

# Hydro Tasmania

---

## Storage Management and Drought

David Marshall

Manager Energy Resources

6th May 2008



# Hydro Tasmania - objectives



- **Manage water prudently**
  - Don't run out!
  - Use the water efficiently
  - Maximise utilisation of water (competing uses)
  - Maintain environmental flows & habitats
- **Maximise trading value for Hydro Tasmania**



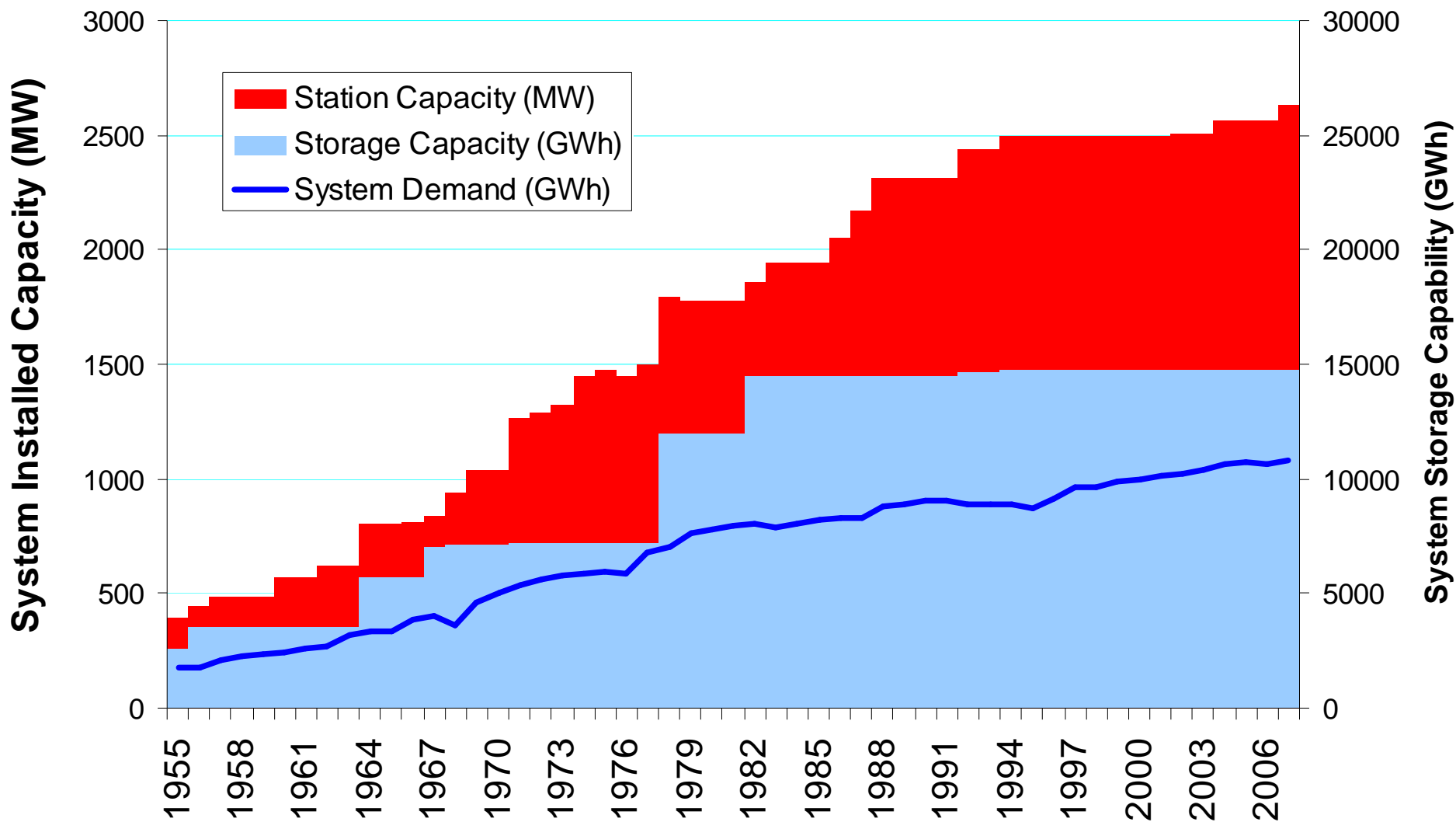


# Presentation Contents

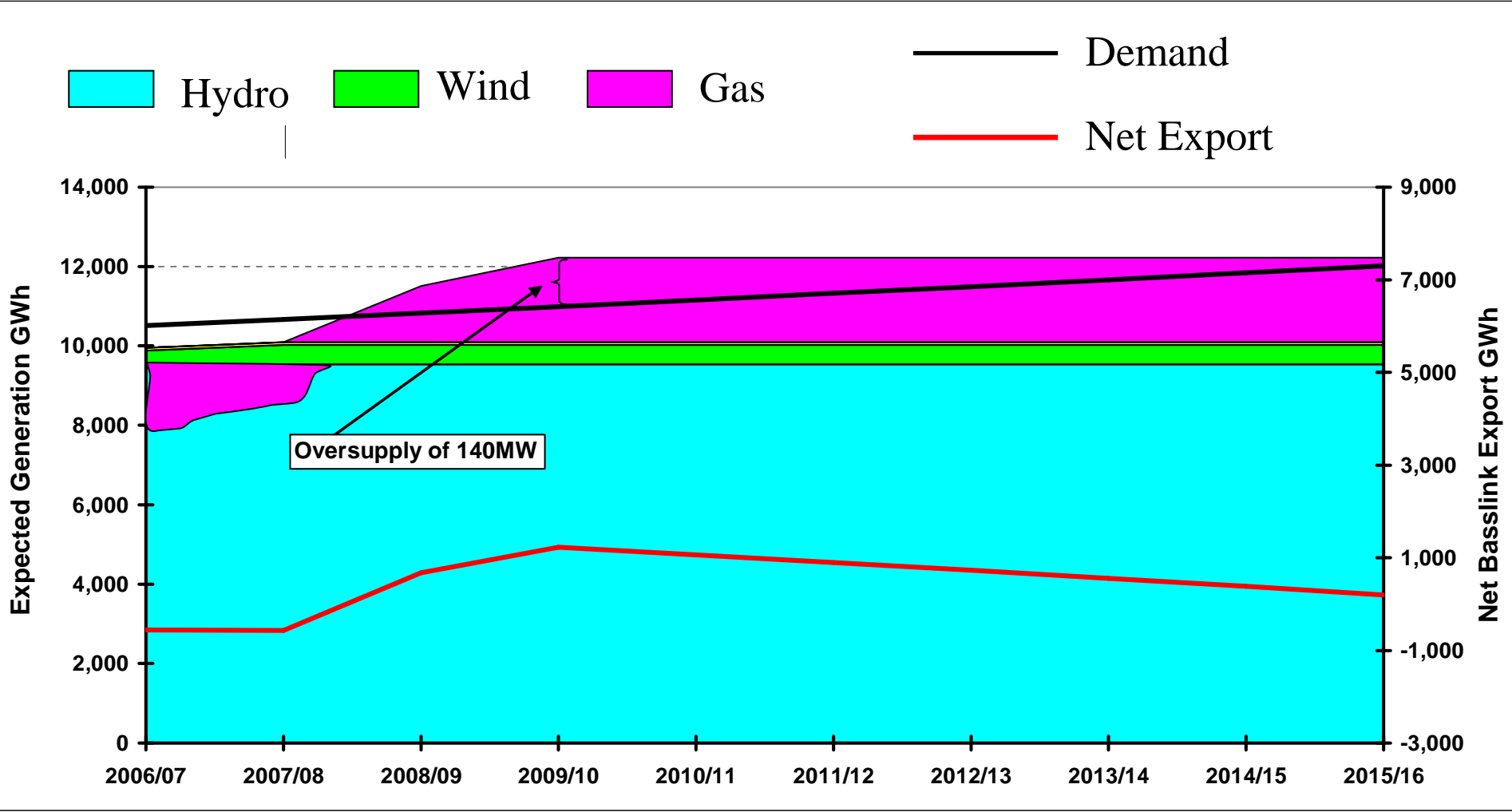
---

- Demand and supply
- Storage management
- Drought or climate change
- Response to the dry years

# Hydro Tasmania – supply and demand history



# Tasmania – supply and demand forecast



# Tasmania – meeting demand

- Tasmanian demand of over 11,000 GWh and rising is satisfied through the following sources

Hydro Yields	7,000-11,000GWh
Hydro Storages	2,600GWh (@18.5% full)
Gas Generation	Over 2,000GWh and expected to increase
Wind	Around 500GWh and expected to increase
Basslink Imports	Up to 3,500GWh

- Tasmanian system should be capable of satisfying system demand, just a matter of what percentage from which source

# Tasmania – meeting demand

---

## Roaring 40's

Source: [www.roaring40s.com.au](http://www.roaring40s.com.au)

- Woolnorth Wind - 140MW
- Musselroe Wind Farm - 129MW
  - Finalising turbine procurement

