

# Desalination: An Australian Overview

CEDA Forum  
Western Australia's Desalination Story

Melbourne  
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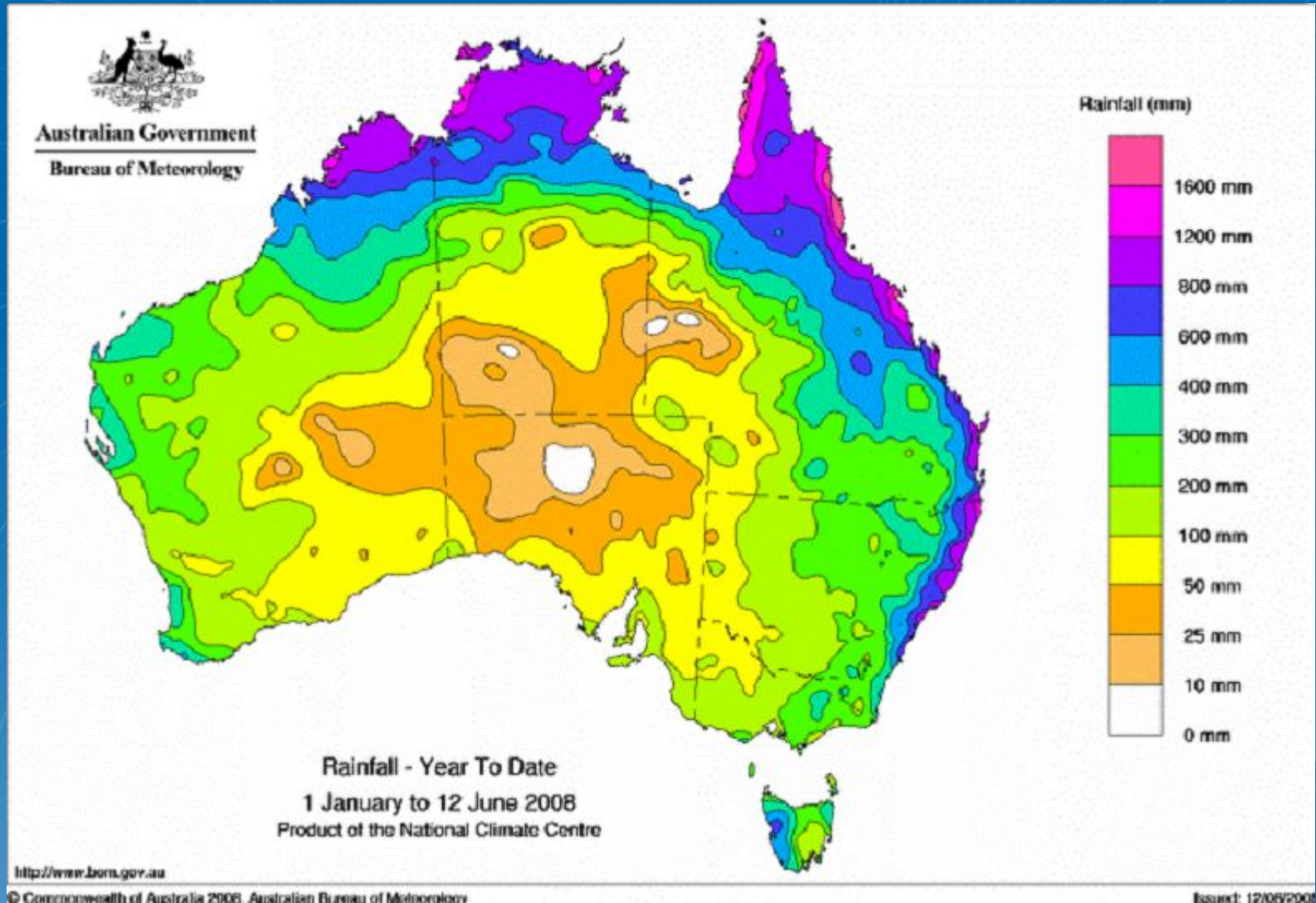
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# Current Storage Levels

Adelaide	60.0%
Canberra	46.5%
Darwin	100%
Hobart	70.3%
Melbourne	30.0%
Perth	31.9%
South East Queensland	55.3%
Sydney	59.1%

