

# *Managing Residential Water Demand & Supply: An Alternative Approach*

by

R. Quentin Grafton

*Crawford School of Economics and Government*

*The Australian national University*

[quentin.grafton@anu.edu.au](mailto:quentin.grafton@anu.edu.au)

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- 1. National Water Initiative and Urban Water Reform**
- 2. A Cross-Country Comparison**
- 3. Urban Australia and the 'Big Dry'**
- 4. Water Demand:**
  - Prices versus rationing
- 5. Water Supply:**
  - Sydney water inflows and storage
  - Water pricing and supply augmentation
  - Costs of premature investment
- 6. Alternative Approach**

- **The 2004 National Water Initiative committed Australian governments to:**
  - 66. i) “Continued movement to upper bound pricing...”**
  - 90. vi) “achieve improved pricing for metropolitan water”**
  - 91 iii) “review the effectiveness of temporary water restrictions and associated public education strategies, and assess the scope for extending low level restrictions as standard practice”**

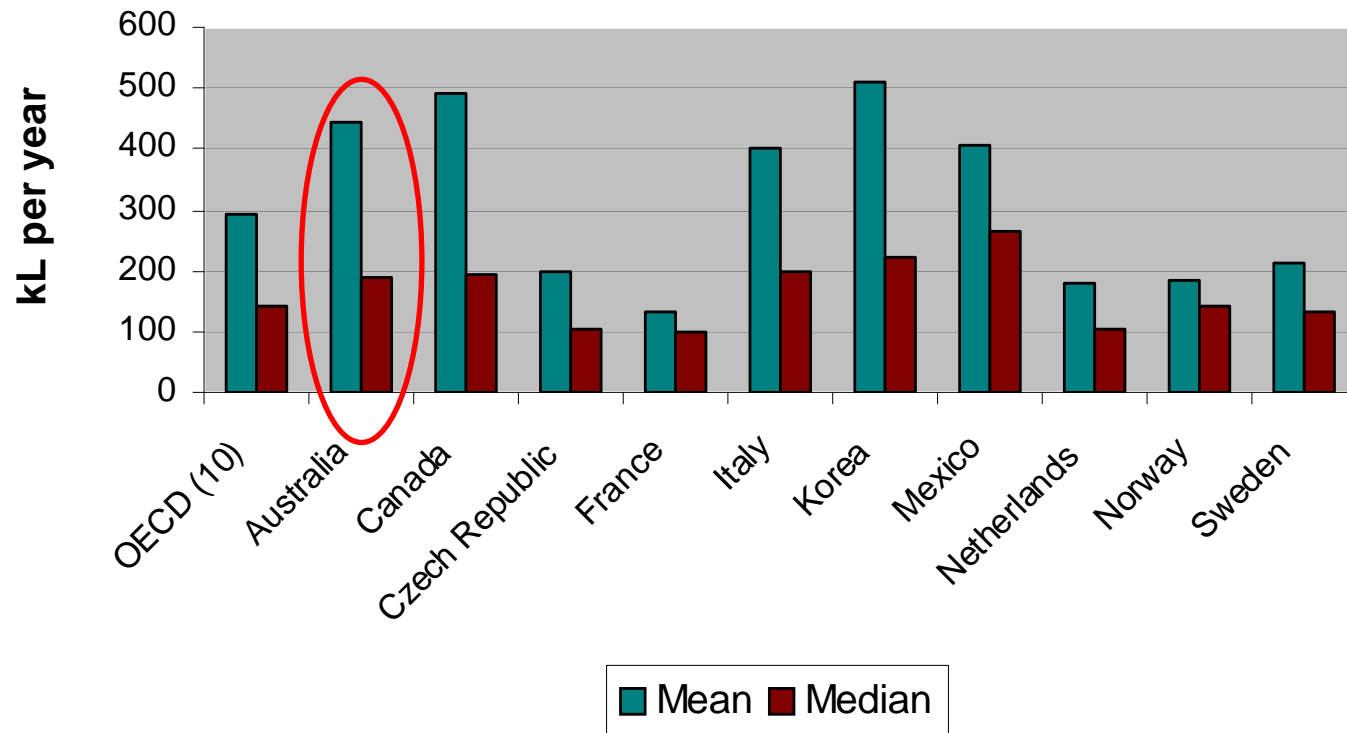


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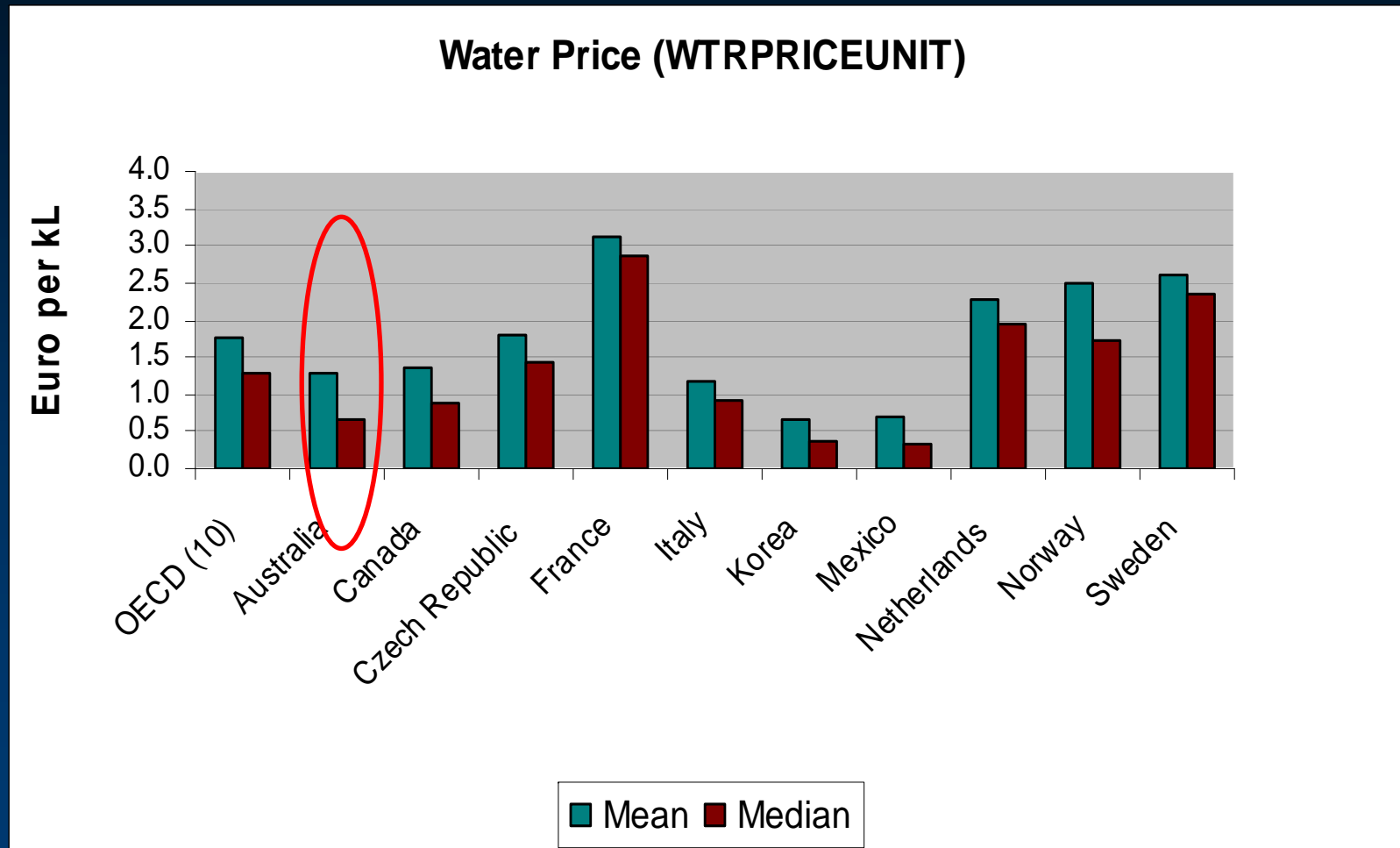
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# Household Water Consumption