## Babcock and Brown (Alinta)

Source: [www.alintagas.com.au](http://www.alintagas.com.au)

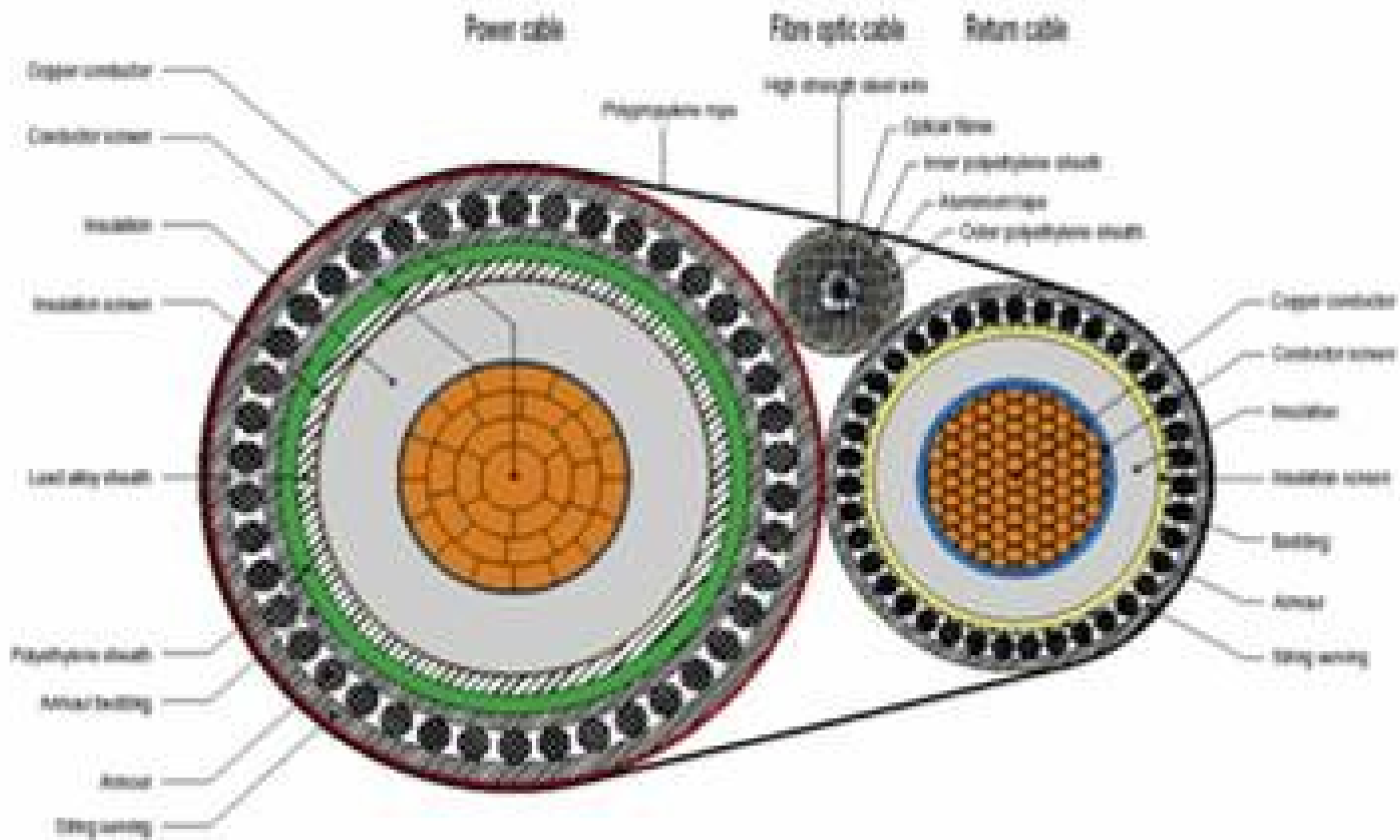
- Tamar Valley Power Station 375MW
- Commissioning 60MW Dec08 210MW Mar09

## Basslink

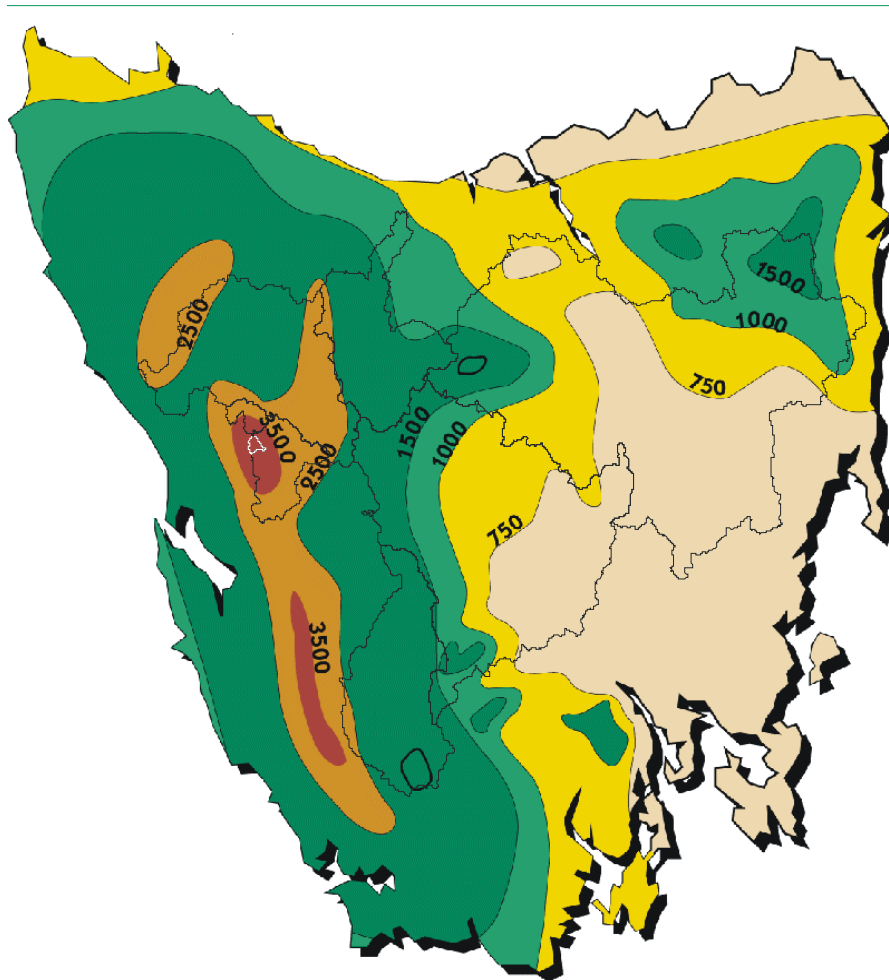
Source: [www.basslink.com.au](http://www.basslink.com.au)

- Continuous flow 500MW in either direction
- Up to 630MW export from Tasmania for short periods

