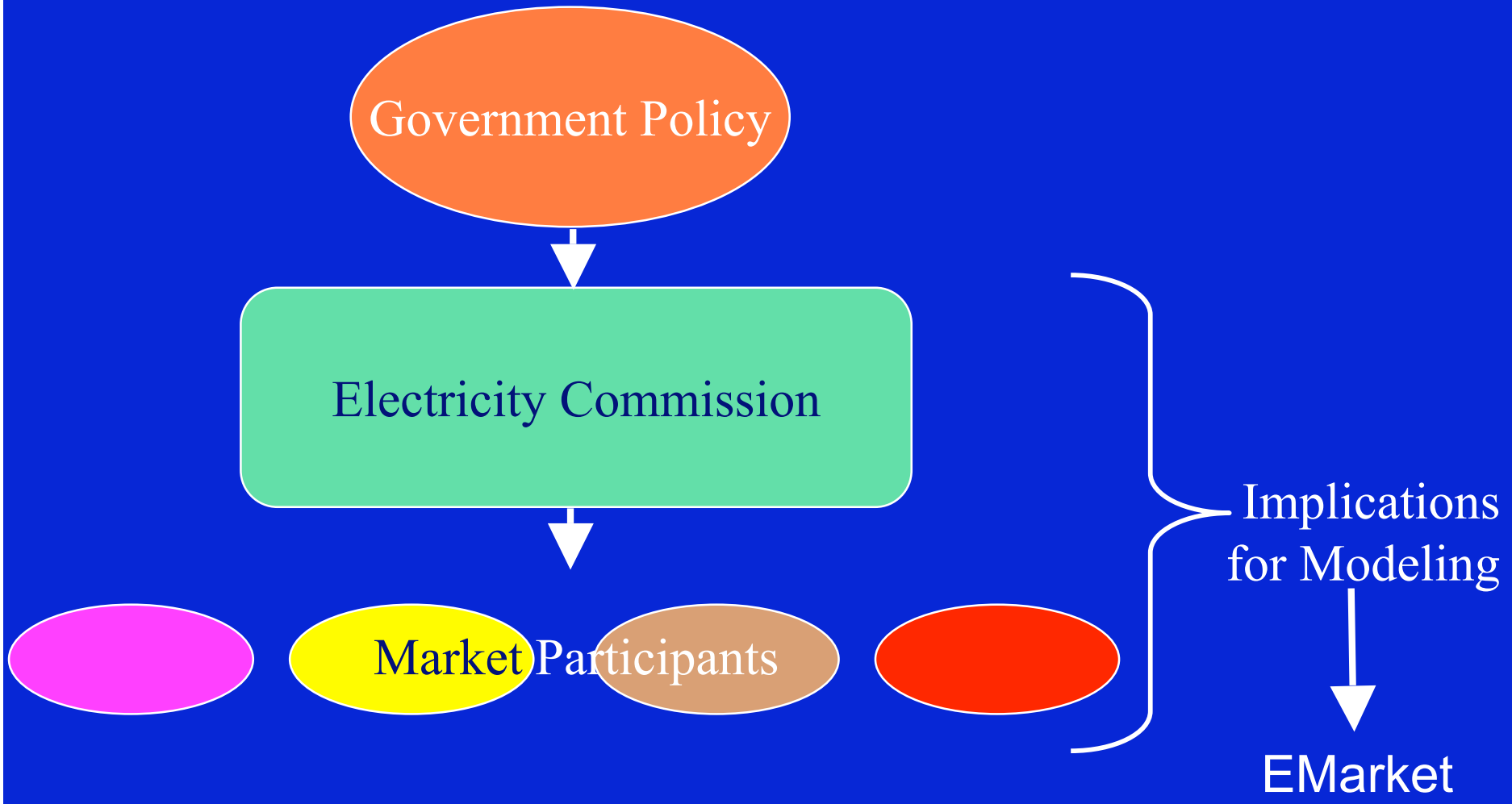
The Changing Climate for Security of Supply

Energy Link Ltd

Political Climate



Government Policy

- A radical change from anything in recent experience:
  - 1-in-60 dry year security (cf ECNZ after 1992)
    - » what does this mean?
  - without the need for national conservation campaigns (cf 1992, 2001 and 2003)
  - reserve generation contracted and ring fenced
    - » trigger points
    - » trade-offs between running reserve frequently and infrequently (cf peaking plant shut down and sold off)

Electricity Commission

- Charged with delivering 1-in-60 security of supply

- Wide powers to contract for or mandate:
  - reserve generation
  - fuel reserves
  - hedging
  - demand-side management

Electricity Commission

- Commissioners likely to be conservative:
  - Individual liability unclear but “the pressure will be on”
  - Will monitor closely, ask questions and expect answers
  - Tendency to centrally manage
    - » How to accommodate the “normal” working of the market?