Water Consumption (WTRCONS)



# Volumetric Water Prices





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# Water Prices and Water Burden

Country	Water Bill (Euros)	Median Water Price (€/kL)	Water Bill/Income (%)
Australia	226	0.66	0.62
Canada	332	0.88	0.74
Czech. Rep.	229	1.44	1.91
France	373	2.88	1.01
Italy	270	0.93	0.90
Korea	116	0.36	0.50
Mexico	104	0.31	1.42
Netherlands	230	1.93	0.75
Norway	318	1.72	0.50
Sweden	394	2.35	0.98



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# Water Consumption & Water Charges

- Price elasticity of demand is inelastic but statistically significant from zero in all countries (overall a price elasticity of -0.56).
- No statistically significant effect of environmental attitudes or actions on water use.
- Factors that have statistically significant + effect on water use are: h'hold income, # adults, # children, house area and washing machines
- Factors that have statistically significant - effect on water use are: water charges and dual flush toilets.

# Water Saving Behaviours and Effect of Volumetric Water Pricing

	Marginal effects on Prob ("Often" or "Always")				
	Turn off the water while brushing teeth	Take shower instead of bath specifically to save water	Plug the sink when washing dishes	Water the garden in the coolest part of the day to save water	Collect rainwater/ recycle waste water
Australia	0.1971***	0.0404***	0.2477***	0.2126***	0.2271***
Canada	0.1283***		0.1676***	0.1467***	
Czech Republic	0.0711***	-0.0865***	-0.0749***	-0.0599**	0.3404***
France	0.2083***	0.0655***		0.1318***	0.1753***
Italy		0.0456***	-0.0864***	0.1000***	0.4788***
Korea	0.0940***	-0.0270**	-0.2312***	-0.2723***	-0.1320***
Mexico	0.2194***		-0.1752***	0.0425**	-0.1340***
Netherlands	0.1744***	0.0932***	0.1318***	0.1085***	
Norway	-0.0437			-0.1203***	-0.1172***
Sweden	0.0906***	0.1042***			0.0858**

# The 'Big Dry'

- The Big Dry provides a 'window to the future' — equivalent to longer-term and more severe warming trend (+3 Celsius) projected over next 50-100 years under some climate change scenarios.
- Existing risks (afforestation, groundwater extraction, increased farm dams, etc.), coupled with current and projected warming trends, will place an increasing strain on a water management system that has been designed primarily to address needs of users rather than environment.



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# Urban Australia and the 'Big Dry'

- Policy response to Big Dry has been to impose water restrictions in Canberra (since Dec 2002), Sydney (Oct 2003), Melbourne (Nov 2002), and Brisbane (May 2005).
- State governments are currently making massive capital investments (+\$20 billion) to 'drought proof' coastal cities.
- Estimates of welfare loss from long-term and severe water restrictions in response to Big Dry are large:
  - \$150/household in Sydney (Grafton & Ward 2007)
  - \$347-870/household in Perth (Brennan et al. 2007)
  - \$239/household in Canberra (Hensher et al. 2006)

# Water Demand: Prices versus Rationing

- Rationing a scarce good equally among all consumers is not economically efficient if consumers have different marginal valuations for the same good.
- Rationing will also be economically inefficient even if consumers are identical if the good has different uses where at least one use is restricted such that marginal values differ across uses.
- Despite the economic inefficiencies associated with rationing, water utilities frequently choose to restrict when and how water is used to balance supply and demand in low rainfall periods.