# Basslink

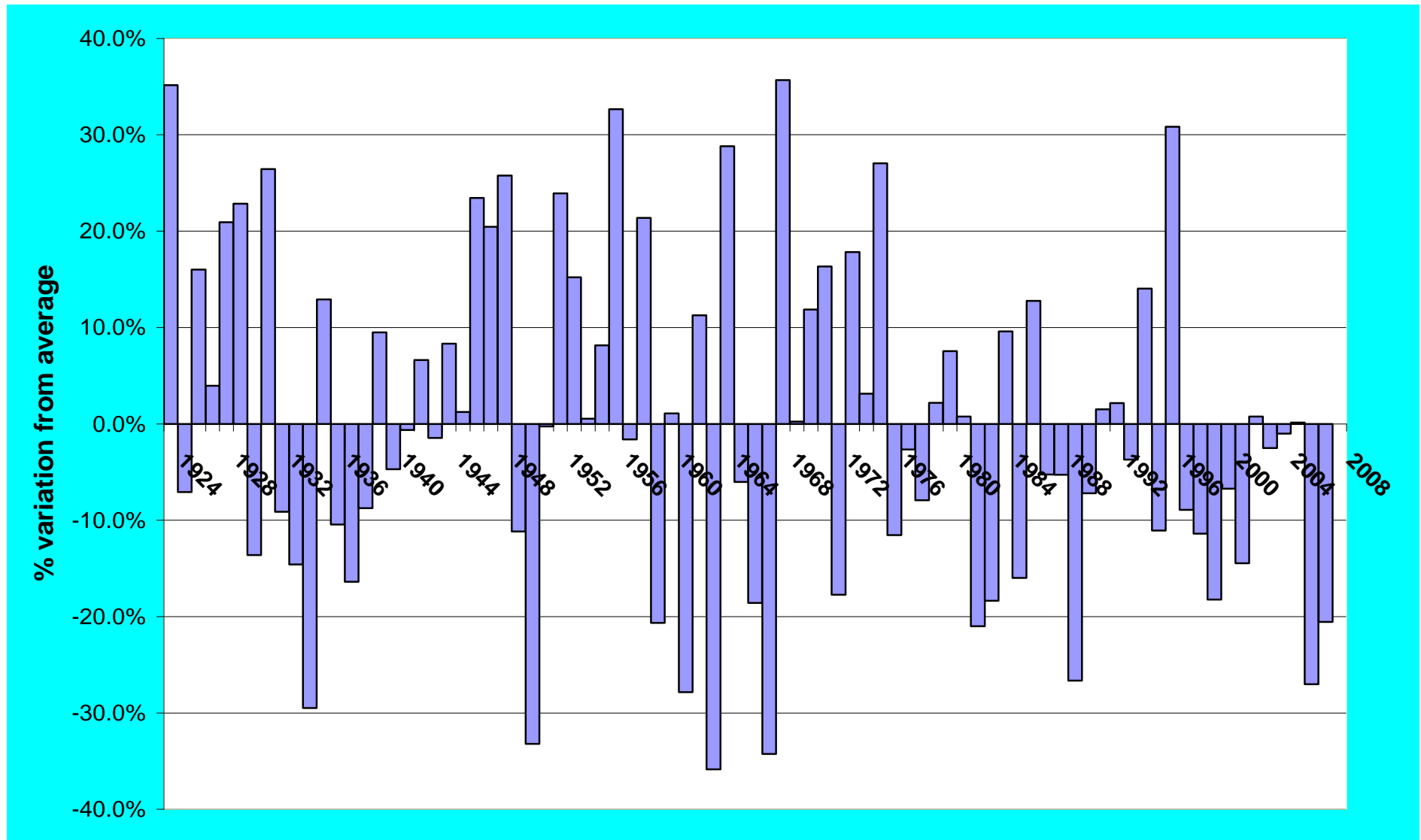


# Managing Storages - Tasmanian rainfall



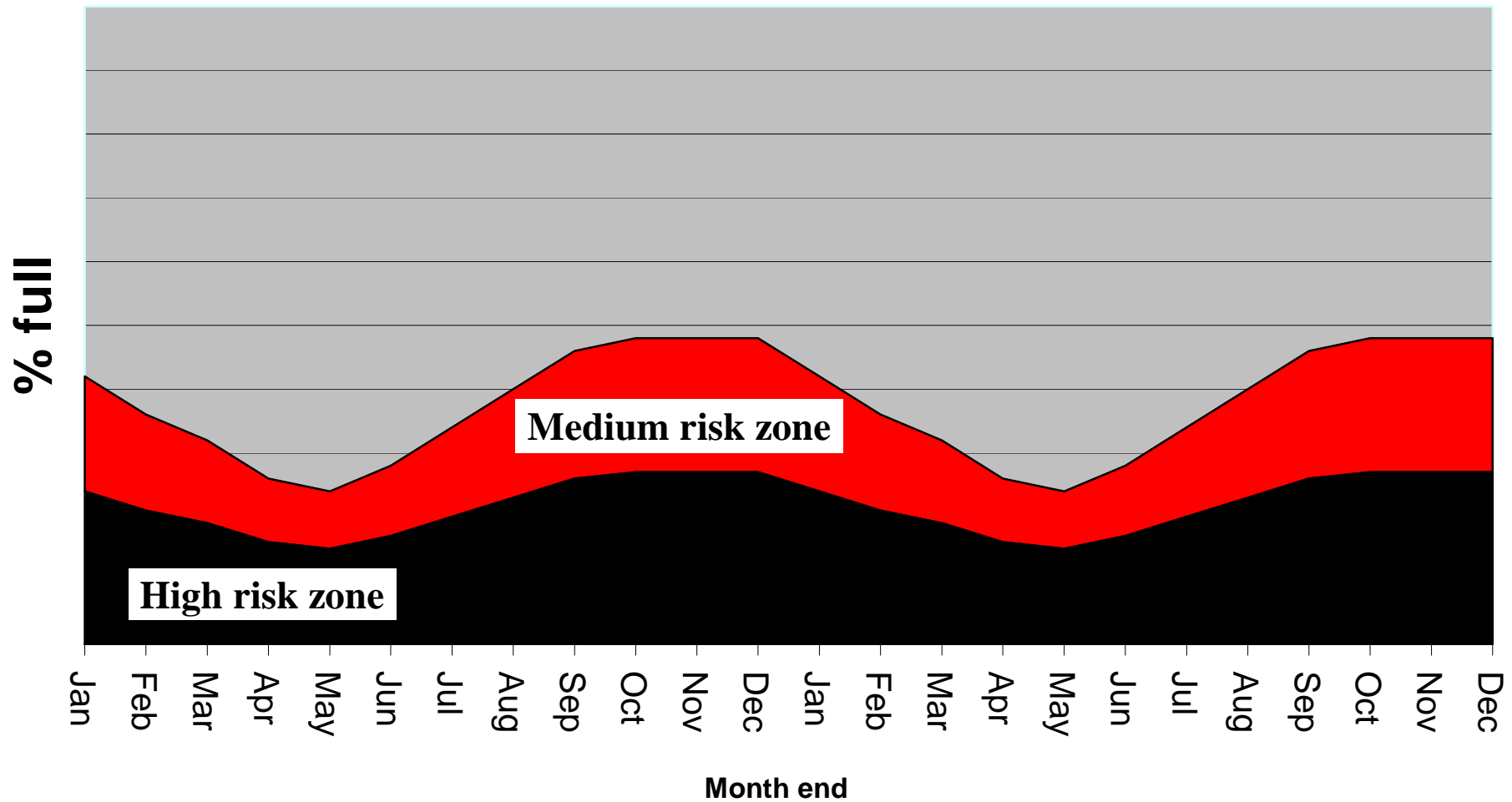
- Tasmania has valuable water resources but rainfall distribution is uneven in both location & time.
- Rainfall is predominantly from the west.
- Hydro schemes located in both wet and dry areas.
- Catchment area of 21,000 km<sup>2</sup> (1/3 of Tasmania)