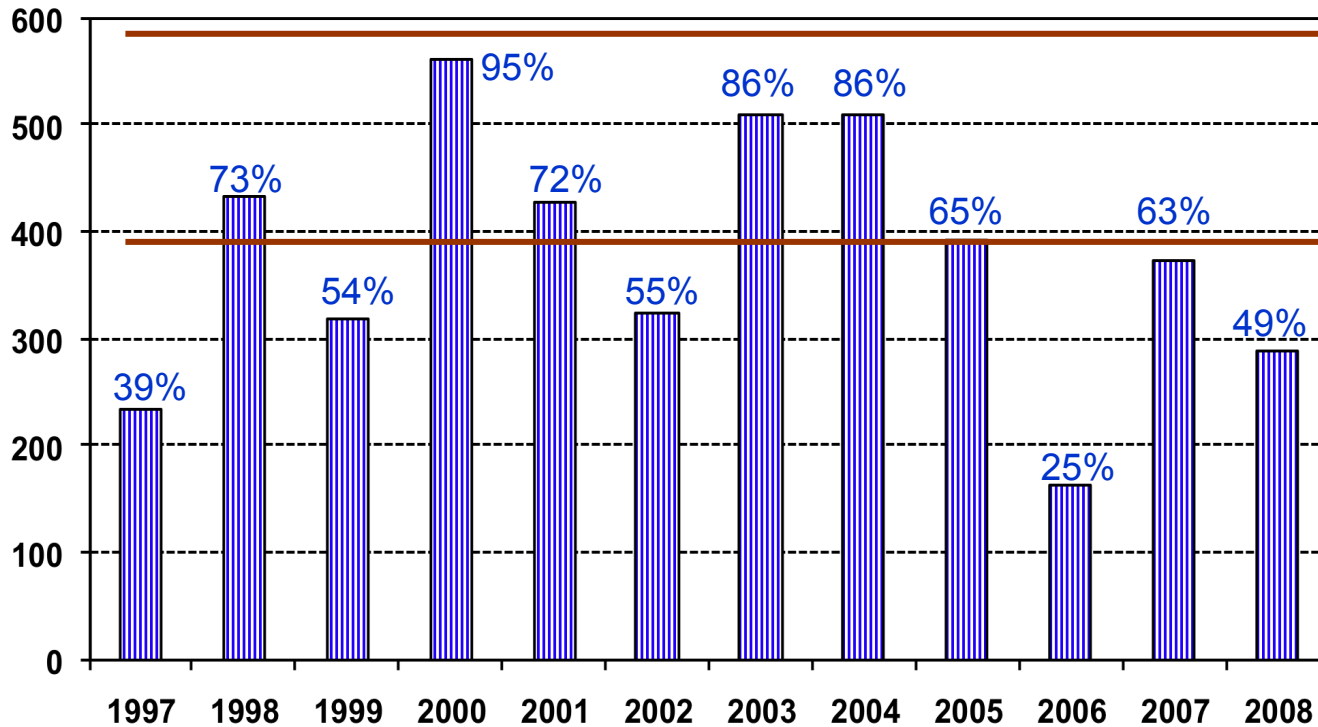


# Australian rainfall - 2008



# Annual inflows to Melbourne's storages

Gigalitres



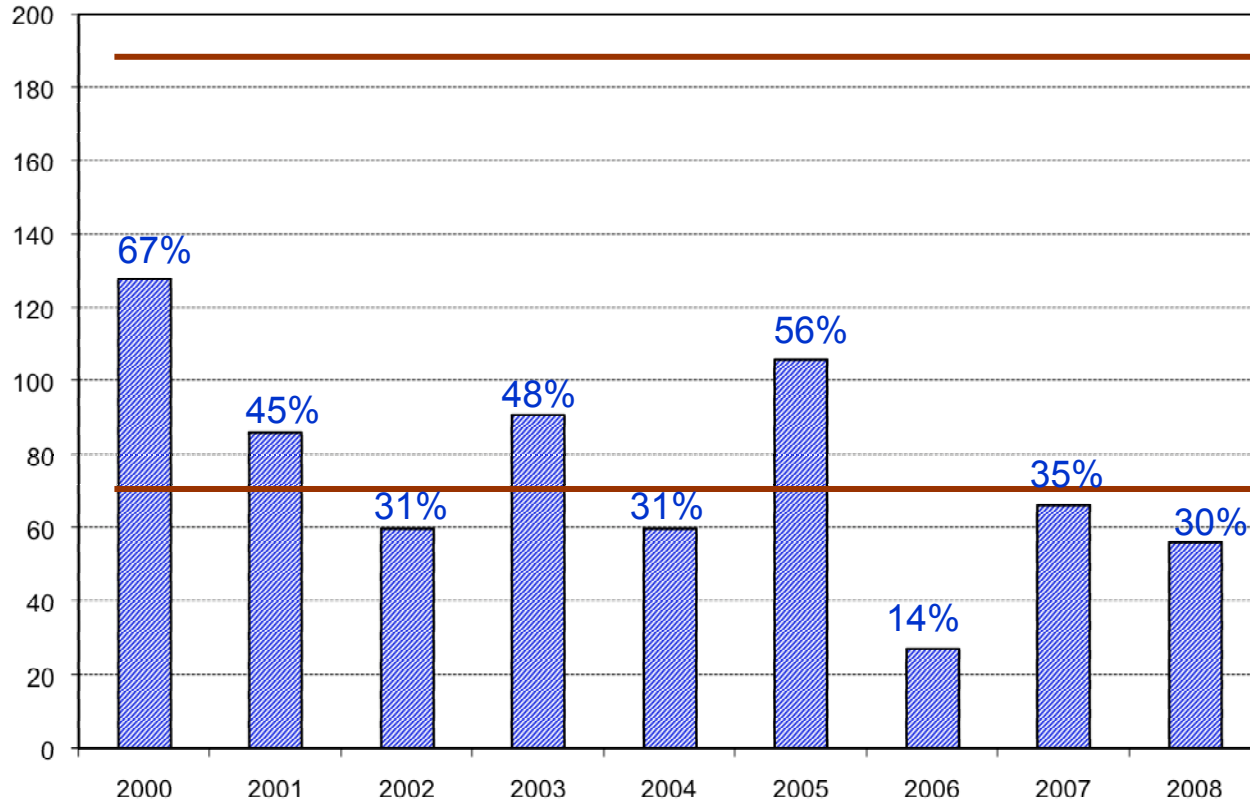
585 GL Long term average inflow 1913 – 2008

