The Role of Desalination in Meeting California's Water Needs

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Topics to be Discussed

- California Water Plan-How does desalination fit in?
- Costs, Opportunities, Challenges
- Review by State Desalination Task Force in 2003
- $50 Million in Desalination Grants – Proposition 50

California Water Plan

- Done every 5 years
- Water Plan update 2005
- By 2030 California is projected to have 12 million more people
  - Increased reliable water needs
- Conventional water resources are declining:
  - Colorado River 4.4 Plan
  - Local groundwater contamination in some areas
  - Environmental Needs (Bay-Delta, Mono Lake, Etc.)
  - Possible effects of climate change on surface runoff patterns
- http://www.waterplan.water.ca.gov/

Framework for Action

Sustainable & Reliable Water in 2030

Vision

Vital Economy
Healthy Environment
High Standard of Living

2 Initiatives Ensure Reliable Water Supplies

Implement Integrated Regional Water Management

Improve Statewide Water Management Systems

3 Foundational Actions Ensure Sustainable Water Uses

Use Water Efficiently

Protect Water Quality

Support Environmental Stewardship

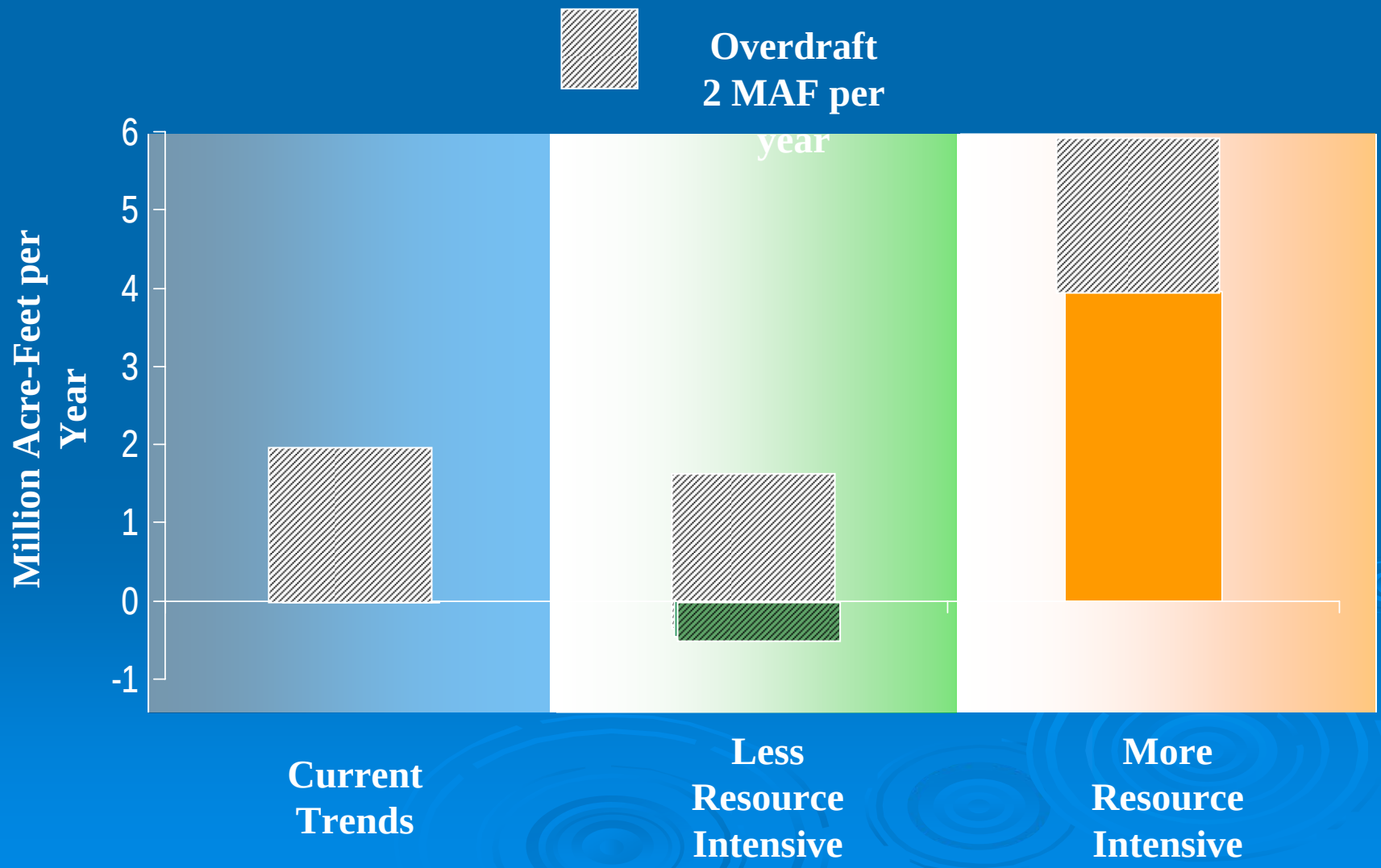
Initiative 1
Implement Integrated Regional Water Management