# Justifications for Water Restrictions

- **Water is a basic need and because demand is price inelastic even small reductions in consumption require large price increases making a price approach inequitable but...**

*(1) water & sewage bills are, on average, currently less than 1% of household income,*

*(2) Demand is inelastic (median value  $-0.35$  so 1% increase in price will reduce demand by 0.35%), but will respond to price changes*

*(3) lump-sum rebates from higher water prices can be used to reduce fixed charges*

*(4) a basic needs allocation (50 L/day/per person) could be provided at low cost*

# Water Supply in Sydney

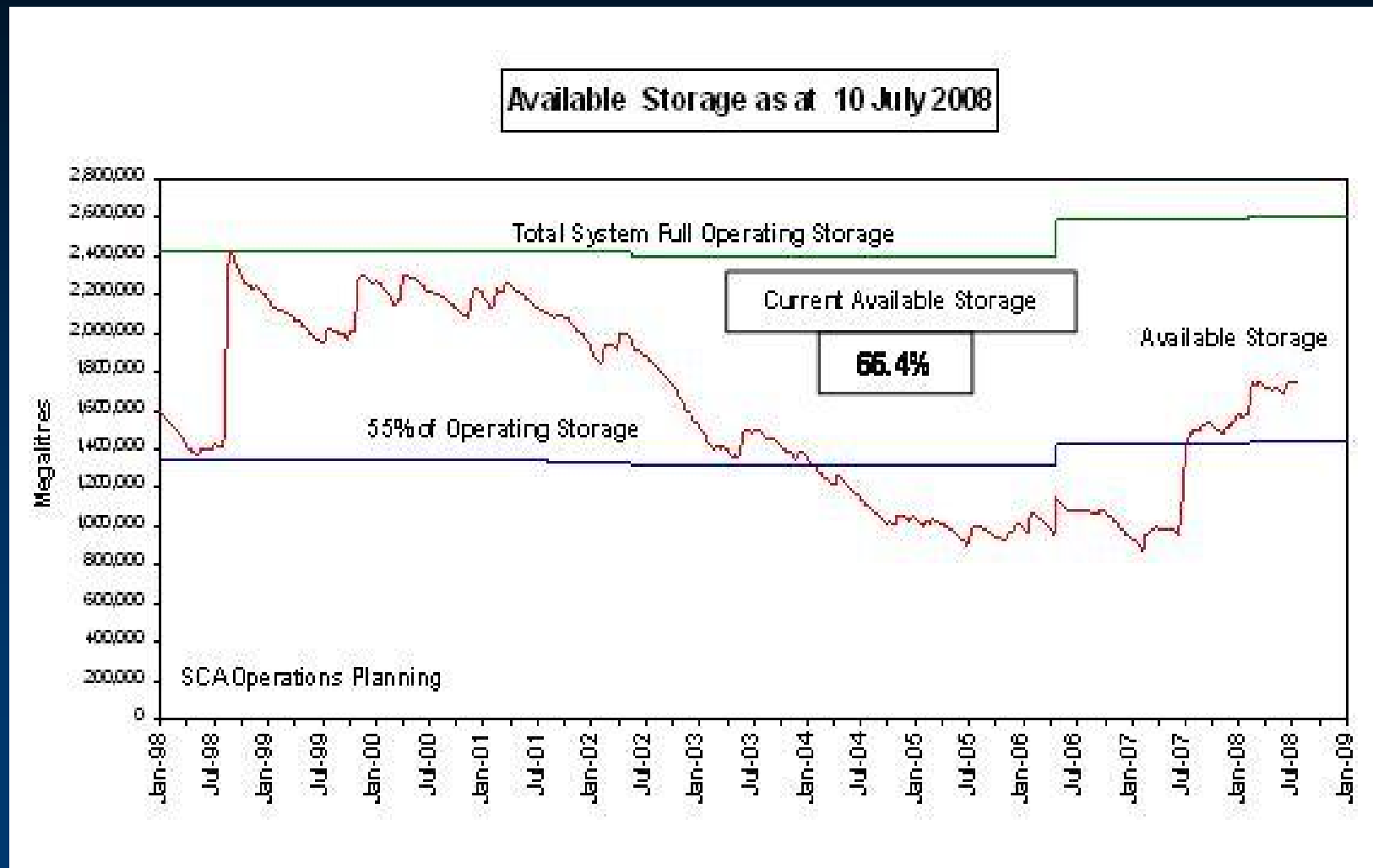
- Concerns over future water supplies (claim of reduced net inflows) and to 'drought proof' Sydney led the NSW government to contract to build a desalination plant on 18 July 2007.
- Desalination plant will become operational by 2009/10 and its capital cost will be paid for with water charges that will rise to \$1.90 per thousand litres (kL) by July 2010 (most consumers currently pay \$1.61/kL and paid \$1.01/kL in 2005).
- Postponing decision to invest has an option value. This value comes, in part from the fact that:  
*35% of total inflows comes from only 5% of months so waiting has a big payoff (water storage in Sydney catchment jumped from 37% to 57% in the month before the desalination contract was signed in July 2007).*



