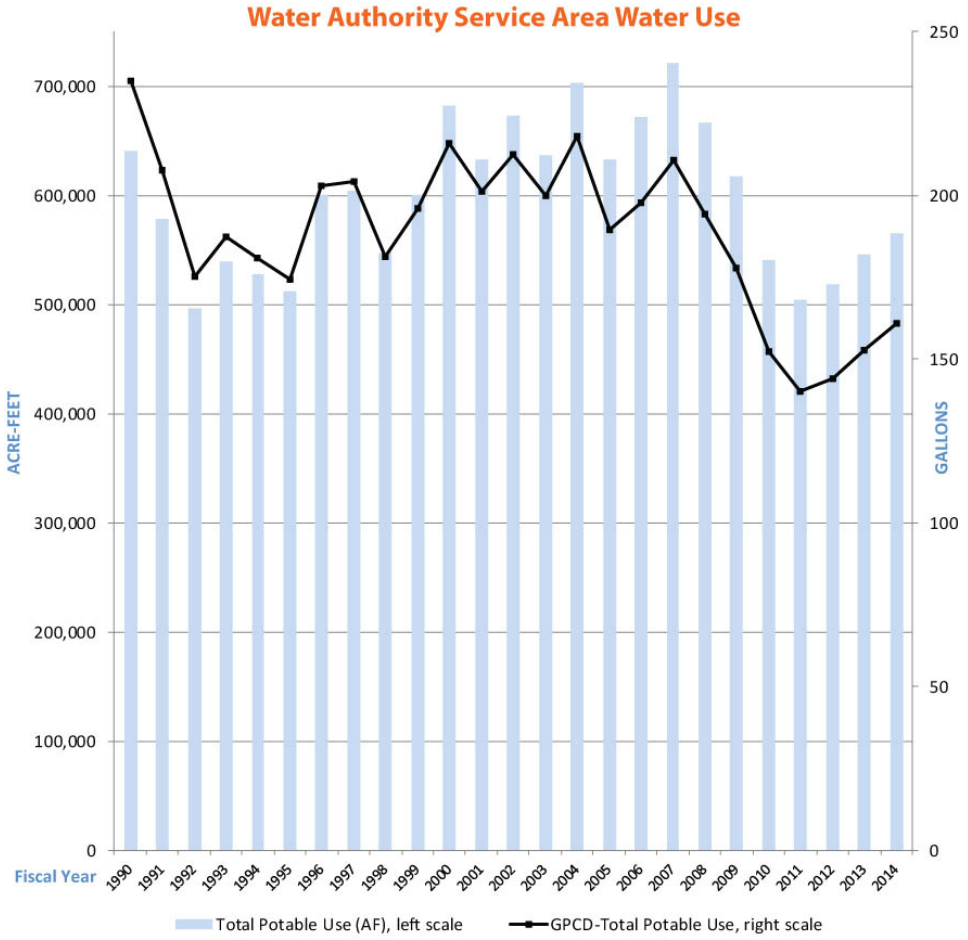
For specific information about this electricity product, contact Imperial Irrigation District. For general information about the Power Content Label, contact the California Energy Commission at 1-800-555-7794 or www.energy.ca.gov/consumer.

NOTE: IID is planning to exit the ownership of the coal resource by the end of 2017.