377 GL average inflow 1997 - 2008 is 65% of long term average



# Annual inflows to Canberra's storages

Gigalitres



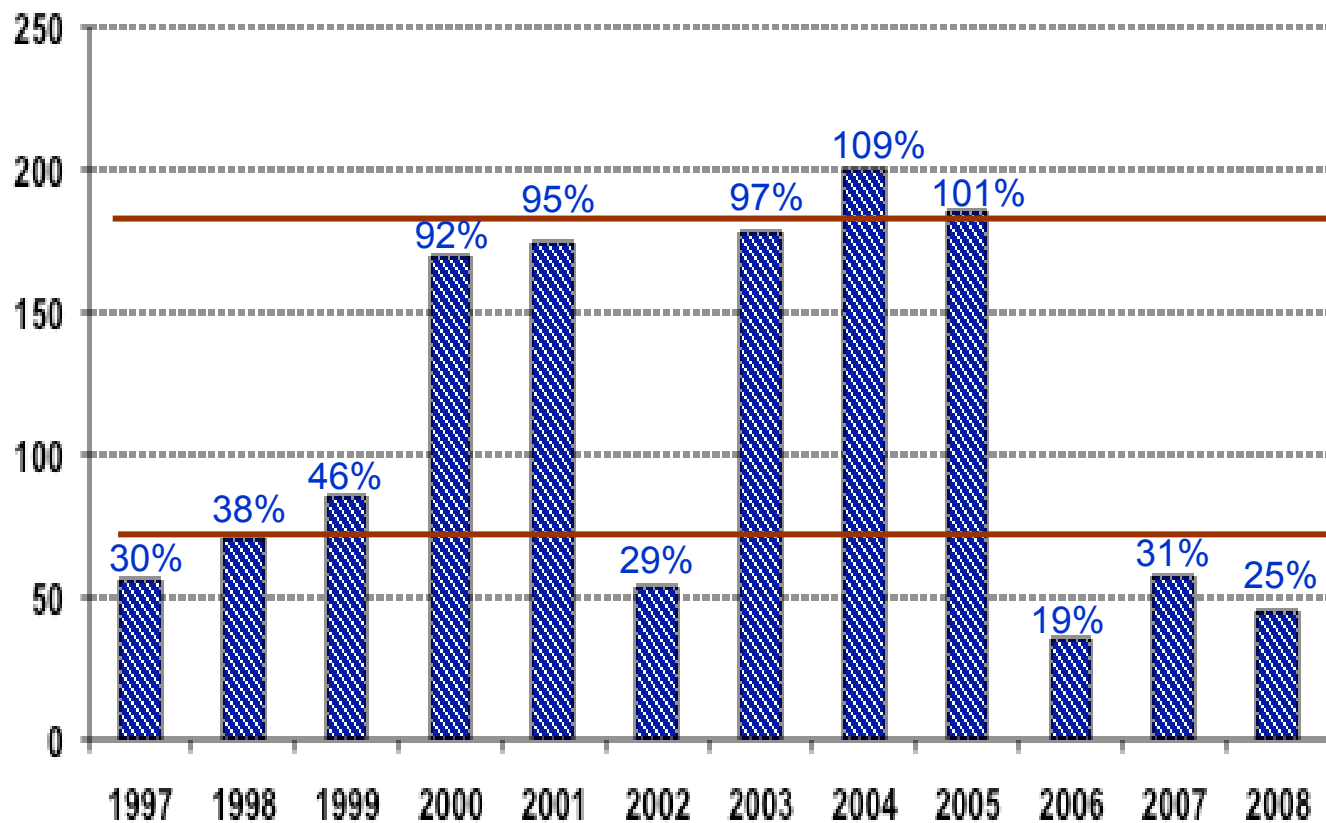
187 GL Long term average inflow 1871 – 2008