- Foster regional partnerships
- Develop integrated regional water management plans
- Diversify regional water portfolios using mix of strategies

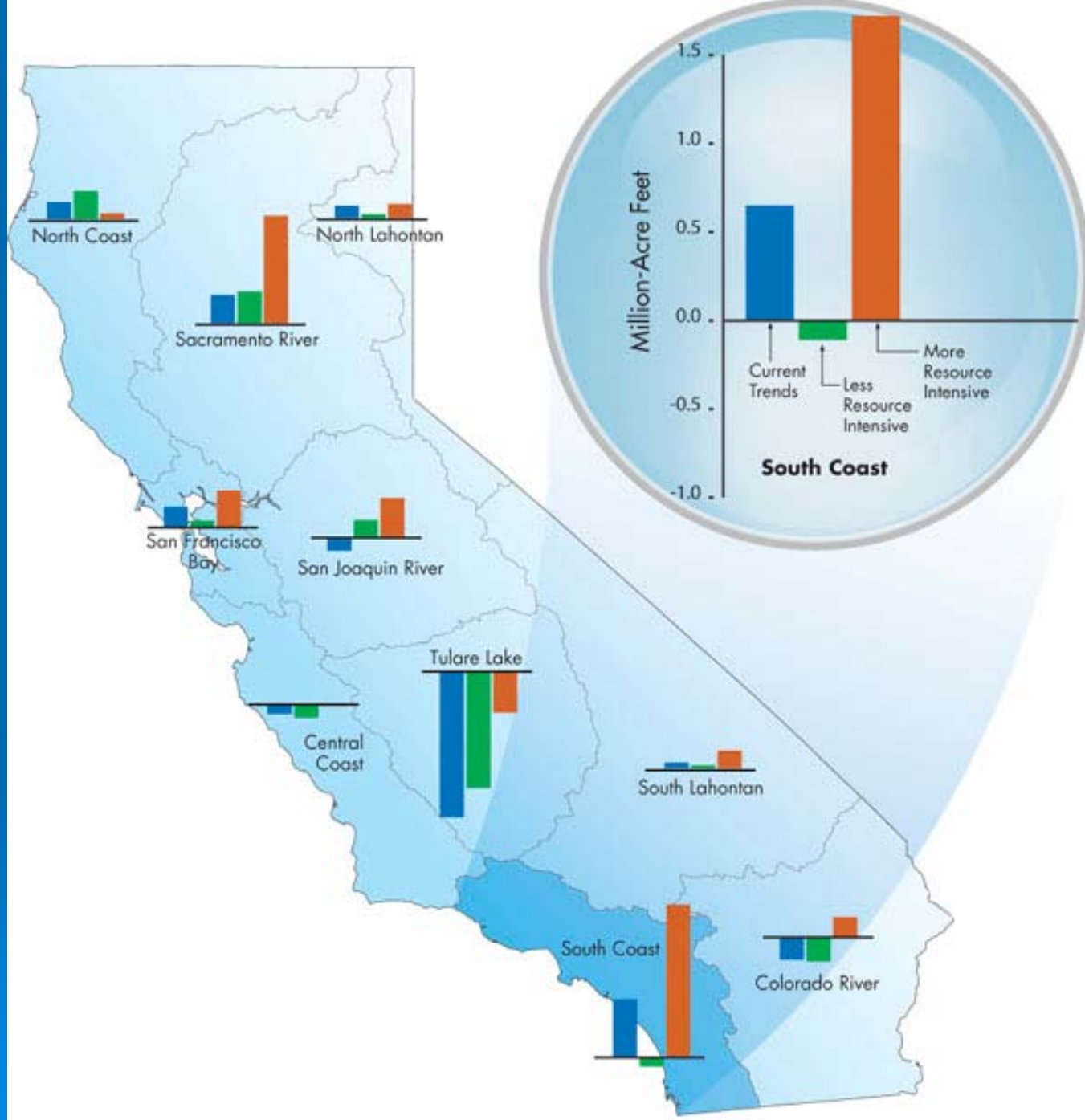
Initiative 2
Improve Statewide Water Management Systems

- Improve aging facilities
- Implement CALFED Program
- Improve flood management
- Sustain the Sacramento-San Joaquin Delta
- Implement Statewide Water Management Programs

Statewide Scenario Demand Changes Plus Groundwater Overdraft



Scenario Demand Changes by Region



Resource Management Strategies

Reduce Water Demand

- Agricultural Water Use Efficiency
- Urban Water Use Efficiency

Improve Operational Efficiency & Transfers

- Conveyance
- System Reoperation
- Water Transfers

Increase Water Supply

- Conjunctive Management & Groundwater Storage
- **Desalination –Brackish & Seawater**
- Precipitation Enhancement
- Recycled Municipal Water
- Surface Storage – CALFED
- Surface Storage - Regional/Local