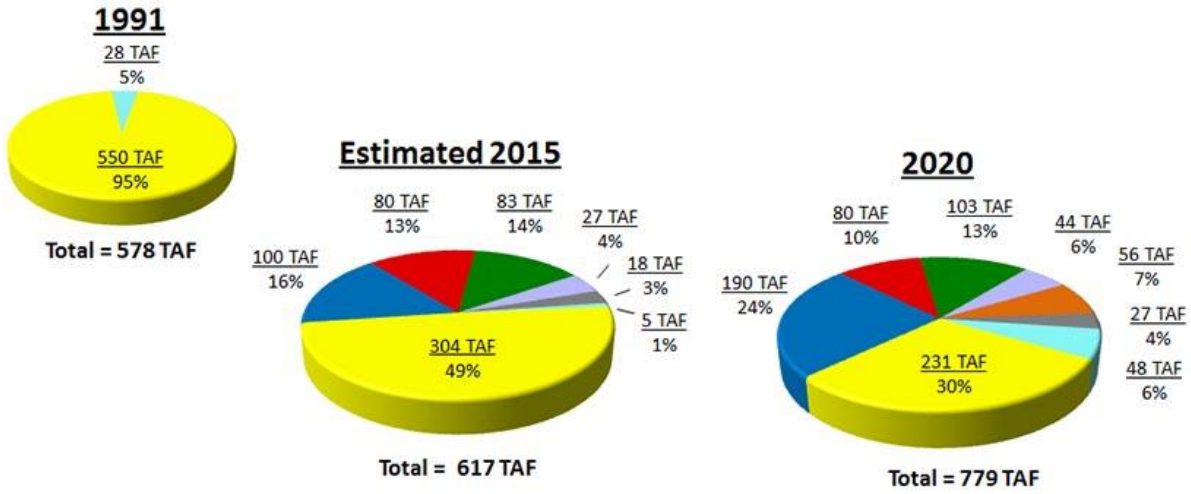
September 2014

Sources of San Diego County's Water Supply (2009-2013 five-year average) -

San Diego County Water Use

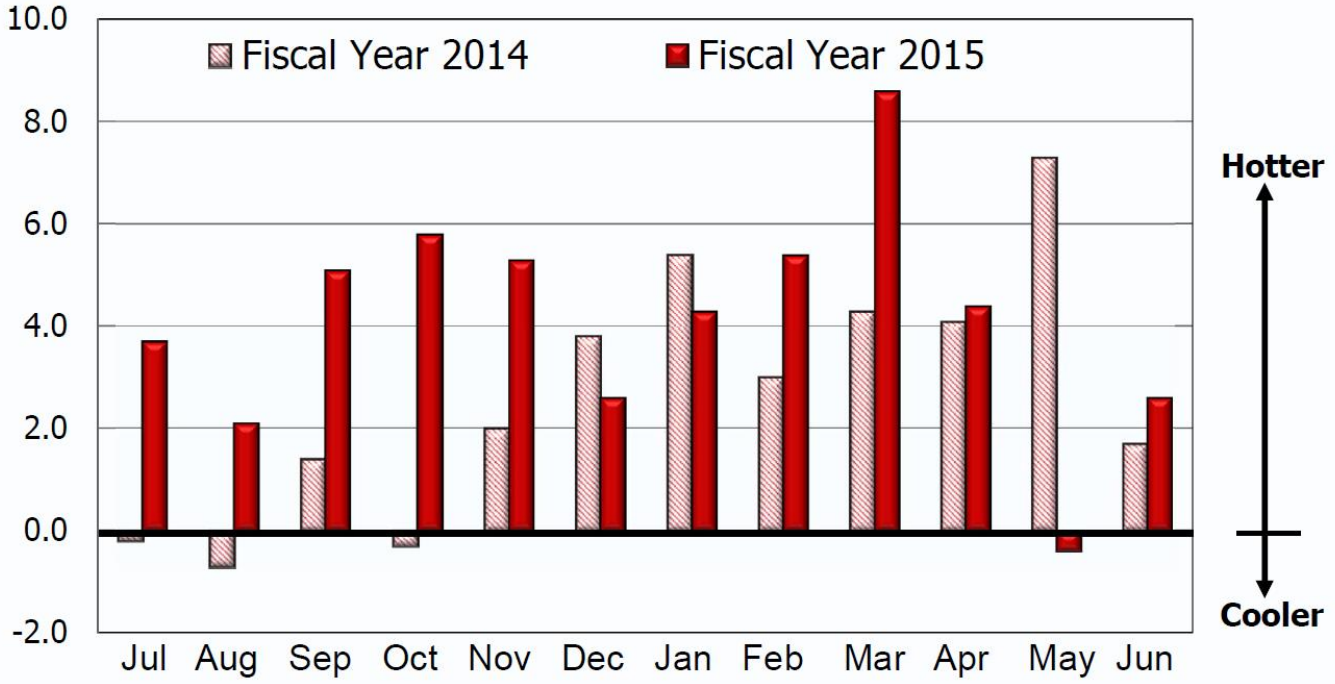


Increasing San Diego County's Water Supply Reliability through Supply Diversification