68 GL average inflow 2000 - 2008 is 37% of long term average



# Annual inflows to Adelaide's storages

Gigalitres

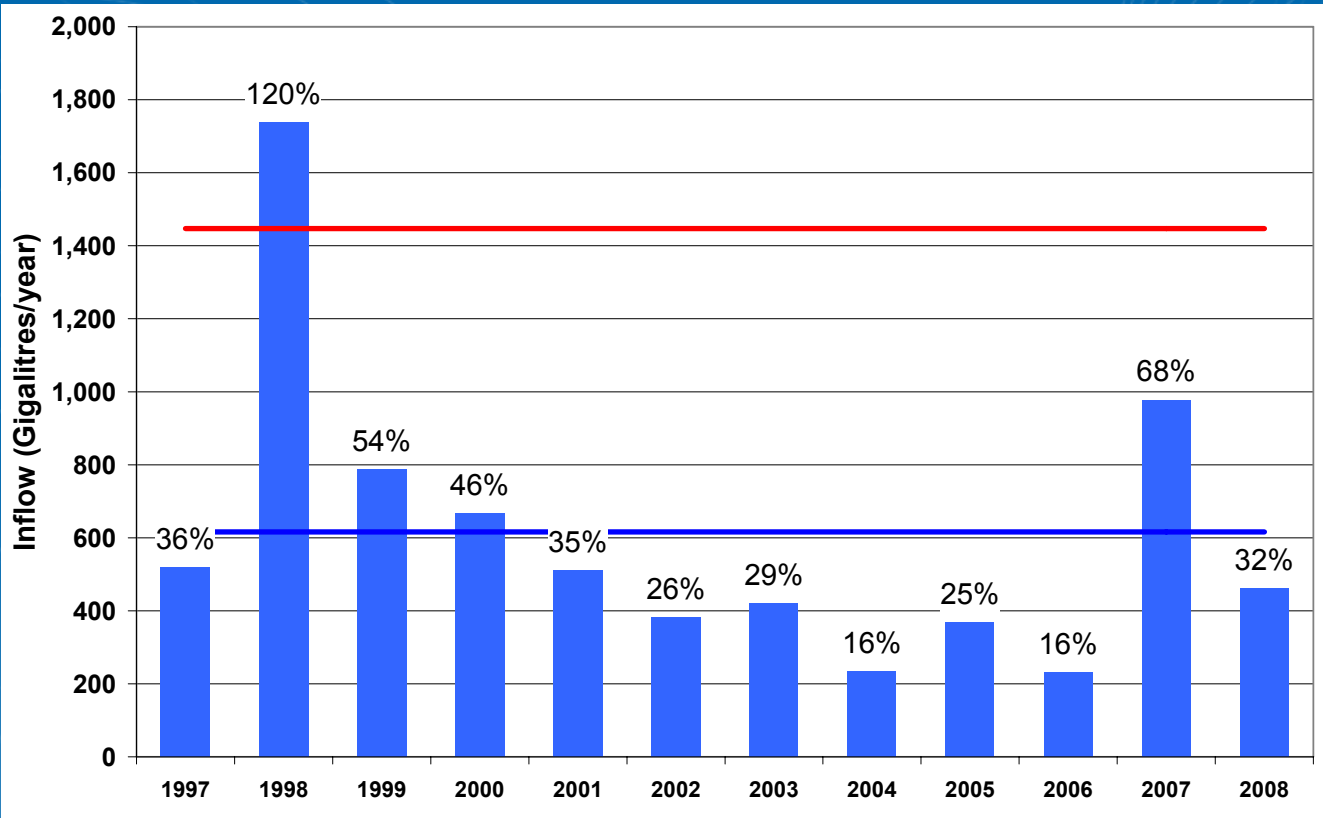


183 GL Long term average inflow 1892 – 2008

109 GL average inflow 1997 - 2008 is 60% of long term average



# Annual inflows to Sydney's storages excluding Shoalhaven



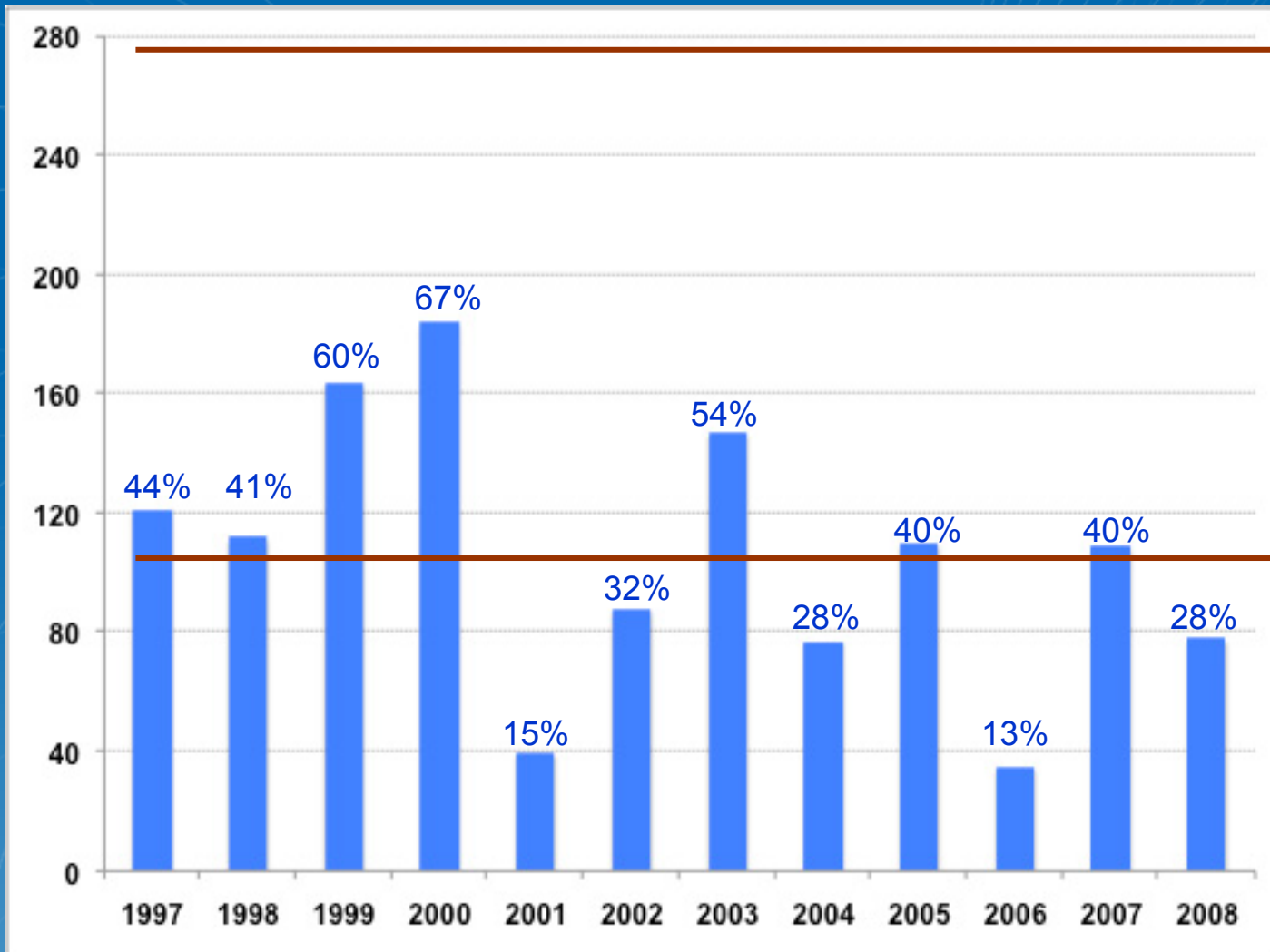
1,447 GL - Long Term Average Inflow between 1909-2008