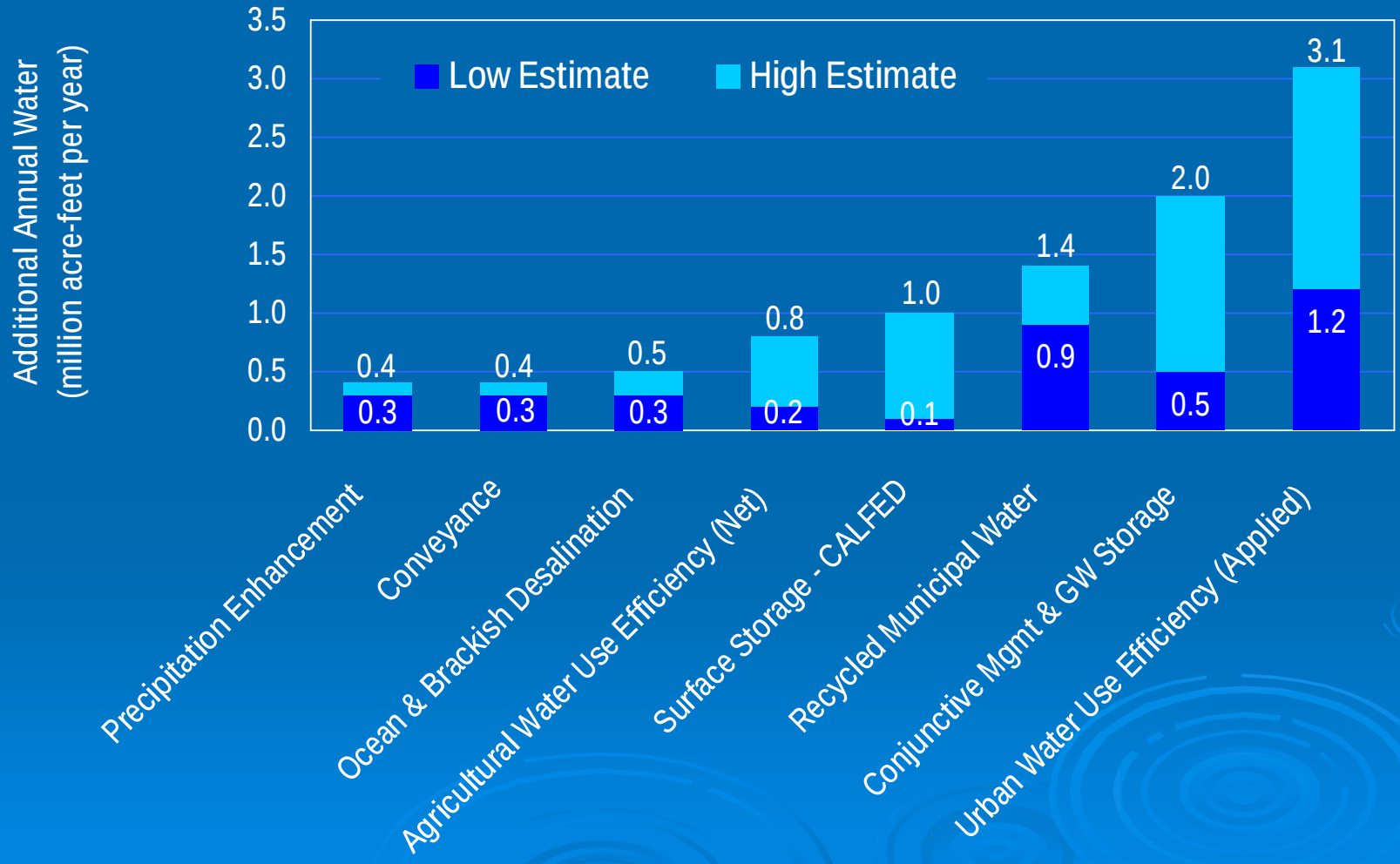
Improve Water Quality

- Drinking Water Treatment and Distribution
- Groundwater/Aquifer Remediation
- Matching Quality to Use
- Pollution Prevention
- Urban Runoff Management

Practice Resource Stewardship

- Agricultural Lands Stewardship
- Economic Incentives (Loans, Grants, and Water Pricing)
- Ecosystem Restoration
- Floodplain Management
- Recharge Areas Protection
- Urban Land Use Management
- Water-Dependent Recreation
- Watershed Management