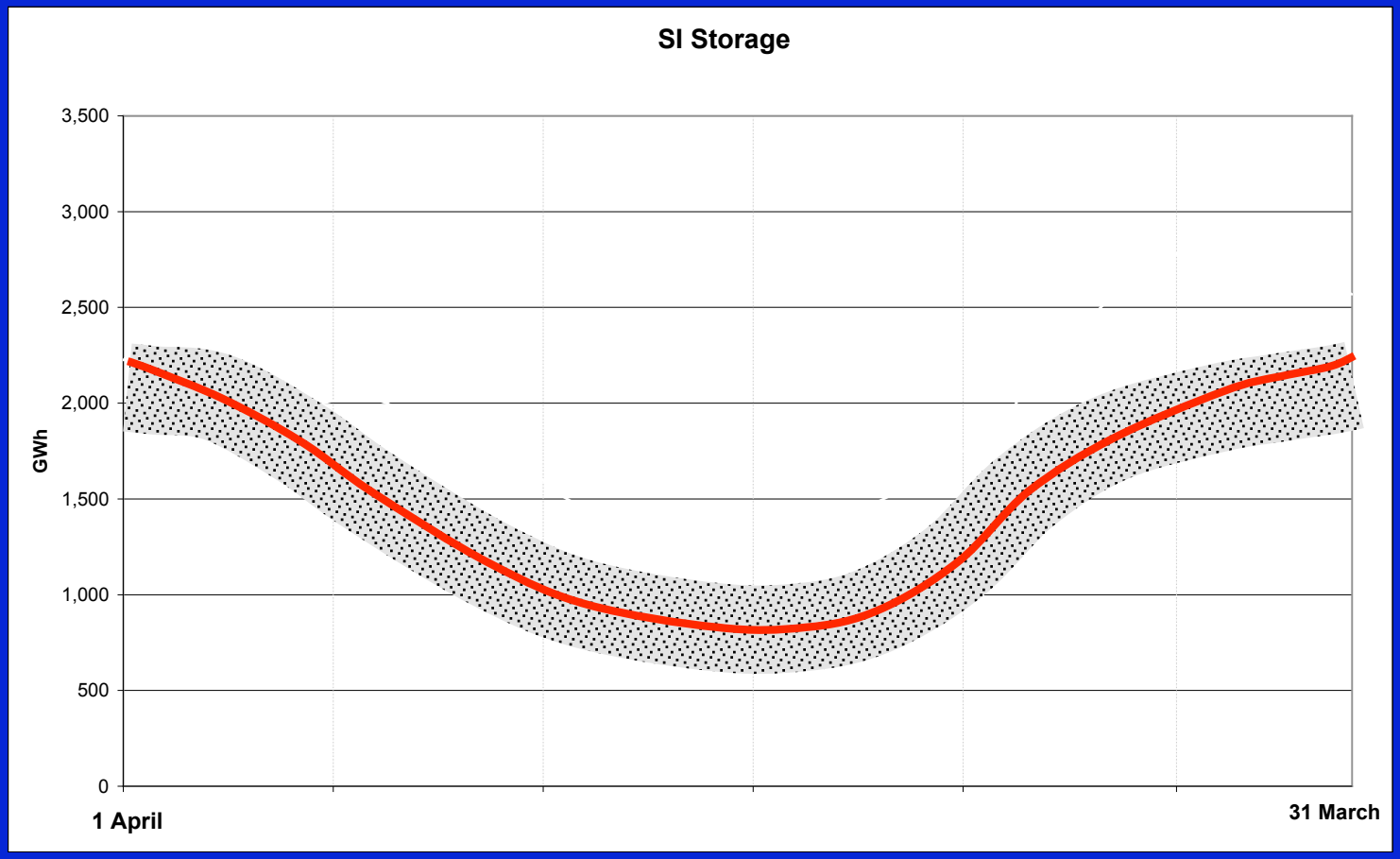
- Tension between Commission’s objectives and market participants’ objectives:
  - individual contract position versus national interest
  - fair return versus national interest

Market Participants

- Maximise profits by trade-off between:
  - reserve capacity: low risk but reliant on contracting to EC
  - base or firming capacity: “normal” commercial risk
- Better information about water, fuel supplies and reserve:
  - greater certainty, lower risks
- Price capped (?):
  - incentives to price up to the cap
  - EC will watch for unnecessary running of reserve plant