616 GL - Average Inflow between 1998-2008 (43% of long term average)



# Annual inflows to Perth's storages

Gigalitres



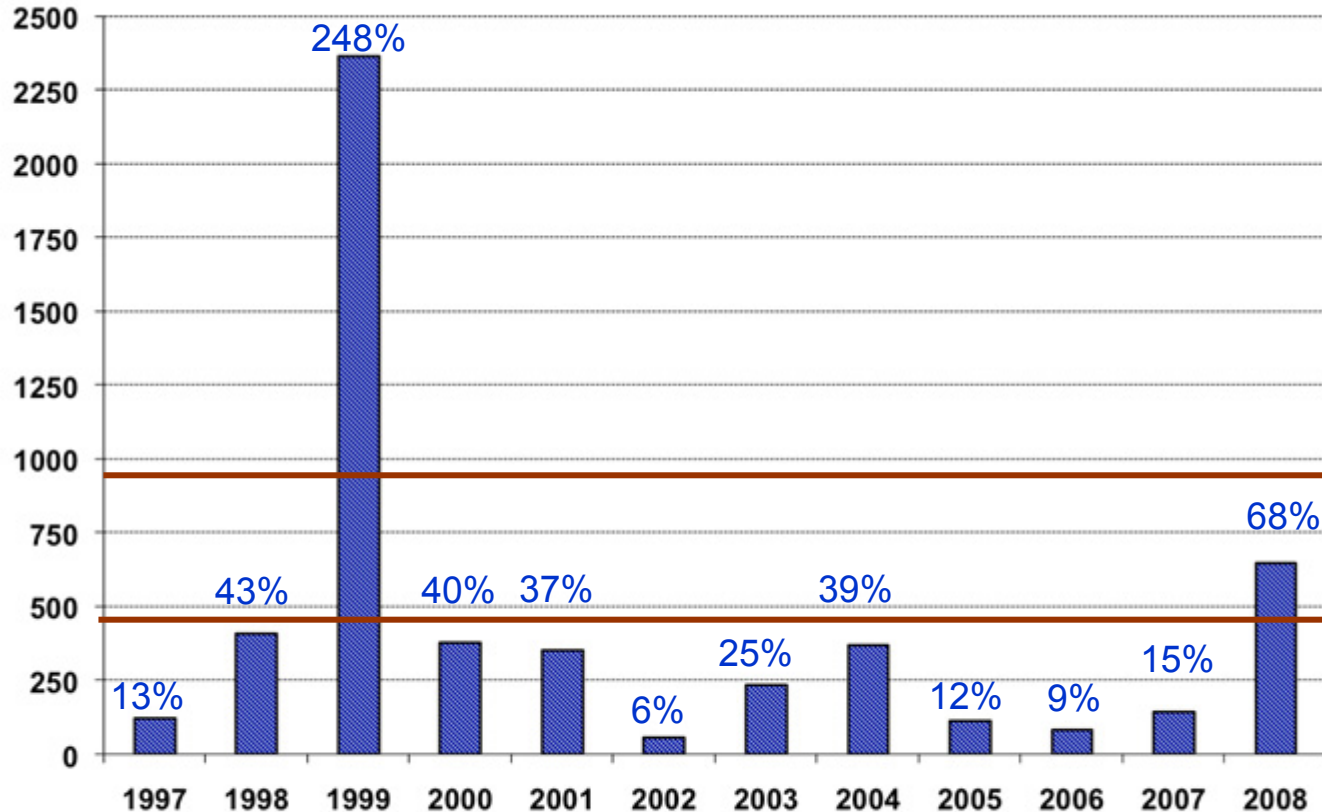
274 GL Long term average inflow 1911 – 2008

105 GL average inflow 1997 - 2008 is 38% of long term average



# Annual Inflow to Brisbane's Storages – Wivenhoe, Somerset and North Pine

Gigalitres



953 GL Long term average inflow 1889 – 2007

441 GL average inflow 1997 - 2008 is 46% of long term average

# Context for what is happening in the water industry

- Climate shift – yields are collapsing dramatically, 30% to 70%.
- Rapidly growing populations and changing demographics.
- Additional environmental flows for stressed rivers.
- Expectations of increased levels of service i.e. growing affluence.
- Meeting these challenges in a sustainable manner e.g. water/energy inter-relationships and operating in a carbon constrained world.



During 2007/2008, the average population growth in Australia's major urban areas was 1.6 percent or a total of 227,800 people

### Capital City Population Growth 2006/2007

City	Population Increase	Annual Growth Rate	Population June 2007 (millions)
Adelaide	12,100	1.10%	1.16
Brisbane	37,200	2.00%	1.86
Canberra	5,600	1.70%	0.34
Darwin	3,000	2.60%	0.12
Gold Coast	17,500	3.40%	0.52
Hobart	3,400	0.70%	0.49
Melbourne	61,700	1.60%	3.81
Perth	35,300	2.30%	1.56
Sydney	52,000	1.20%	4.34
<b>Total</b>	<b>227,800</b>	<b>1.60%</b>	<b>14.20</b>



# Projected Population Increases for Australia's Major Urban Areas up to 2050

City	Current Population June 2006 (000s)	Project population 2030 (000s)	Project population 2050 (000s)	% increase from June 2006 to 2050
Melbourne	3,682.6	4,869.9	5,846.5	58.8
Sydney	4,307.7	5,386.7	6,267.8	45.5
Brisbane	1,864.0	3,071.3	4,147.1	122.5
Perth	1,512.2	2,299.4	2,965.9	96.1
Darwin	114.7	199.8	290.4	153.2
Canberra	330.3	446.7	542.3	64.2
Hobart	206.3	253.5	285.4	38.3
Adelaide	1,133.2	1,259.9	1,324.5	16.9
<b>Total</b>	<b>13,151.0</b>	<b>17,787.2</b>	<b>21,669.9</b>	<b>64.8</b>

Source: ABS Population Projections Australia 2006



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# Responses

## Both on the demand and supply side

- Ongoing water conservation programs.
- Diversifying sources of water to remove the urban water industry's almost total reliance on surface water run-off i.e. security through diversity.
- Major projects will include:
  - Desalination plants
  - Building new dams
  - Pipelines to connect water supply systems
  - Large scale water recycling plants
  - Pipe networks to transfer recycled water
  - Third pipe systems in new developments and redevelopments
  - Pipelines connecting rural water to urban areas
  - Water sensitive urban development in new developments
- No water supply option should be ruled out in an era of climatic uncertainty.