Range of Additional Water for Eight Resource Management Choices



Brackish and Ocean Water Desalination

Desalination Potential by 2030

- 500,000 acre feet

  - 200,000 acre feet ocean water desalination

  - 300,000 acre feet brackish water desalination

- Total capital investment needed- $1 to 2 billion

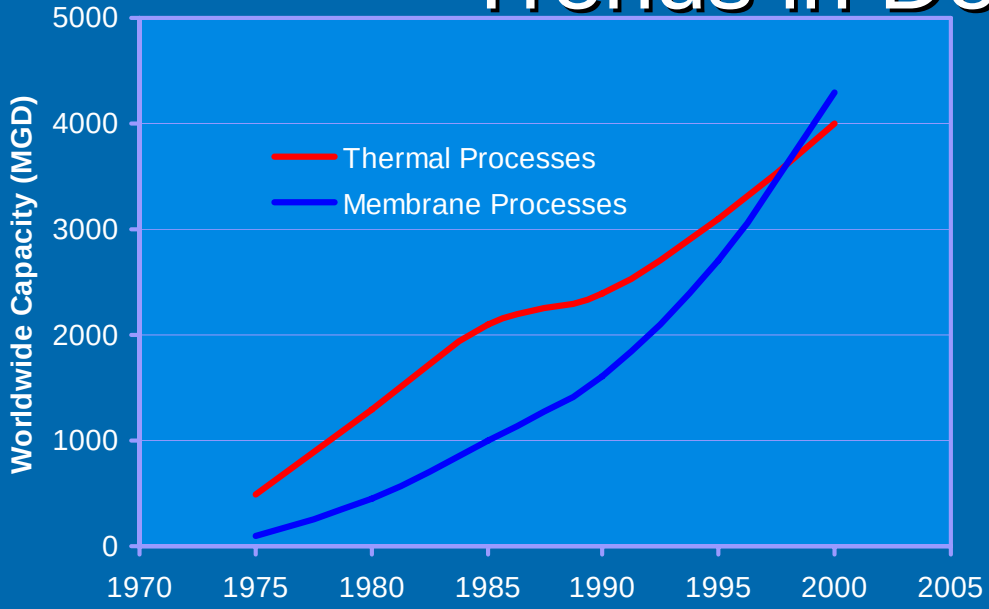
Benefits of Desalination

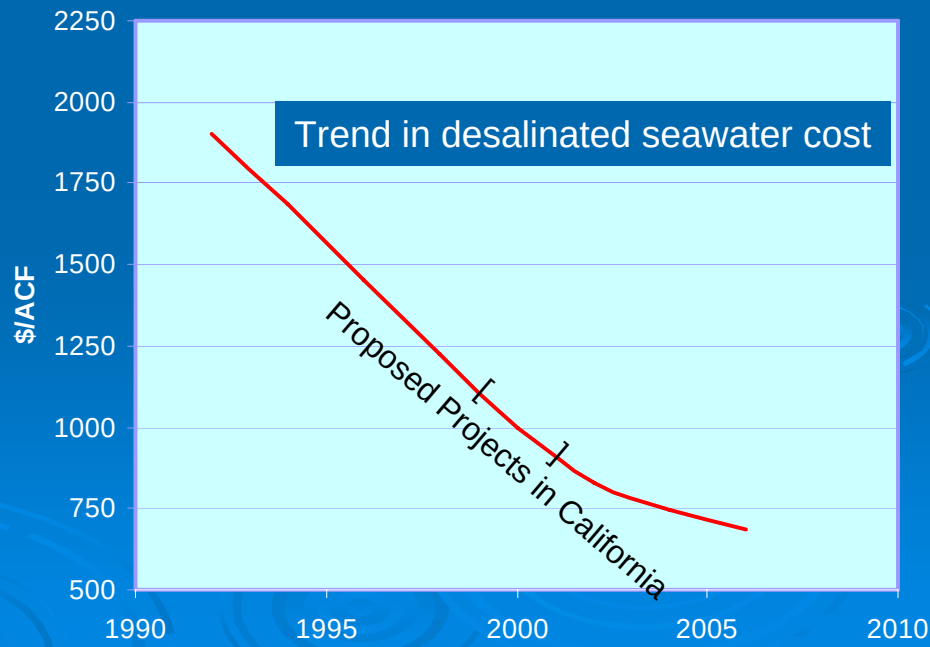
- Can help meet water demand by introducing a new water supply component
- Diversify the State's water portfolio
- Drought-proof
- Ocean Water Desalination - Renewable
- Brackish Water Desalination – Use of previously unusable water supplies

Water Desalination Processes

- **Membrane processes**
  - **Reverse osmosis (RO)**
  - **Electrodialysis (ED)**
  - **Nanofiltration (NF)**
  - **Microfiltration (MF)**
- **Thermal or Distillation processes**
  - **Vapor Compression: Thermal (TVC) & Mechanical (MVC)**
  - **Multi-Stage Flash Distillation (MSF)**
  - **Multi-Effect Distillation (MED)**
- **Other processes (not yet competitive)**
  - **Freezing**
  - **Membrane distillation**
  - **Air humidification/dehumidification**

