



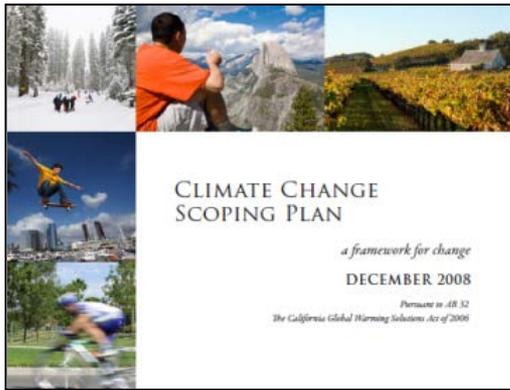
Water Energy Nexus : Energy for Water Related Services

**Marzia Zafar, Director
Policy and Planning Division
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How Much Energy is in the Water Energy Nexus? *It depends whom you ask...*



“... the Water sector is comprehensively defined and includes groundwater, surface water, agricultural use, urban use, conveyance, treatment, wastewater, and recycling....

Approximately **19 percent of electricity** and 30 percent of non-power plant natural gas consumed in California are used by the Water sector ...

California Air Resources Board “Climate Change Scoping Plan” Dec 2008

Embedded Energy in Water Studies
Study 1: Statewide and Regional Water-Energy Relationship

Prepared by
GEI Consultants/Navigant Consulting, Inc.

Prepared for the
California Public Utilities Commission
Energy Division

“Energy embedded in water refers to the amount of energy that is used to collect, convey, treat, and distribute a unit of water to end users, and the amount of energy that is used to collect and transport used water for treatment...”

“..the Study Team believes that water sector electricity use is at least **7.7 percent of statewide electricity** requirements,..”

**GEI consultants/Navigant Consulting for the CPUC
“Embedded Energy in Water Studies: Study 1” Aug 2010**

Which metric is right?





It Depends on Technologies Counted in the Nexus

Segment of Nexus	Segment of water cycle	CEC 2005	GEI Study 1&2
Water sector energy	Supply thru distribution	10742	16270
	Wastewater treatment	2012	2012
	Total (GWh)	12754	18282
	Water sector (%)	5.10%	7.70%
Water driven energy demands	AG	7372	Not included in GEI study
	Res, Comm, Industrial	27887	
	Total (GWh)	35259	
Total water energy nexus	Total (GWh)	48,013	
	Water nexus (%)	19.20%	

What Tech is included in the definition of the nexus:

- *Some studies focus only on embedded energy, which excludes end-use energy.*
- *Some studies include all water related energy as part of the nexus.*

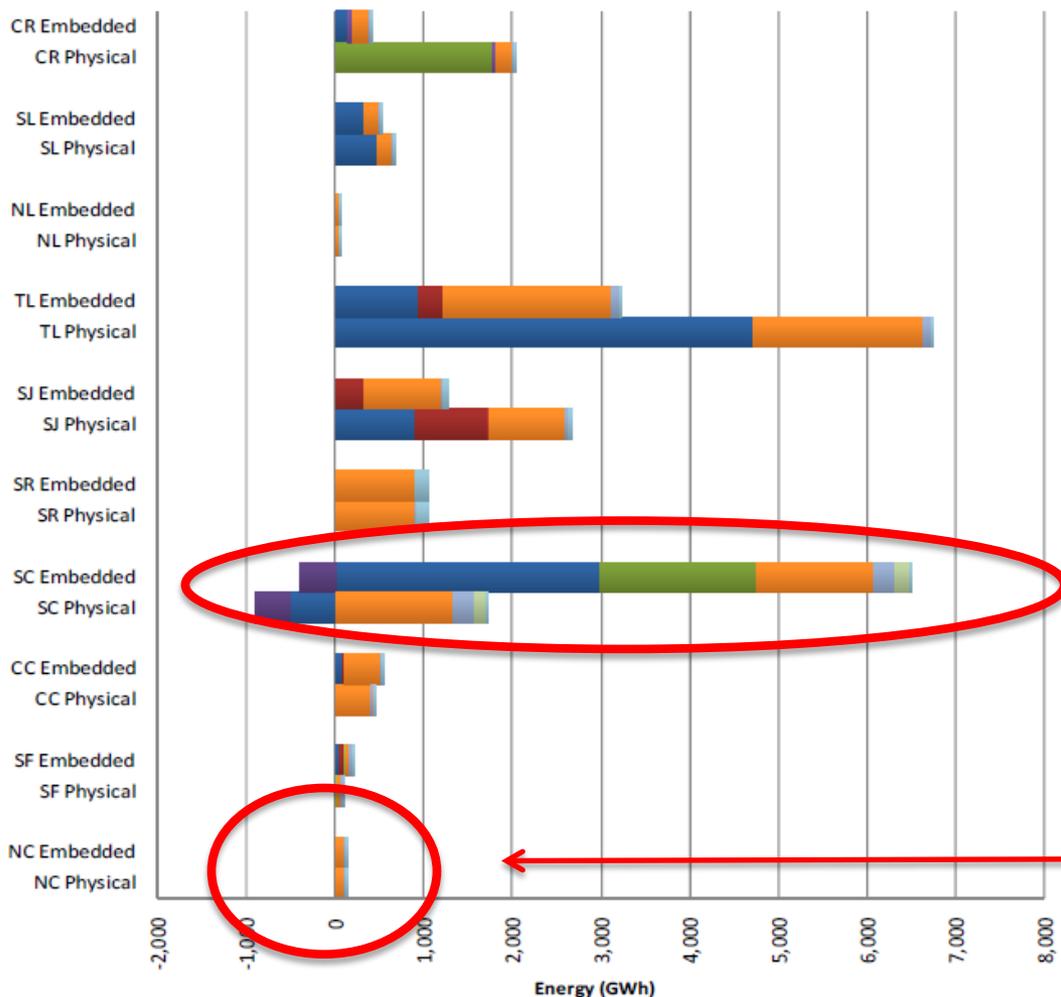
Data source: GEI 2010 – “Embedded Energy in Water Studies : Appendix N” - Merged Tables N-1 and N-2 GEI study 1&2.

CEC 2005 “California’s Water Energy Relationship” CEC-700-2005-011-SF Nov 2005





It Also Depends on Regional Boundaries



Energy intensity is regionally driven :

- *Regions that convey water over mt. ranges will have higher conveyance energy.*
- *Regions that rely on low quality water will have higher treatment energy.*

Southern coast hydrologic region

North coast hydrologic region





How Should the Diversity of Energy Intensity in the Nexus be Managed?

It depends on the objectives..

Objective

Reduce GHG emissions

Mitigate water scarcity risk

Sector
Isolated
Action

- Minimize the deployment of high energy intensity technologies.



- Utilize high energy intensity water technologies to buy down water risk. (e.g. desalination)

Coordinated
Water-Energy
Actions

- Assess both the value of water and the value of energy when assessing cost and benefits for new projects.
- Prioritize and reduce high energy intensity water use.
- Define best practices for energy efficiency in the water sector.
- Develop state water-energy data reporting rules so that water related GHG impacts can be tracked.