# Desalination in Australia

City	Location	Capacity (ML/annum)	Ability to increase capacity (ML/annum)	% of annual total consumption 2007/08	Completion date
Sydney	Kurnell	90,000	180,000	19% <i>(potential 37%)</i>	2009/10
Melbourne	Wonthaggi	150,000	Up to 200,000	41% <i>(potential 54%)</i>	2011
South East QLD	Tugun	45,000		24%	2008/09
Perth	Kwinana	45,000		19%	Completed
	Binninyup	50,000	100,000	21% <i>(potential 42%)</i>	2011
	Kwinana & Binninyup combined	95,000		40%	
Adelaide	Port Stanvac	50,000		35%	Dec 2010

<b>Total</b>	<b>430,000</b>	<b>620,000</b>
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This represents 44% of capital city water consumption in 2007/08





# Desalination

Up to 15% of Sydney's water supply by 2015



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# New Water Sources – More Energy Intensive

- Conventional water systems – 0.2kWh/m<sup>3</sup>
- Recycled water – 2.8kWh/m<sup>3</sup>
- Desalinated water – 4.3kWh/m<sup>3</sup>
- Current desalination benchmark  
3.5kWh/m<sup>3</sup>



# Federal Government Support for Desalination

## DEWHA - Grants and funds

- \$1 billion - National Urban Water and Desalination Plan  
<http://www.environment.gov.au/water/programs/urban/index.html>
- \$40 million - Centres of Excellence in desalination and water recycling  
<http://www.environment.gov.au/water/programs/urban/desalination-recycling.html>





# Advantages of Desalination

- Highly reliable source of water
- Small footprint
- Proven technology
- Allows storages to recover
- Can be put directly into the water distribution system (unlike recycled water)



# Environmental Impacts

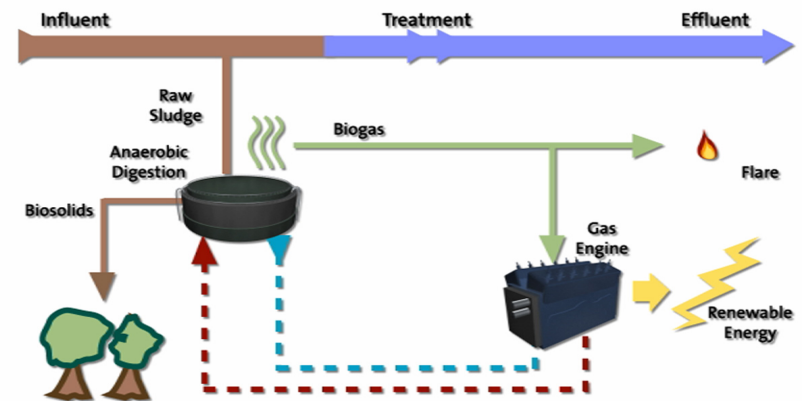
- Intake of seawater
- Discharge of concentrated salt stream
- Disposal of waste biosolids
- Greenhouse gas emissions