Trends in Desalination





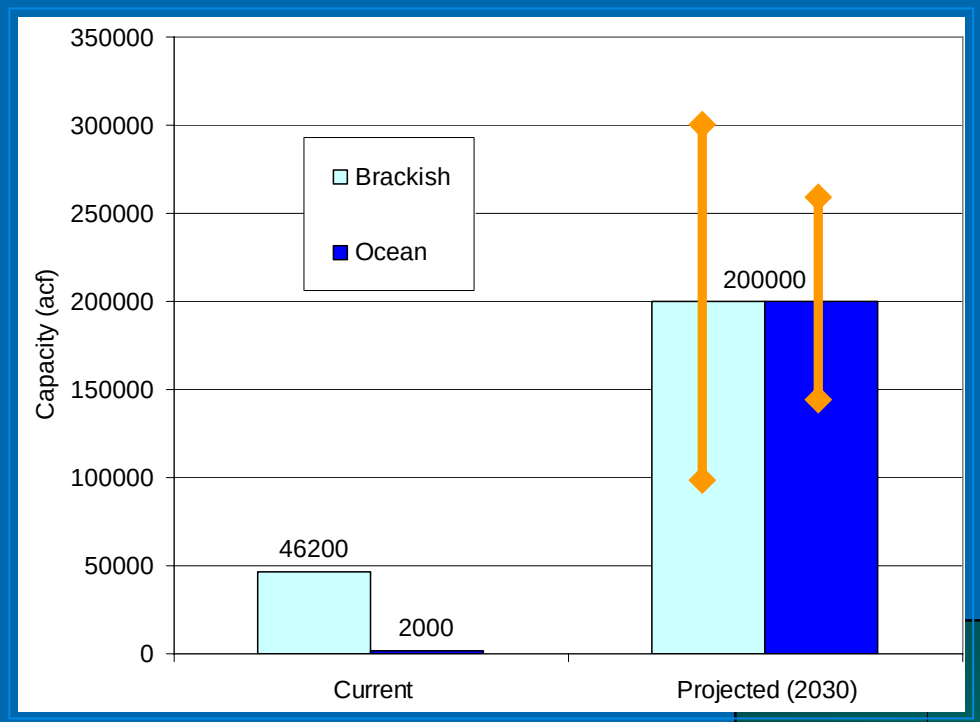
Estimated Unit Cost

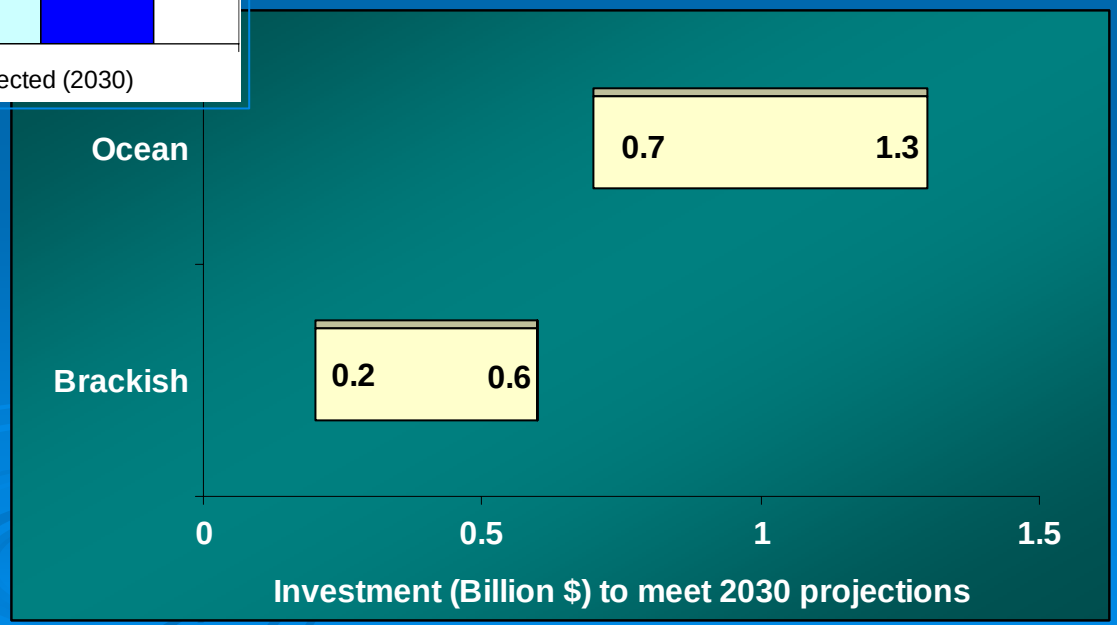
Brackish Water Desalination
The total cost for brackish water desalination, including the amortized costs for planning, designing, and constructing such a facility and the costs for operation (e.g., energy, chemicals, disposal etc) will be based on site-specific conditions and range from **$130 to $1,250 per acre-foot*.**

Oceanwater Desalination
In California, the total amortized production cost of reverse osmosis desalination would be $860/AF to $1,300/AF (assuming electricity costs of $0.08/kWh). On the average, an increase in electric energy cost of $0.01 per kilowatt hour (kWh) would increase the total cost of desalination by $53 per acre-foot (AF) of desalinated water.