# Managing Storage - Inflow Variability

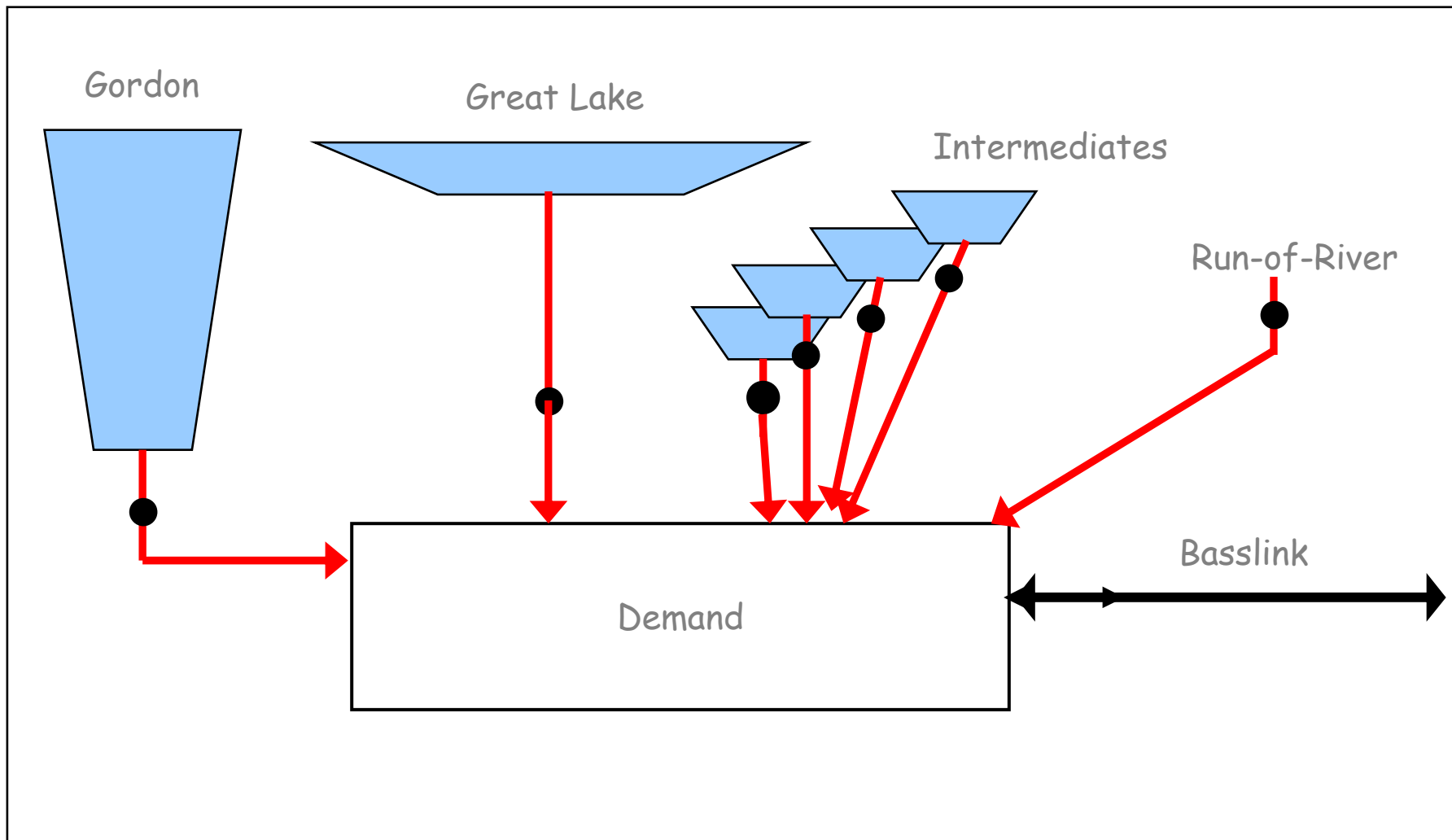


# Managing Storages

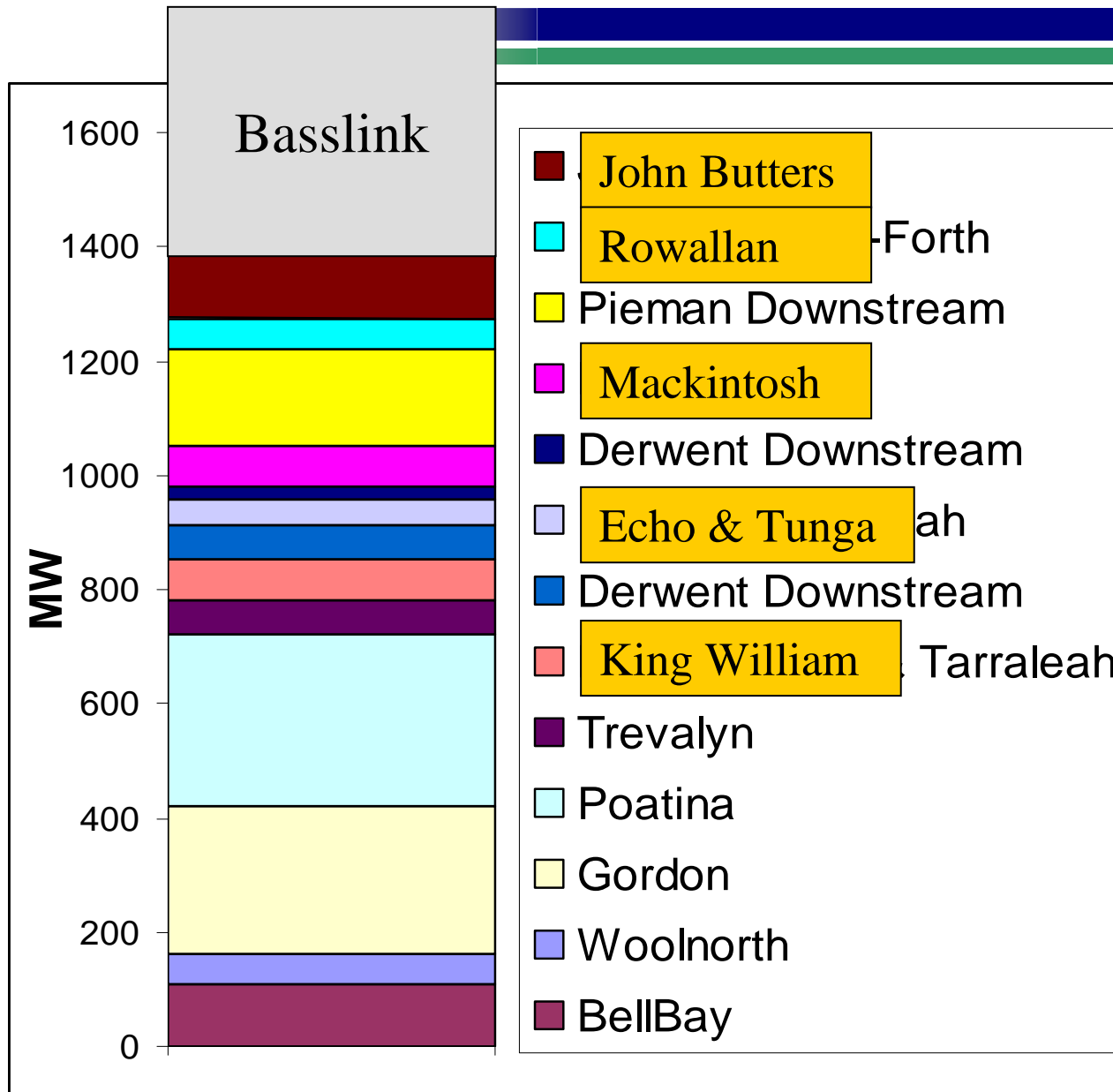
Total energy in storage



# Managing Storages



# How to allocate the water?



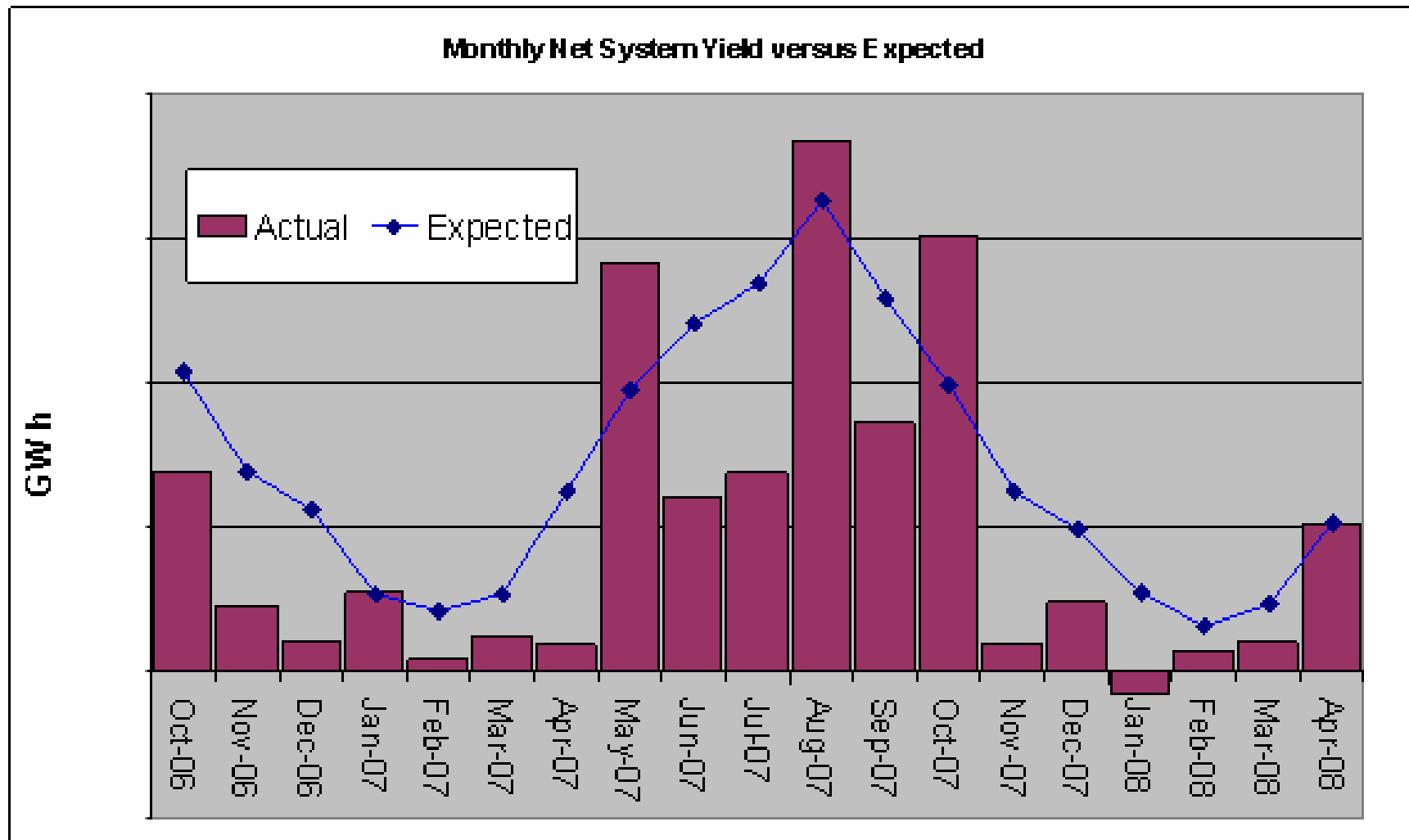
## “Spare” for peak

Tribute	90
Fisher	43
Wilmont	30
Cethana	100
Devils Gate	63
Paloona	30

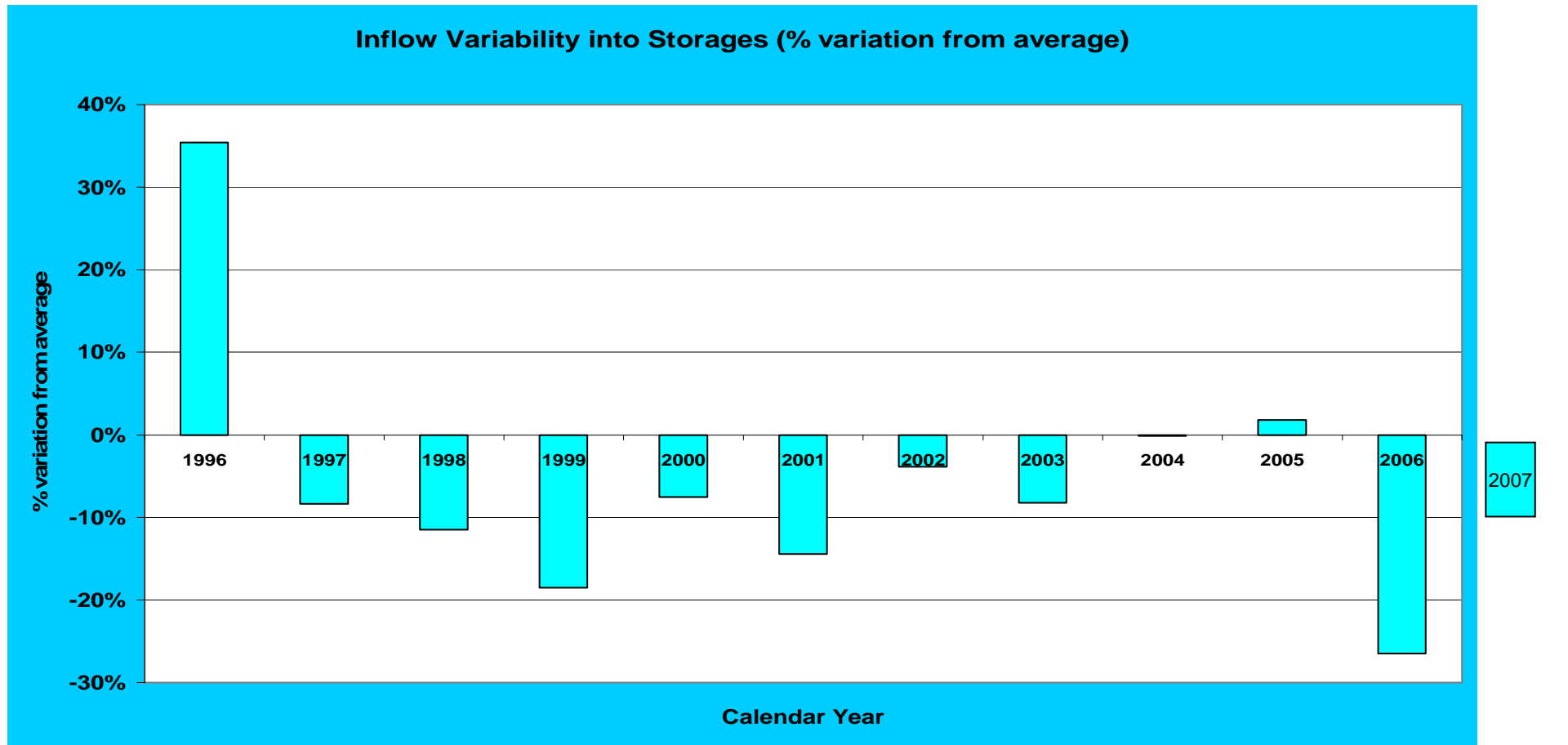
# Managing Storages



# Drought or Climate Change

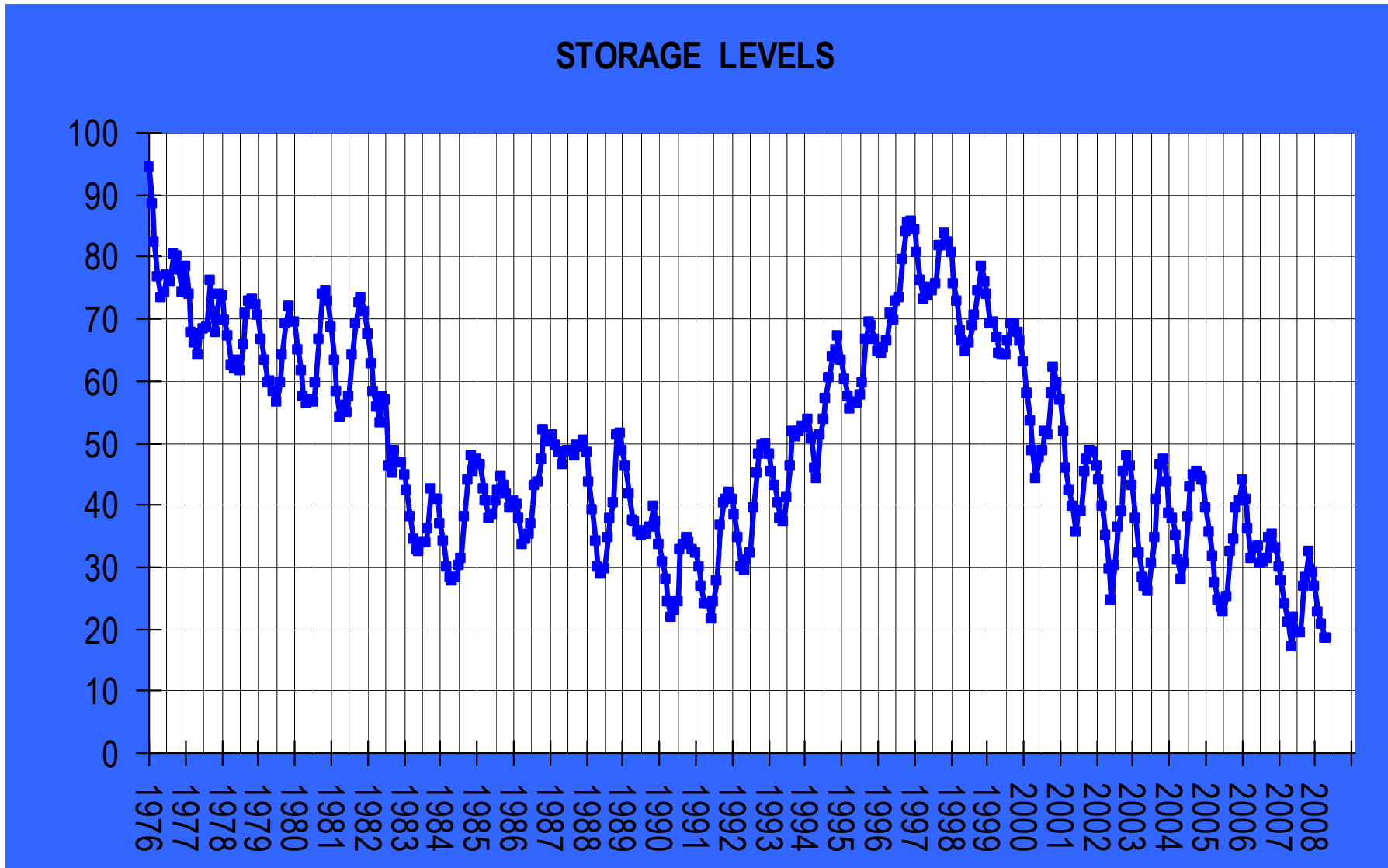