# Renewable energy generation



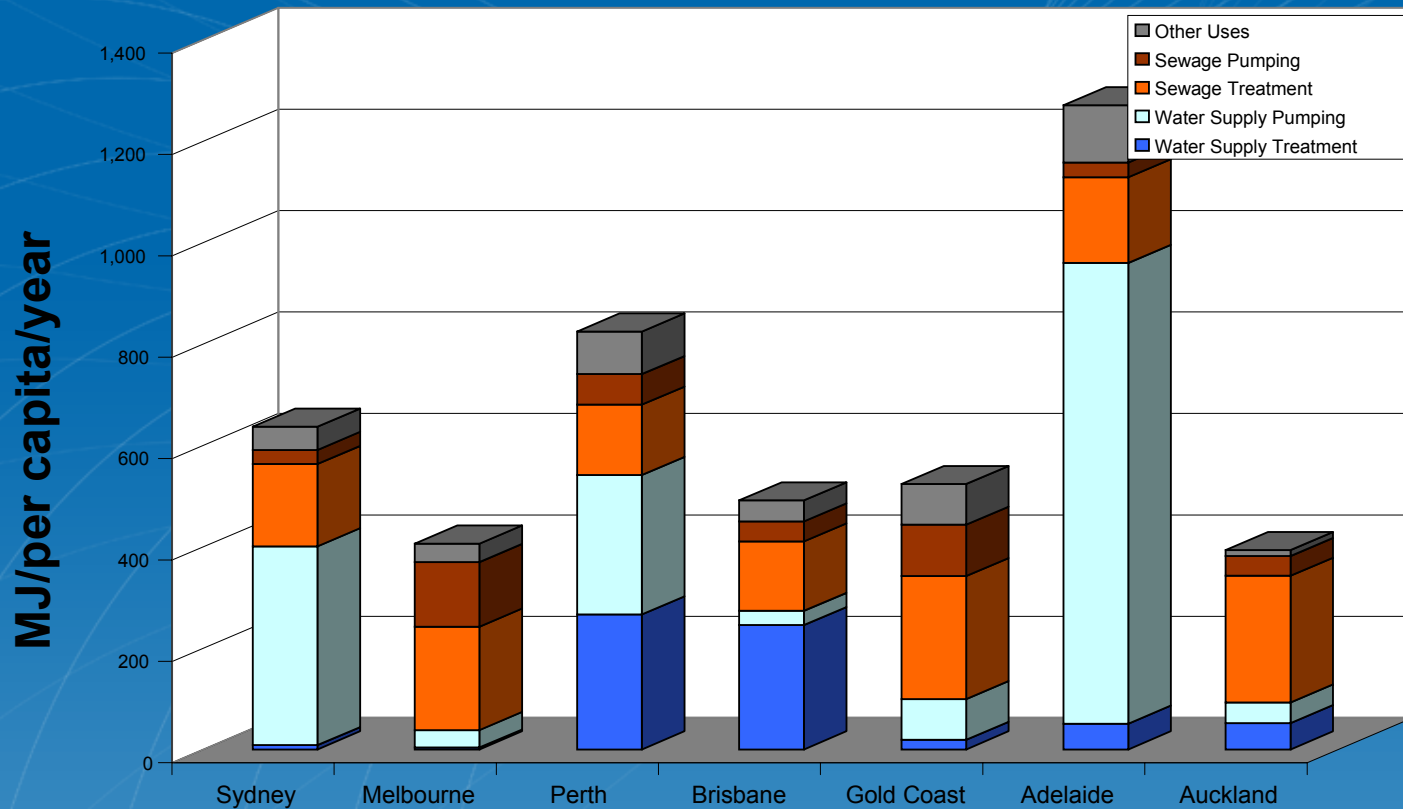
Simplified Treatment Process





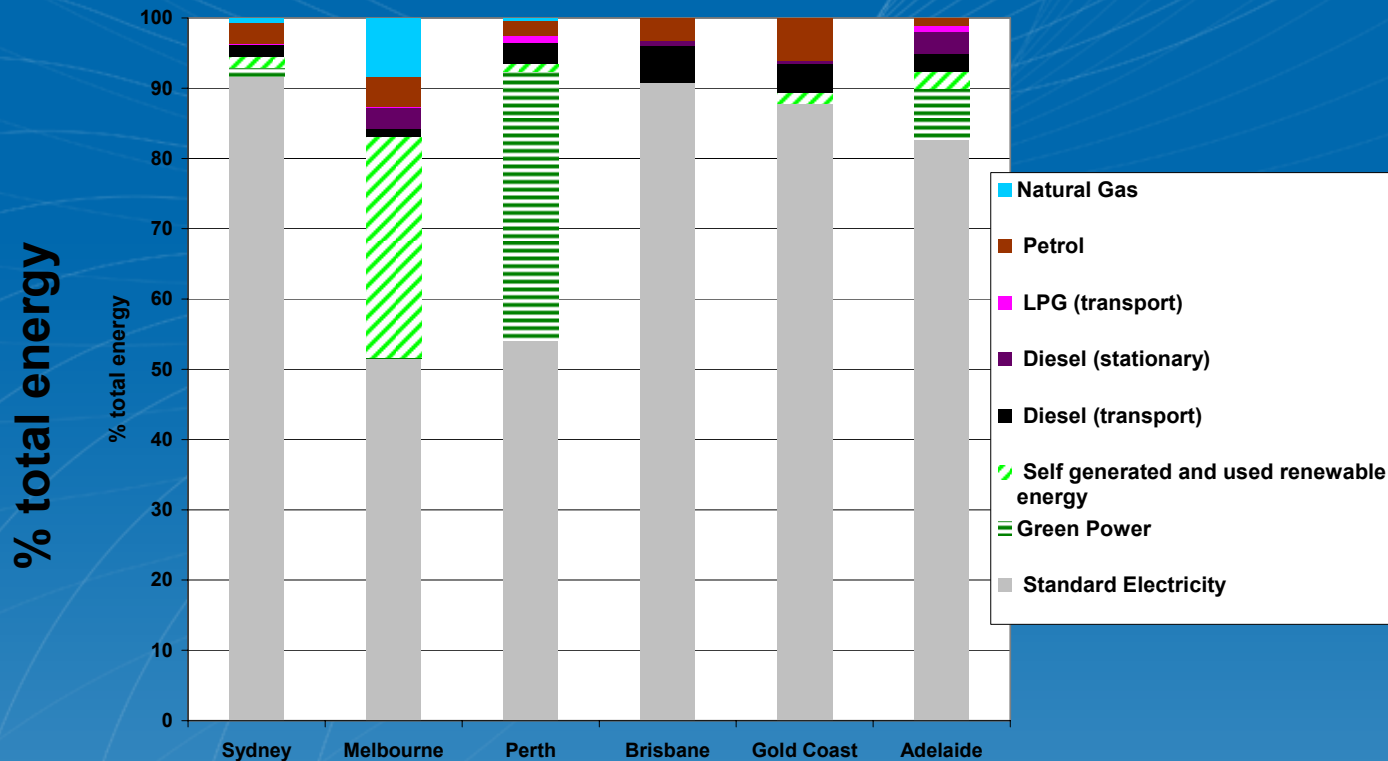
# Energy use across urban water cycle

Energy breakdown for water and wastewater services (2006-07)



# Energy use across urban water cycle

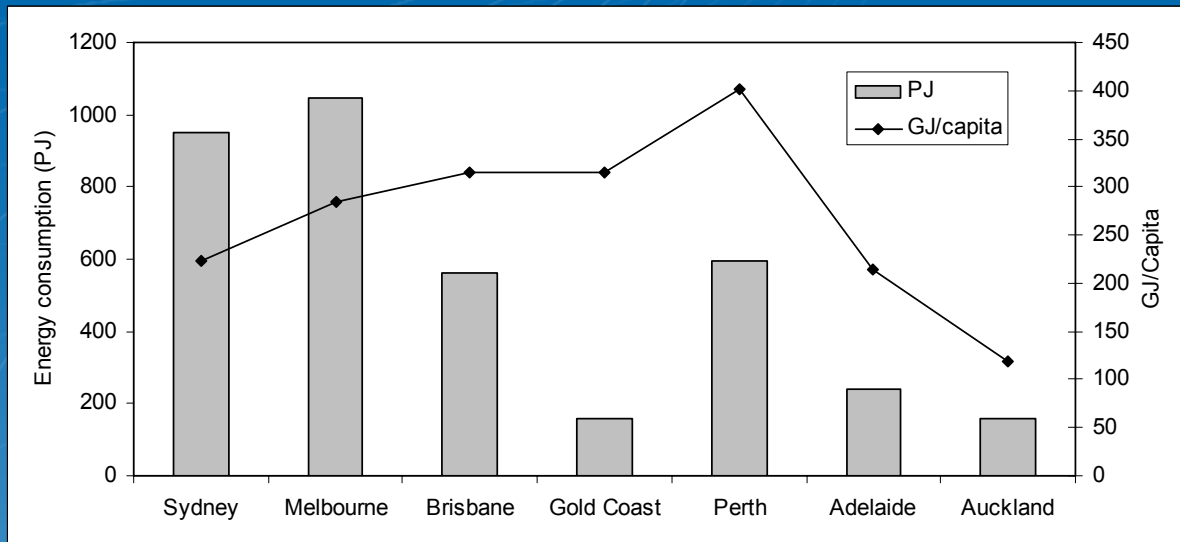
Energy use by water utilities by source (2006-07)



# Context within the 'wider urban system'

- The total energy use for water and wastewater services of the six Australian cities studied was 7.1 PJ/annum in 2006-07. This figure represents about 0.2% of total urban energy use.