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# Water Supply: Storages in Sydney

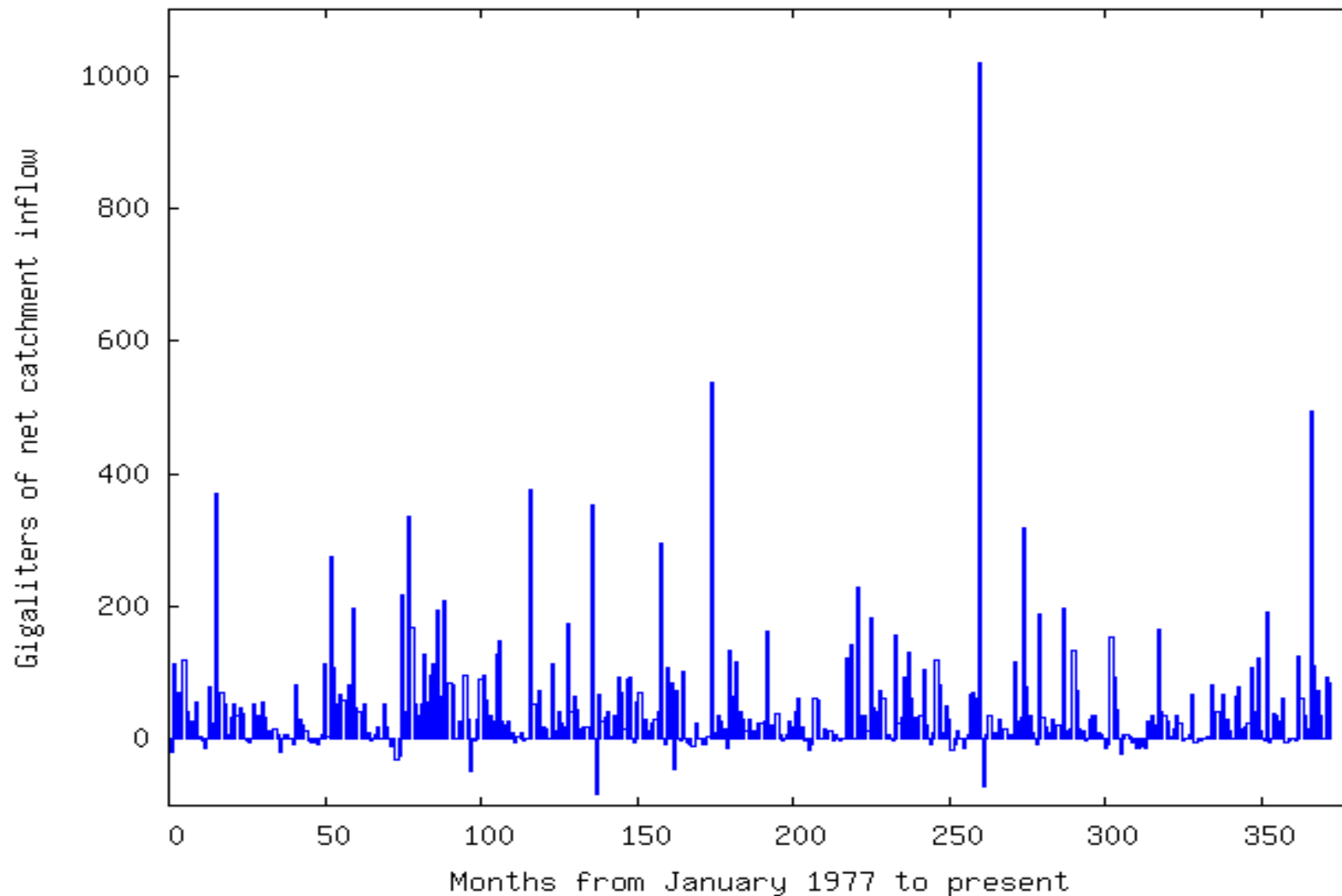




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# Net Inflows in Sydney Catchment