# Recent Inflow Variability



Inflows in period 1996-2007 >5% below long term average

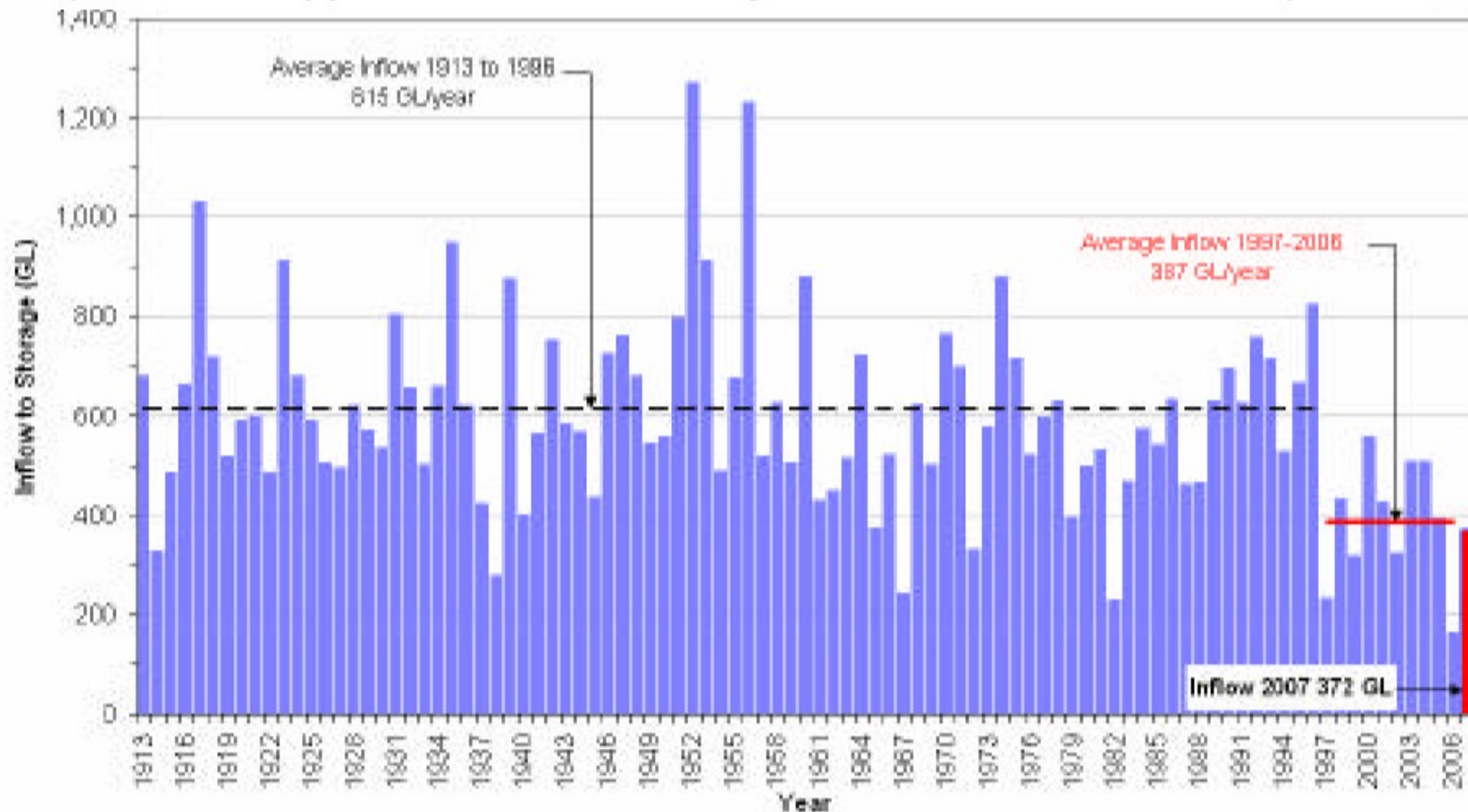
# Storage Level History



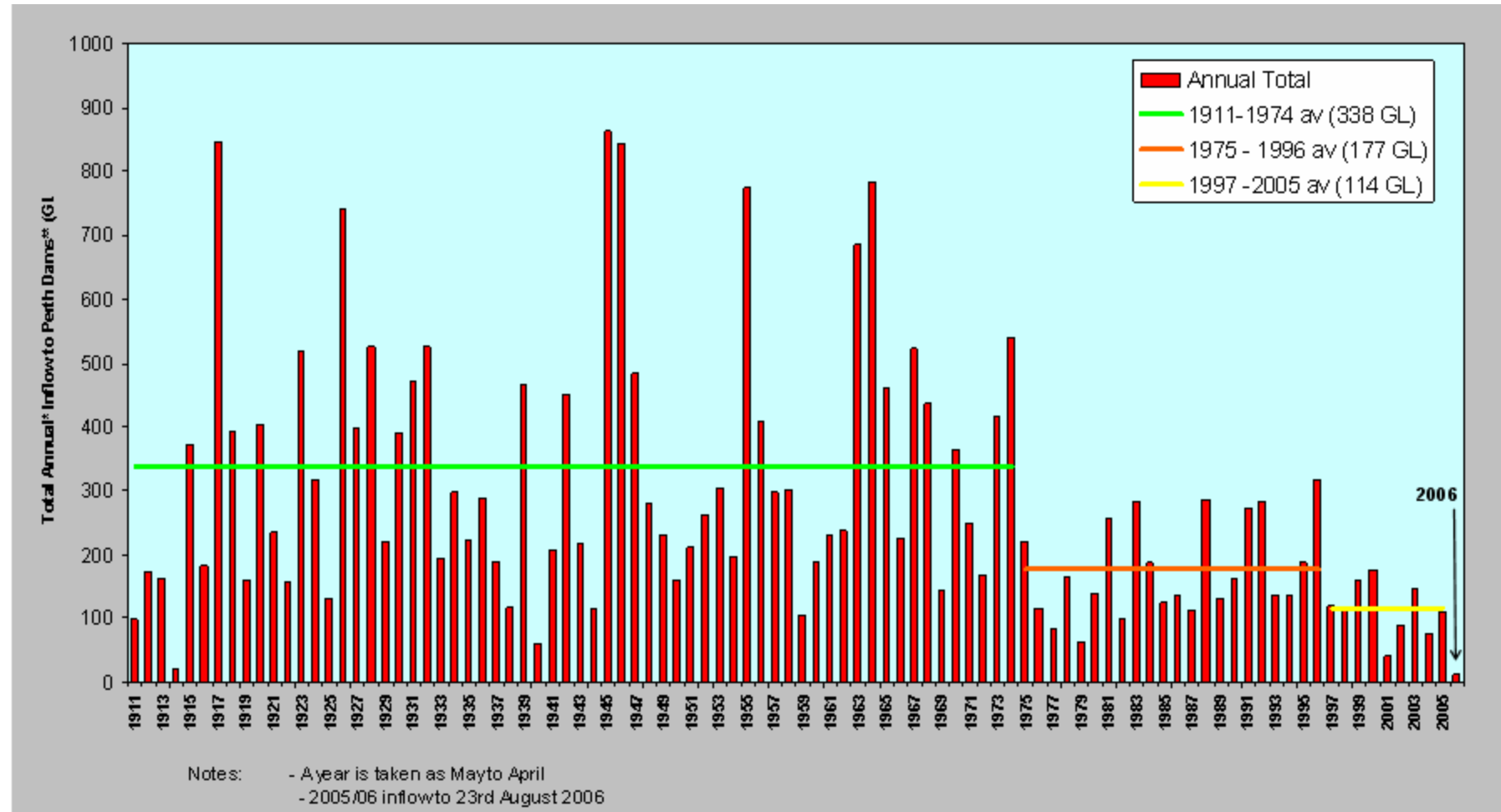
# Supporting research – Melbourne Water Supply

## Annual inflow to Melbourne's four major harvesting reservoirs

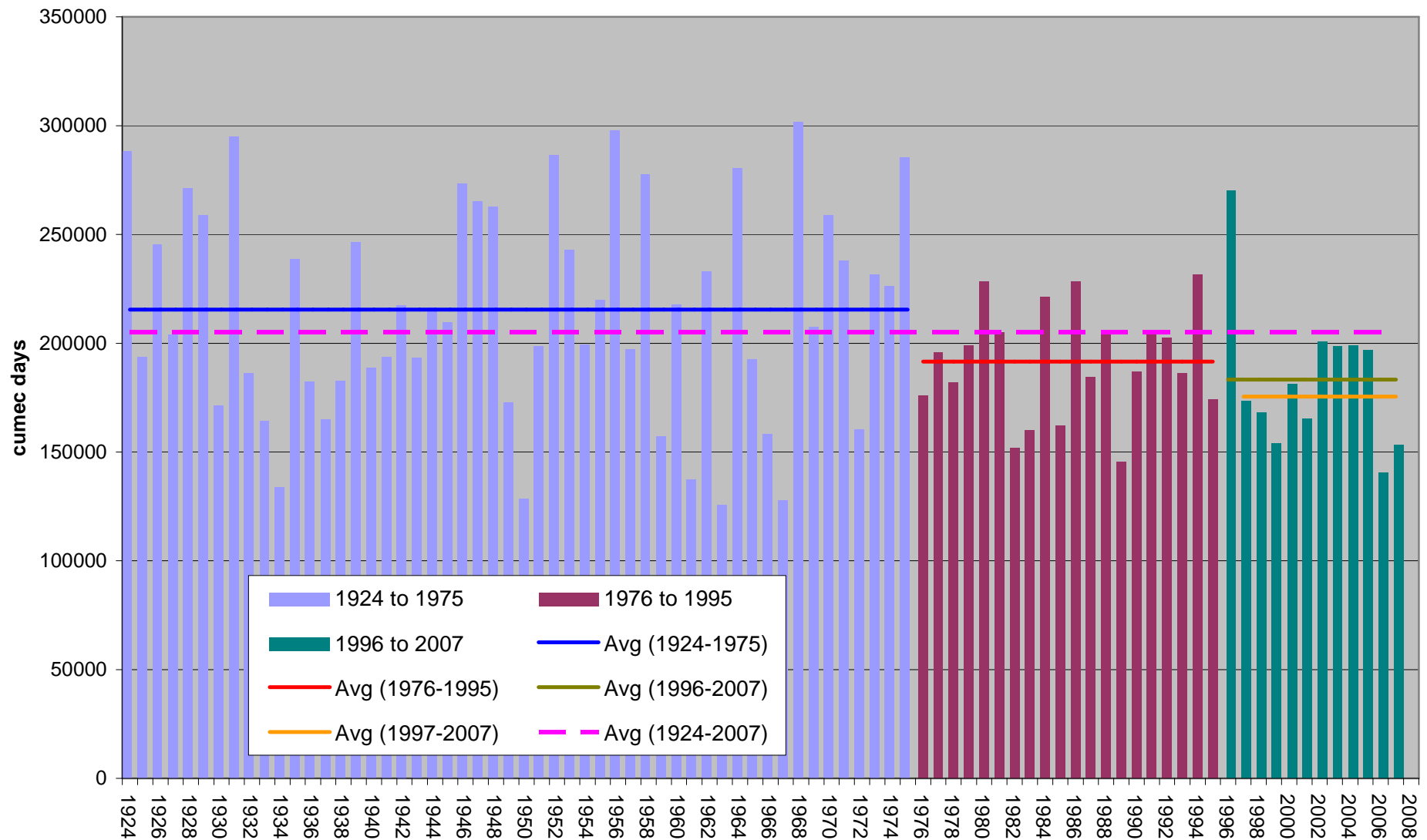
(Thomson, Upper Yarra, O'Shannassy and Maroondah Reservoirs)



# Perth Water Supply



# Hydro Tasmanian Inflow Yields



# Statistical evidence



- 3 statistical tests for trends
- All 3 showed significant downward trends in inflows over the full period ( $>$  than 5% level of significance).
- Tests showed a break in series around 1976.
- Significant difference in mean pre- and post-1976.
- Post-1996 also different to 1976-1996, but not as clear
- No significant indication of **trend** post-1976.