In addition, there are distribution costs of **$100 - $300 per acre-foot.**
Operation and maintenance may vary from 50% to 70% of total cost

Desalination Projections & Associated Average Capital Cost





Desalination in California

	In Operation		In Design & Construction		Planned	
Feedwater Source	No. of Plants	Annual Capacity	No. of Plants	Annual Capacity	No. of Plants	Annual Capacity
Groundwater	14	46,200	5	31,100	8	56,300
Seawater	4	1,150	1	250	9	187,100
Total	18	47,350	6	31,350	17	243,400
Cumulative			24	78,700	41	322,100

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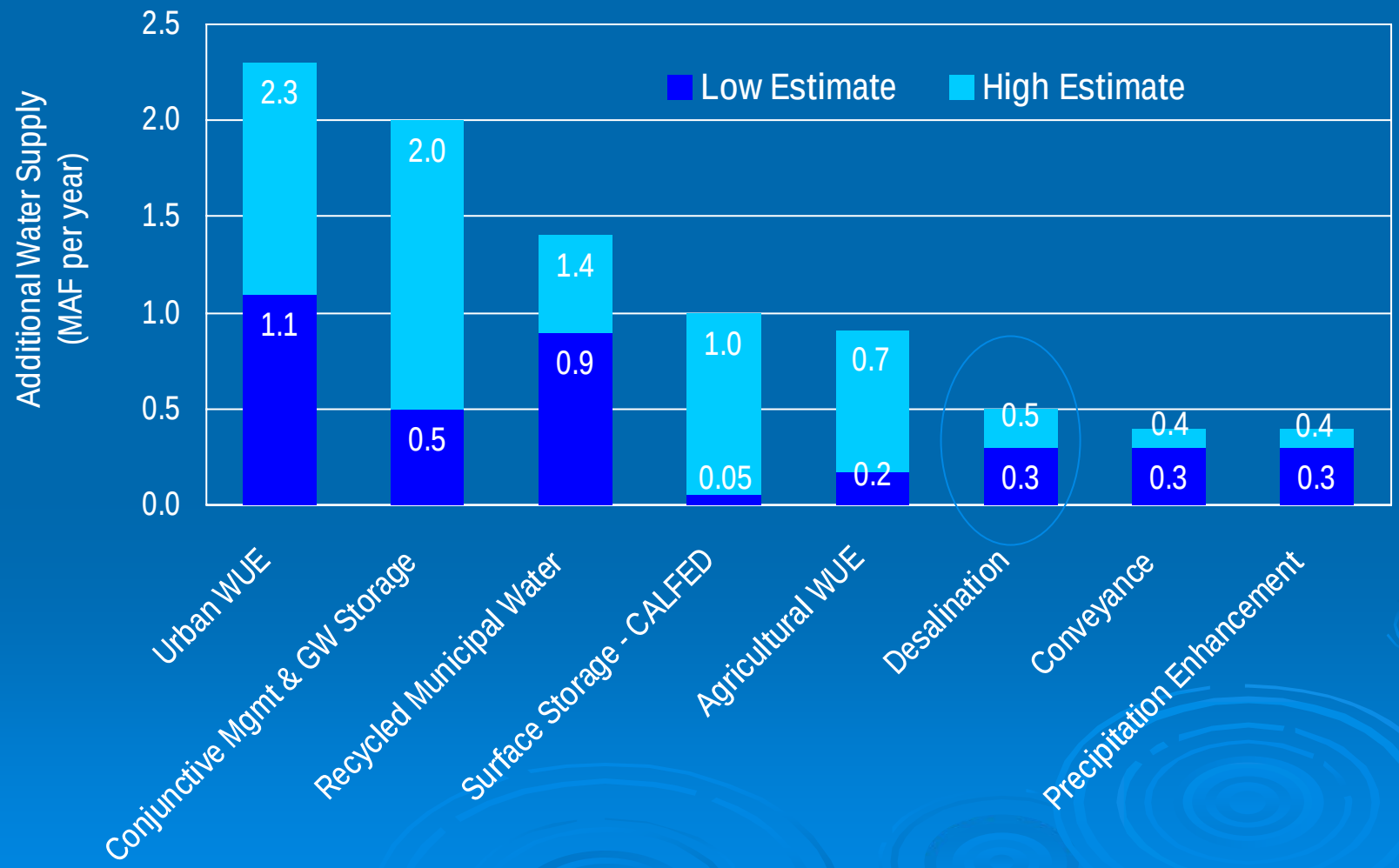
Range of Water Supply Benefits by 2030