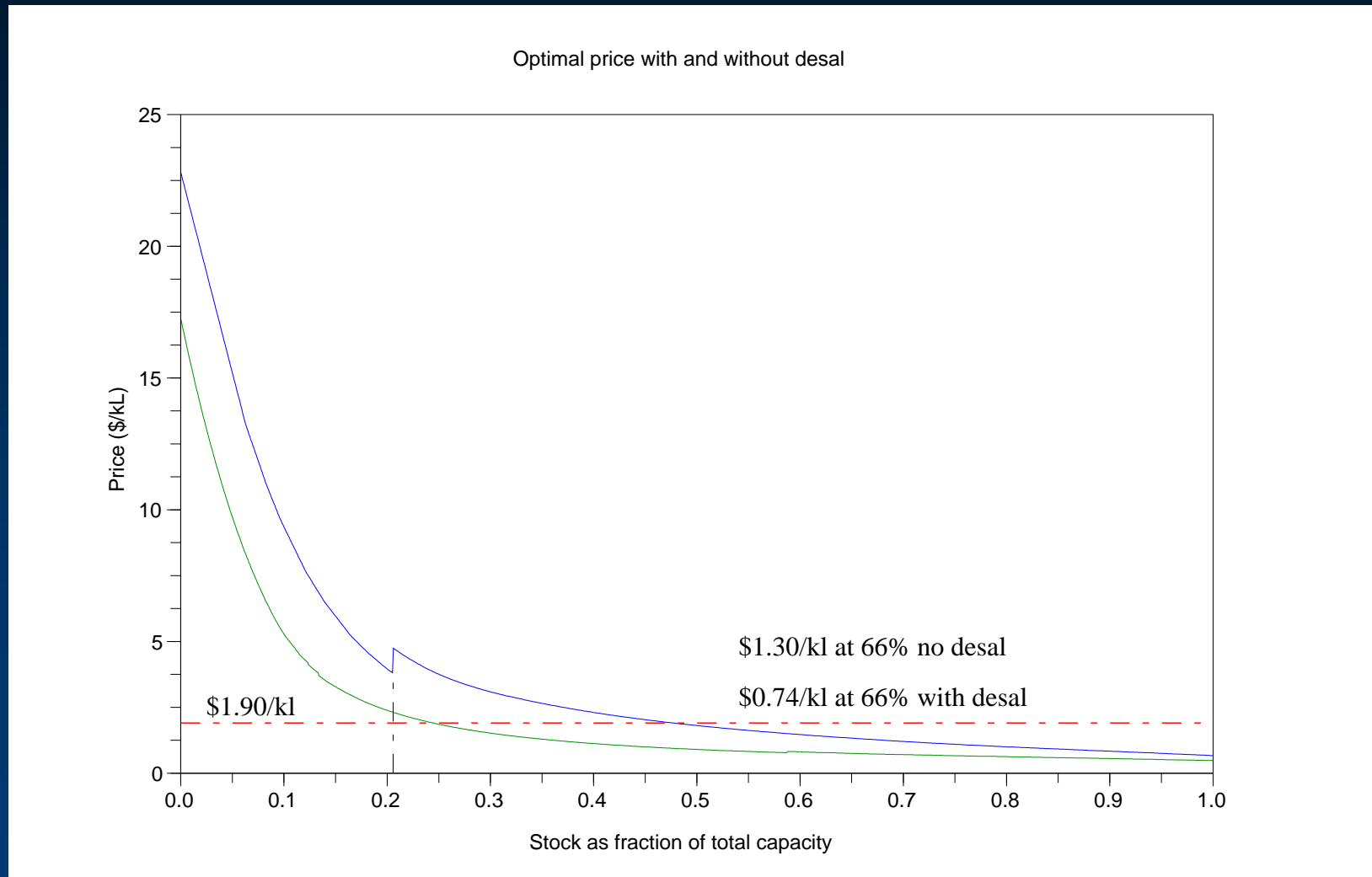




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# Optimal Pricing (\$/kL) & Water Storage