## What about other droughts?



- The driest period known previously ended in 1968.
- Repeating the test on the data set 1924-1967 shows a change in the mean after 1957.
- Average dropped by 9%
- The confidence level was about 8%. Had we done this test in 1968 we might have considered down rating the system a little.
- Subsequent 10 years were 4% wetter than average

# Climate Modelling Results



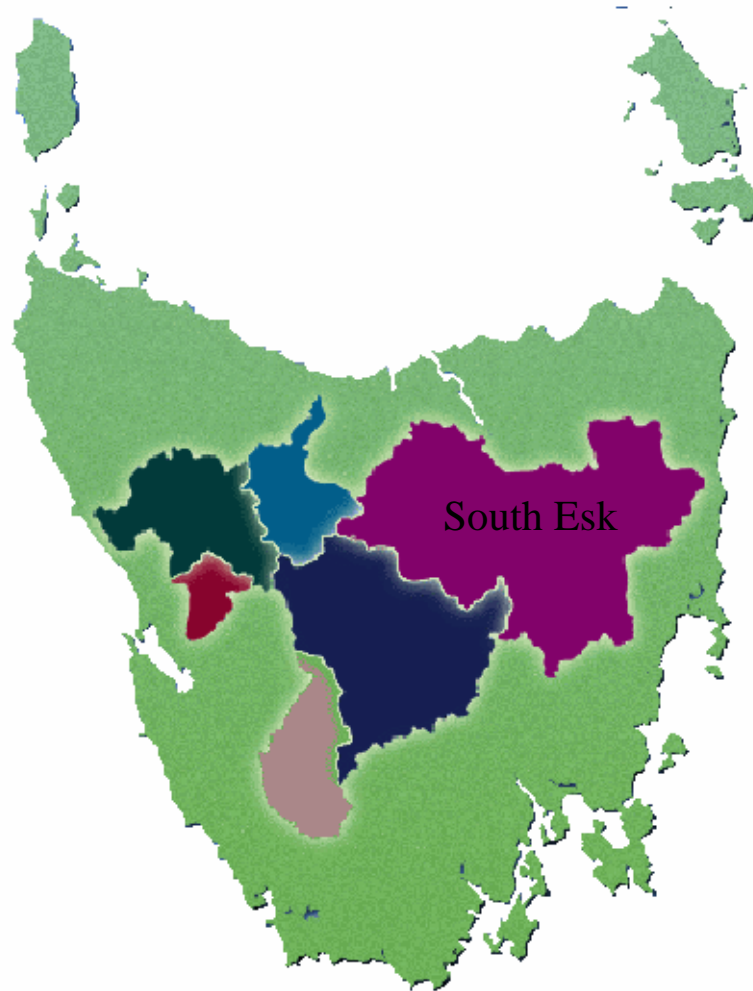
Some models predict :

- Reduced climate change in Tasmania compared to the global average.
- Relatively moderate change out to 2040; some warming and some change in rainfall patterns and winds, but no expectation of a major changes.
- Results uncertain.
- Results should be taken as one possible future, rather than a detailed forecast of climate change.

# High Resolution Model Results - Rainfall

On a seasonal basis there is increased winter and early spring rainfall in all catchments (~1-2 mm per year in each of those months).

There is also a drying trend in the north east in the first half of the year, only partly compensated by increased rainfall later in the year.



Annual rainfall is projected to increase by 7-11% in all catchments except in the South Esk, which decreases by around 8% (some differences to GA results).