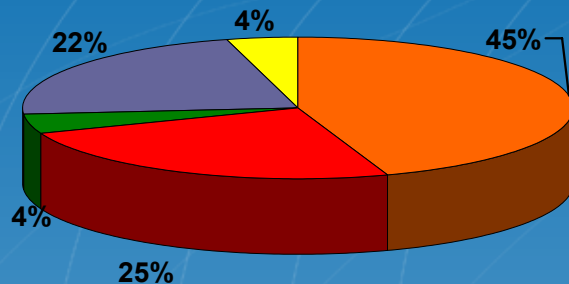
Total energy consumption by city and demand per capita (2006-07)



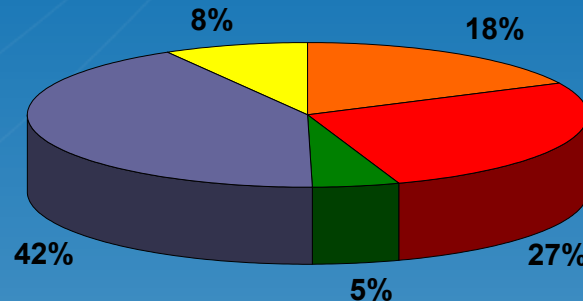
# Comparison of energy use for residential hot water

- Residential hot water heating consumes on average 1.3% of total energy used in Australian cities or 27% of total household energy use.
- Residential hot water uses on average 6.5 times the energy that is used to deliver urban water services, this ratio ranging from 4.7 in Adelaide to 11.2 in Melbourne.
- A 20% reduction in the use of hot water or an equivalent increase in the efficiency of hot water systems would completely offset the total energy currently used for water service provision.

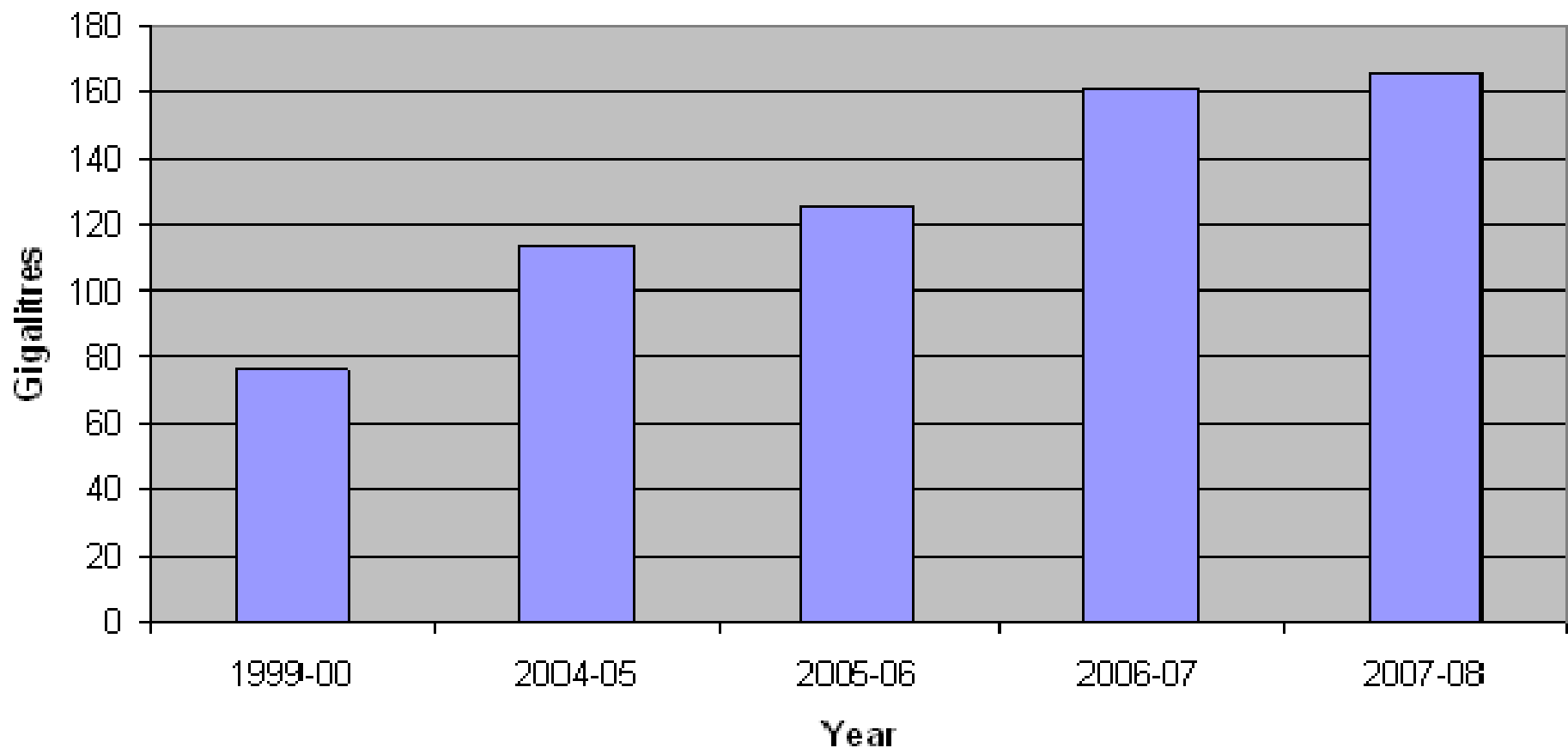
Residential Energy Use by End Use



Residential GHG Emissions by End Use



## Growth in the use of recycled water in major urban water utilities



Dams +  
Recycling +  
Desalination +  
Water efficiency =  
Water reliability





# Questions?



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