Challenges Facing Desalination

- Environmental impacts
  - Brine disposal / Feed water intake issues
- Cost
- Energy use – about 30% higher than Imports
- Planning and regulatory issues
  - Permitting/Regulations
- Distribution Infrastructure Issues
  - Aggressiveness of water
  - Blending / treatment

Desalination Task Force: Background & Objectives

- AB 2717, Hertzberg – Signed 09/26/2002
- Task Force Formed by DWR
  - Convened 05/29/2003
  - Report to Legislature 10/09/2003
- Objectives:
  - Identify potential opportunities and impediments for using desalination
  - Examine what role, if any, the State should play in furthering the use of desalination

Among the Task Force's 29 Major Recommendations:

- ✓ Include desalination, where economically and environmentally appropriate, as an element of a balanced **water supply portfolio**, which also includes conservation and water recycling to the maximum extent practicable
- ✓ Provide **funding** for research and development projects
- ✓ Evaluate all new water supply strategies including desalination based **integrated planning**, growth and water supply/demand projection
- ✓ Ensure desalination projects are designed and operated to avoid, reduce or **minimize environmental impacts**
- ✓ Ensure adequate **public involvement**

Proposition 50 Chapter 6

"Contaminant and Salt Removal Technologies"

Provisions		Grant Amount (m$)	Admin. by
a	Desal. of Ocean or brackish waters	50	DWR
b&c	Treatment or removal of contaminants / Disinfection using UV & ozone treatment	50	DHS

Proposition 50 Chapter 6(a)

"Desalination of Ocean or Brackish waters"

Program Objectives

Assist local public agencies with the development of <u>new local potable</u> water supplies through the construction of brackish water and oceanwater desalination projects and help advance water desalination technology and its use by means of feasibility studies, research and development, and pilot and demonstration projects.

Proposal Solicitation Guidelines

- Proposition 50 Language-November 2002
- AB 1747 Trailer Bill (statute of 2003)
- Water Desalination Task Force

  Findings & Recommendations
- Other relevant laws
- Public Input

Eligible Applicants

- California public entities involved with water management activities including:
  - **Cities, Counties, Cities and counties, Joint power authorities, Public water districts, Tribes, State agencies, and other political subdivisions of the State.**

- The following California and non-California entities:
  - **Non-profit organizations, including California watershed management groups, Universities and colleges, and Federal agencies.**

Funding Criteria / Preferences

- ***Comprehensive conservation and recycling programs***
- ***New and improved technology***
- ***Public information, education, and outreach***
- ***Multiple-benefits***
- ***Ensure equitable access to benefits- address environmental justice impacts***

Eligible Project Types

Feasibility studies	$250,000 / project
Research & development	$1.0 million / project
Pilot or demonstration projects	$2.5 million / project
Construction projects	$5.0 million / project

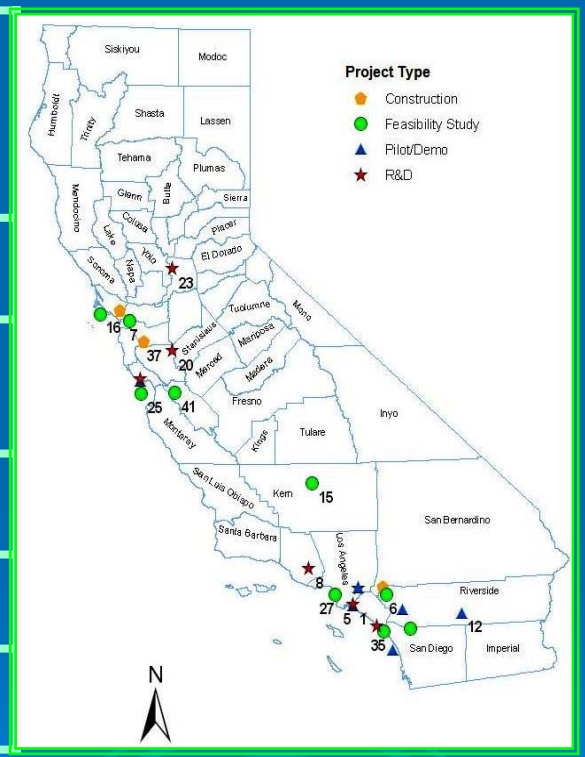
- ***Funds Appropriated: $25 million; 50 % matching funds required.***
- ***Matching fund is not required of qualified projects serving disadvantaged community (SB 117, Machado).***

Collaboration and Coordination

- ***California Energy Commission***
- ***US Bureau of Reclamation***
- ***US Desalination Coalition***
- ***Northern California Salinity Coalition***
- ***Southern California Salinity Coalition***
- ***Universities***
- ***Research institutions***
  - ***Sandia Labs (National Desal and Water Purification Technology Roadmap)***
  - ***Office of Naval Research (Demonstration on Energy Recovery Systems)***
- ***Non-profit organizations (WateReuse, …)***
- ***Environmental & Consumer advocacy groups***
- ***Private sector***
- ***Other stakeholders and interested parties***