# Drought or change?



1895	Global warming
1923	New Ice Age
1939	Global warming
1974	New Ice Age
2001	Global warming
2008	‘Climate Change’

# Hydro Tasmania Response



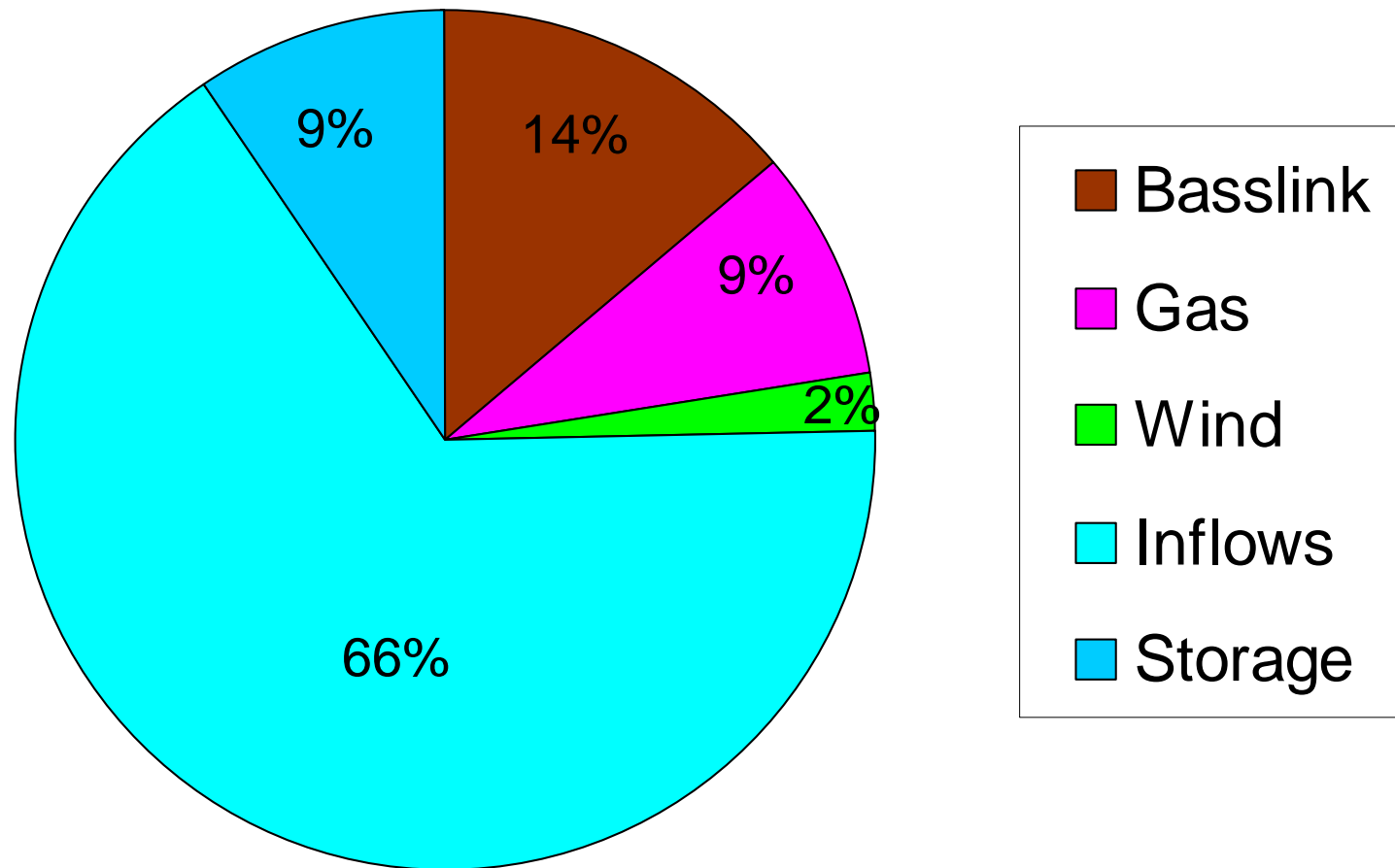
# Managing Low Inflows



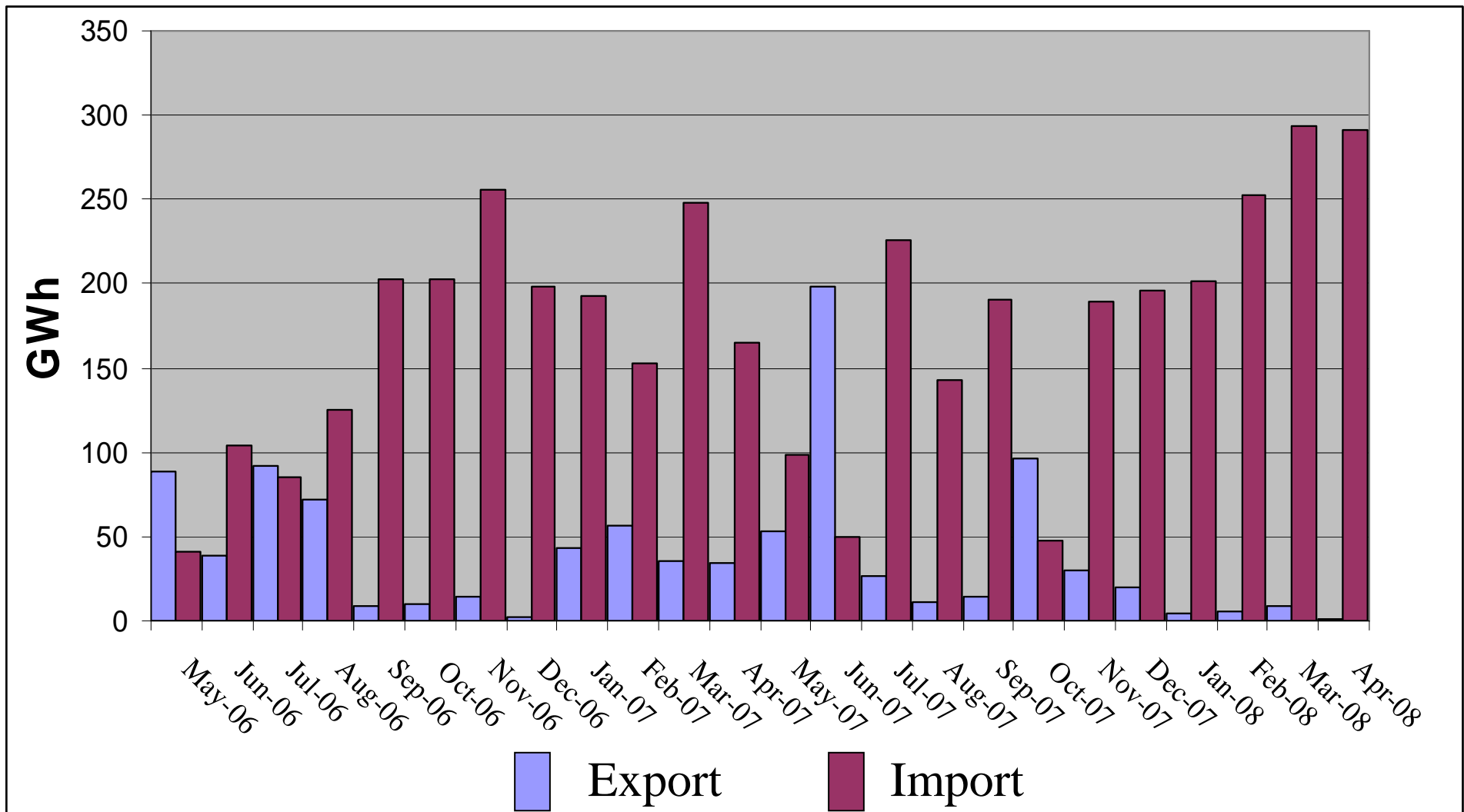
- Make improvements to efficiency of machines, penstocks, canals etc (1000GWh project)
- Encourage other users to increase efficiency (eg irrigators using open channels)
- Continue to improve our cloud seeding efficiency
- Monitor environmental risks – expect to have to change operations to mitigate these risks
- Plan with the assumption that inflow is less
- [Basslink and Bell Bay & Storage Management](#)

# Managing Low inflows

## Sources of Energy since April 2006

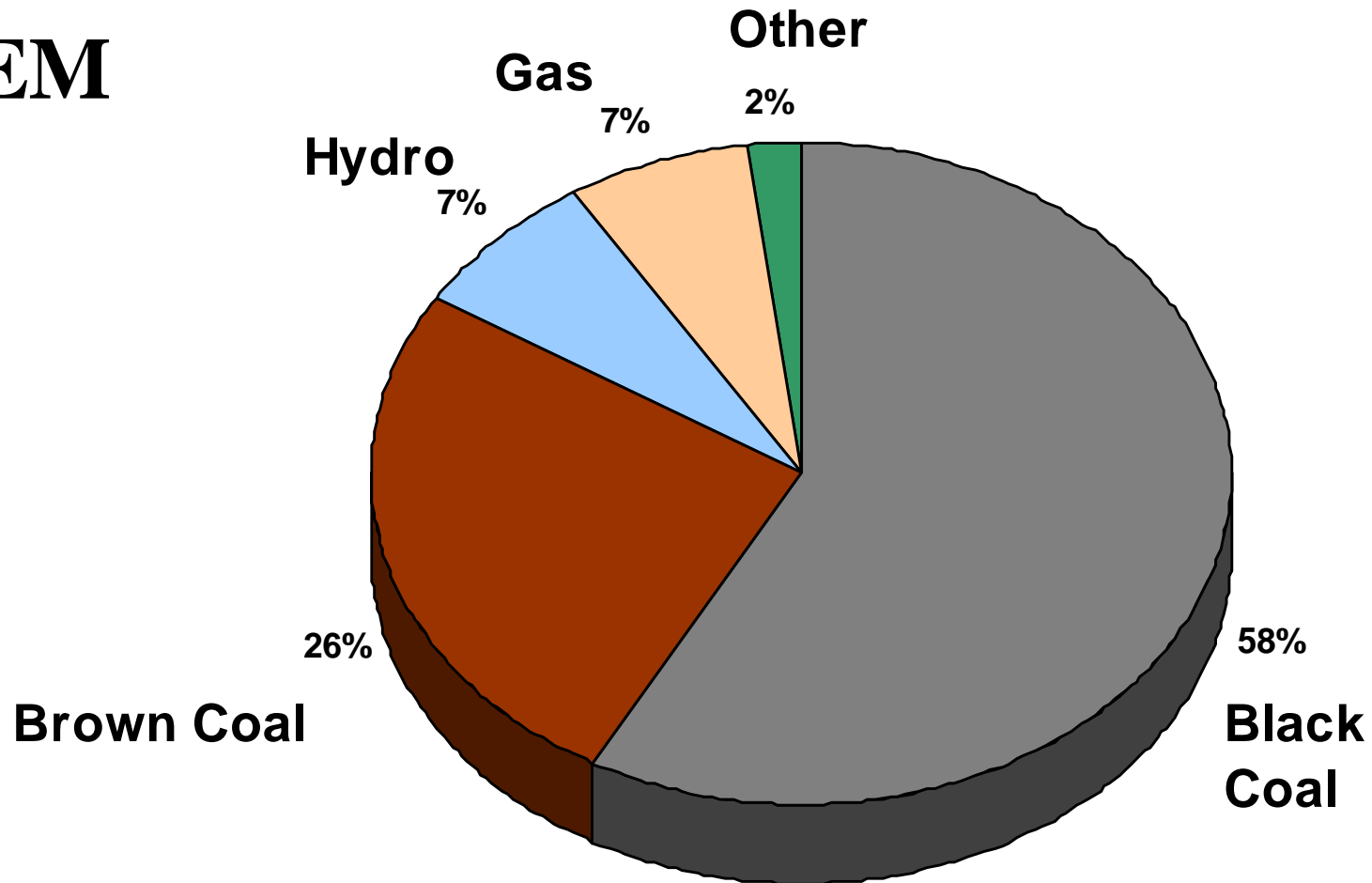


# Basslink Flow



# Basslink – source of power

**NEM**



# Basslink Benefits to Tasmania



- To date, main benefit has been drought mitigation; without Basslink Tasmania would be facing the prospect of power rationing and potential blackouts - 2,800 GWh net imports across Basslink since commercial operations
- Provides incentive for competition to enter Tasmania
- Opportunity for Tasmania to develop more renewable energy to export to the National Electricity Market
- Opportunity for Tasmania to export its excess capacity
- Reduced reliance on hydro storages when prices are low
- Allows Tasmania to build appropriate generation steps to meet demand
- Protects other states against the forecast shortage of peak power

# Summary



1. Last 2 years very dry (may be long-term shift)
  - About the same as the 1966/67 drought.
  - Demand is now  $>$  expected hydro yield plus wind.
2. Have managed 'well' to date in that we have
  - avoided load shortfalls
  - avoided serious environmental damage to our lakes
  - BUT in trouble without Basslink and Bell Bay
3. Outlook
  - Short term - very dependent on inflows and Basslink.
  - Medium term - additional wind and gas – storage rebuild.
  - Longer term– lots of opportunities.

# Hydro Tasmania

---

## Storage Management and Drought

David Marshall

Manager Energy Resources

6th May 2008

# How to allocate the water?