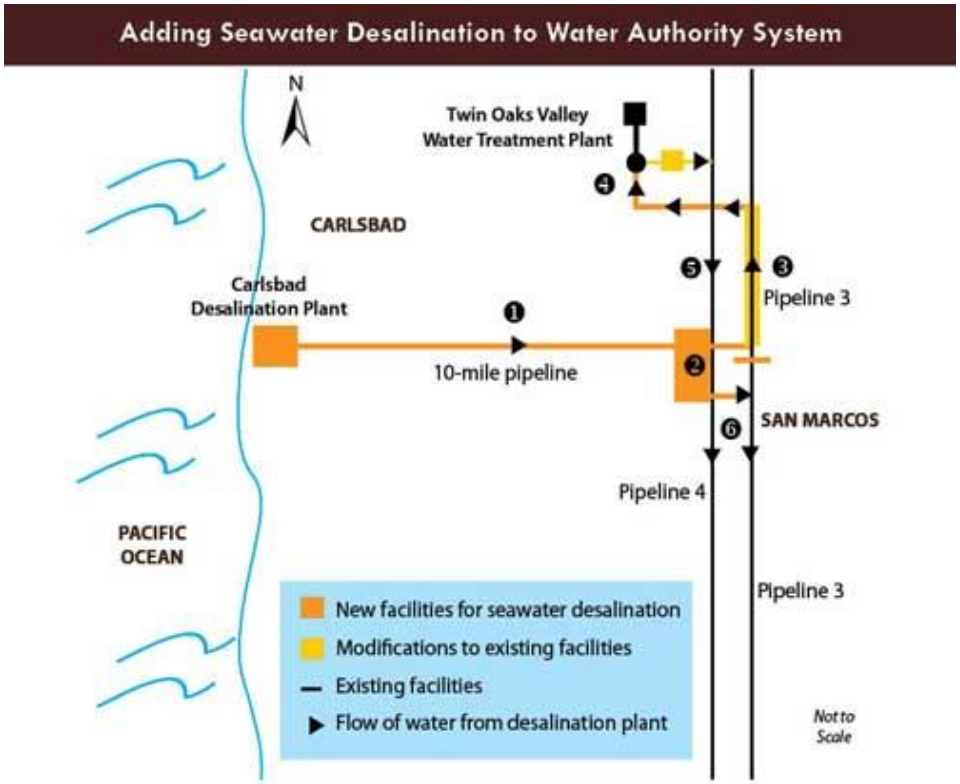


TAF=Thousand Acre-Feet

Average Daily Maximum Temperature at Lindbergh Field – Departure from Normal (°F)



Carlsbad desal plant hook ups



Carlsbad Desal Plant

- **Costs**
- The agreement sets the purchase price at $1,849 - $2,064 per acre-foot in 2012 dollars, depending on how much desalinated water is purchased annually. The additional costs for improvements to the Water Authority's system to integrate the new supply bring the total cost of desalinated seawater to $2,014 -- $2,257 per acre-foot in 2012 dollars, again depending on how much desalinated water is purchased each year. A typical household of four people can expect to pay approximately $5 to $7 more per month when the plant begins producing water by fall 2015.

Rosarito Desalination Plant

ROSARITO MEXICO PROJECT - ACHIEVEMENTS

CONSOLIDATED WATER

- Acquired strategically-located land adjacent to power plant.
- Letter of Intent – Otay Water District, S. California.
- CFE Power Plant – Land lease and access to residual waters.
- Pilot Plant Testing – Phase I completed.