2005 Funding Cycle Awarded Grants

Project Category	(Number of Funded Projects / Total Projects)	Project Total Cost ($)	Requested ($)	Grant Amount ($)
Construction Projects	(3/8)	104,359,043	15,000,000	8,930,744
Pilot and Demonstration Projects	(6/14)	26,438,272	10,474,232	7,974,516
Research and Development	(7/11)	13,804,295	6,004,746	6,004,746
Feasibility Studies	(8/9)	4,437,061	2,089,994	1,840,453
Total	**(24/42)**	**149,038,671**	**33,568,972**	**24,750,459**



2006 Funding Cycle In Progress

~$21.5 million (50 % matching funds required)

Eligible Project Types and Funding Caps

		Received
Feasibility studies	$250,000 / project	7
Research & development	$500,000 / project	13
Pilot or demonstration projects	$1.5 million / project	17
Construction projects	$3.0 million / project	12

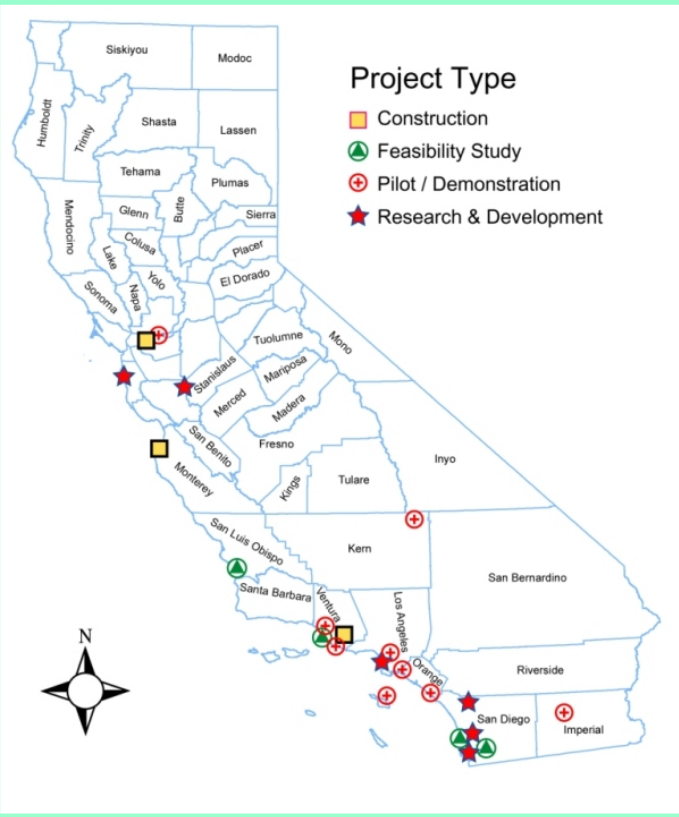
49 applications Requesting $57,511,684

2006 Funding Cycle - Anticipated Schedule

10/04/05	Draft PSP released on website for public comment
11/07/05	2 Public Workshops: Sacramento 10/25/05 San Diego 11/07/05
11/14/05	Public Comment Period ends
01/26/06	Final PSP released on website to accept proposals
02/10/06	Public Workshop for Final PSP
03/24/06	Proposals Due
05/31/06	Review process completed
06/06	DWR makes final funding decision

2006 Draft Funding Recommendations

Project Category	(Number of Funded Projects / Total Projects)	Awarded Projects Total Cost	Funds Requested	Awarded Grant
Construction Projects	(3/12)	$43,015,000	$9,000,000	$9,000,000
Pilot and Demonstration Projects	(9/17)	$22,873,787	$9,811,209	$8,954,577
Research and Development	(7/13)	$7,951,510	$2,860,964	$2,860,964
Feasibility Studies	(4/7)	$1,463,000	$724,000	$724,000
Total	**(23/49)**	**$75,303,297**	**$22,396,173**	**$21,539,541**



Prop 50 Desalination Grants Outcome

- *Mix of R&D, pilot/demonstrations, and construction projects*
- *Ocean / Bay water and Brackish water desalination projects*
- *Statewide*
  - *Northern California Salinity Coalition*
  - *Southern California Salinity Coalition*
  - *Universities / Research institutions*

- *A balanced distribution of fund to brackish water desalination projects and ocean/bay water desalination related projects with a statewide geographically balanced distribution.*

Helpful Links

Department of Water Resources

www.water.ca.gov

Recycling and Desalination Branch

www.owue.water.ca.gov/recycle/

OWUE Grants and Loans

www.owue.water.ca.gov/finance/

Contact – Fawzi Karajeh – (916) 651-9669