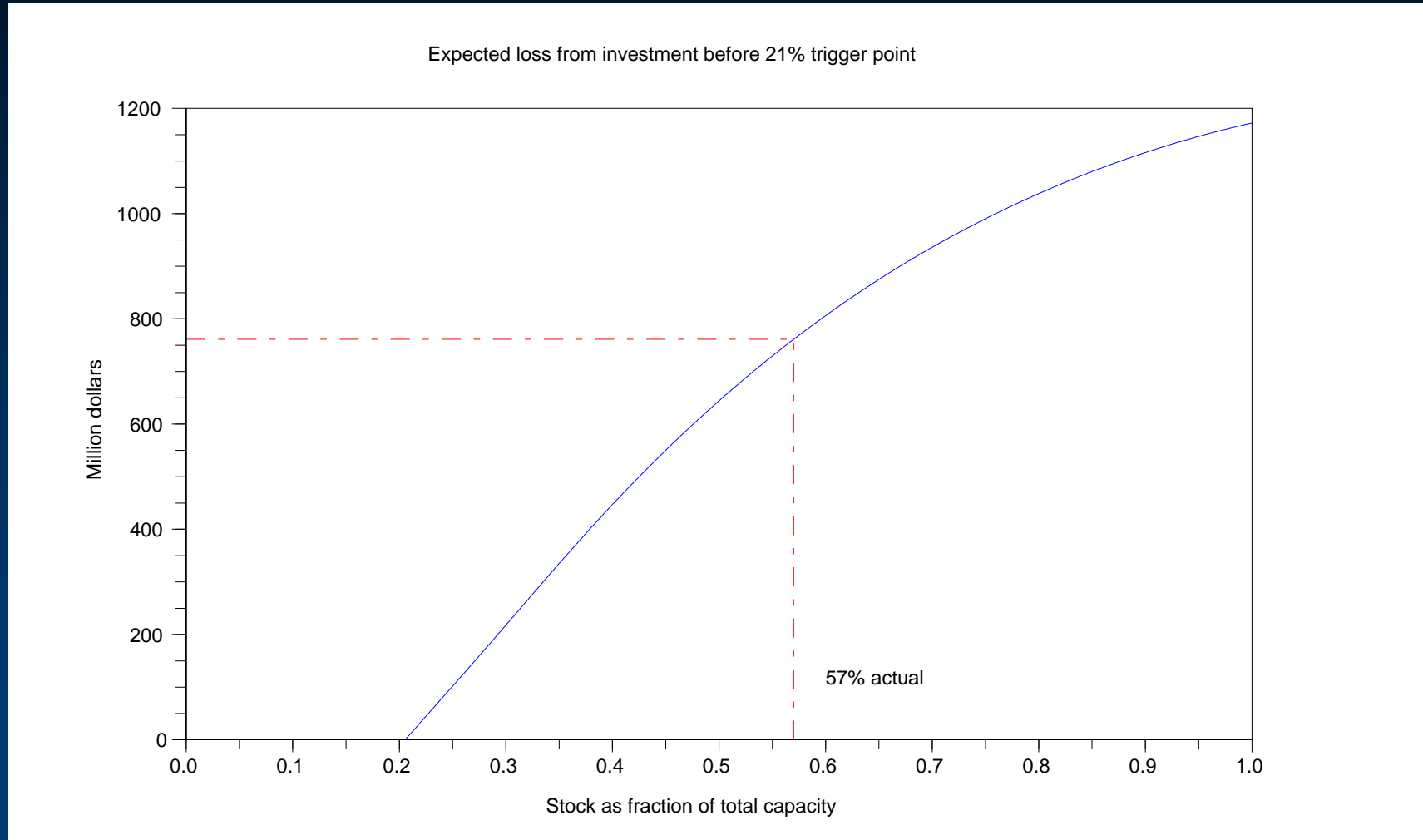




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# Expected Cost of Premature Investment





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# Benefits and Costs of Waiting to Invest

- **Optimal time to invest: water storage at 21% of full capacity**
- **Probability desalination investment will occur (i.e., reach 21% of full storage levels) within next 15 years is 30% given current storage levels (66%) AND optimal water pricing.**
- **Expected welfare cost of contracting to build a desalination plant at 57% water storage (contract signed 18 July 2007), *relative* to optimal time to invest is about \$750 million.**
- **Benefit of waiting to invest is two-fold: interest savings on capital cost of a desalination plant and possibility of a big rainfall event.**

# Water Pricing Problem

- **Households water prices normally set years in advance with no direct connection to water storage levels.**
- **Water is priced according to long-run marginal cost. In NSW & Queensland they use ‘average incremental cost’ (AIC) approach which basically divides the expected cost of augmentation by the expected increase in supply.**
- **By building very expensive infrastructure AIC pricing means that consumers will end up paying much higher water prices in the very near future (already started in Canberra).**
- **If water prices had been allowed to go higher as dams levels fell then many of these investments could have been postponed or even made redundant.**

## Victorian water prices to skyrocket

Matt Pinkney, Sarah Wotherspoon  
November 07, 2008 12:39pm

**WATER prices will skyrocket by up to 96% under plans backed by the State Government today.**

Water minister Tim Holding today said steep increases were necessary to fund crucial water infrastructure projects.

The three Melbourne water retailers would increase prices by up to prices by up to 96.7 per cent by 2012-13.

"Increasing the price of water bills is necessary to fund water and sewerage infrastructure across Melbourne and to cater for a growing population," he told reporters this morning.

He said he was pleased the increases would be no more than double in real terms over time.

The recommended increases will be subject to review by the Essential Services Commission next year.

# An Alternative Approach

- **Allow water prices to vary up and down according to dam water storages — single most effective instrument to manage residential water demand This can be done immediately if governments were to impose ‘water abstraction charges’ designed to balance supply and demand.**
- **Re-evaluate planned infrastructure investments from an economic perspective to avoid another ‘billion dollar bungle’ that occurred with Sydney’s desal plant.**
- **Supplement flexible water pricing with economically efficient water demand saving measures as higher water prices increases prob. Of water saving behaviours and use of water saving devices.**