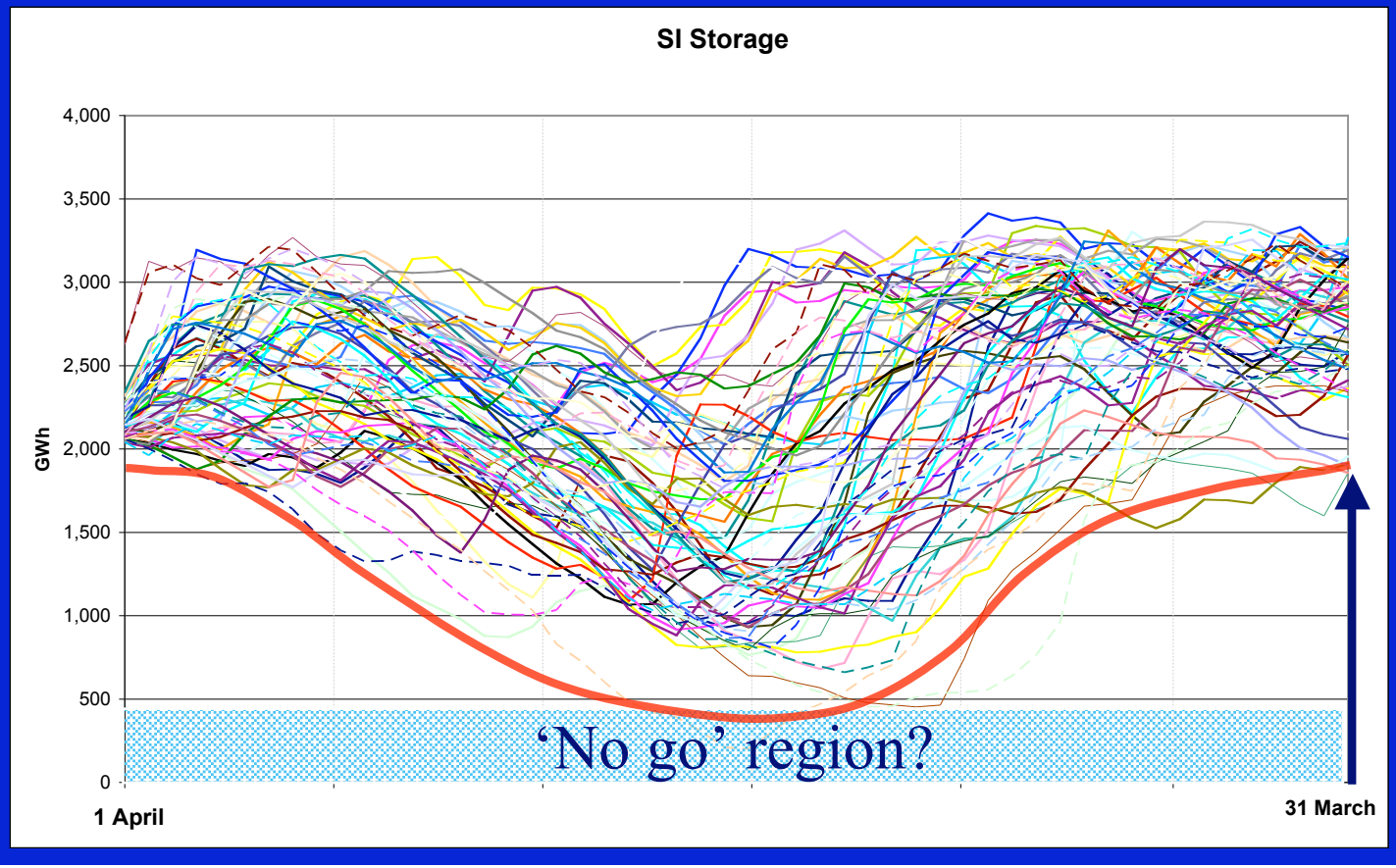
Reserve Generation

- Trigger points for running reserve plant:
  - price: open to manipulation, volatile
  - SI storage: physically based
  - could be based on water value contours (operating guidelines)



Reserve Generation

- Will EC allow reservoirs to run down lower?
  - will have more complete, more accurate information
  - will have greater degree of influence or control over industry
  - confidence may increase over time => over confident?



Autumn minimum storage constraint?

General Need for Greater Accuracy in *EMarket*

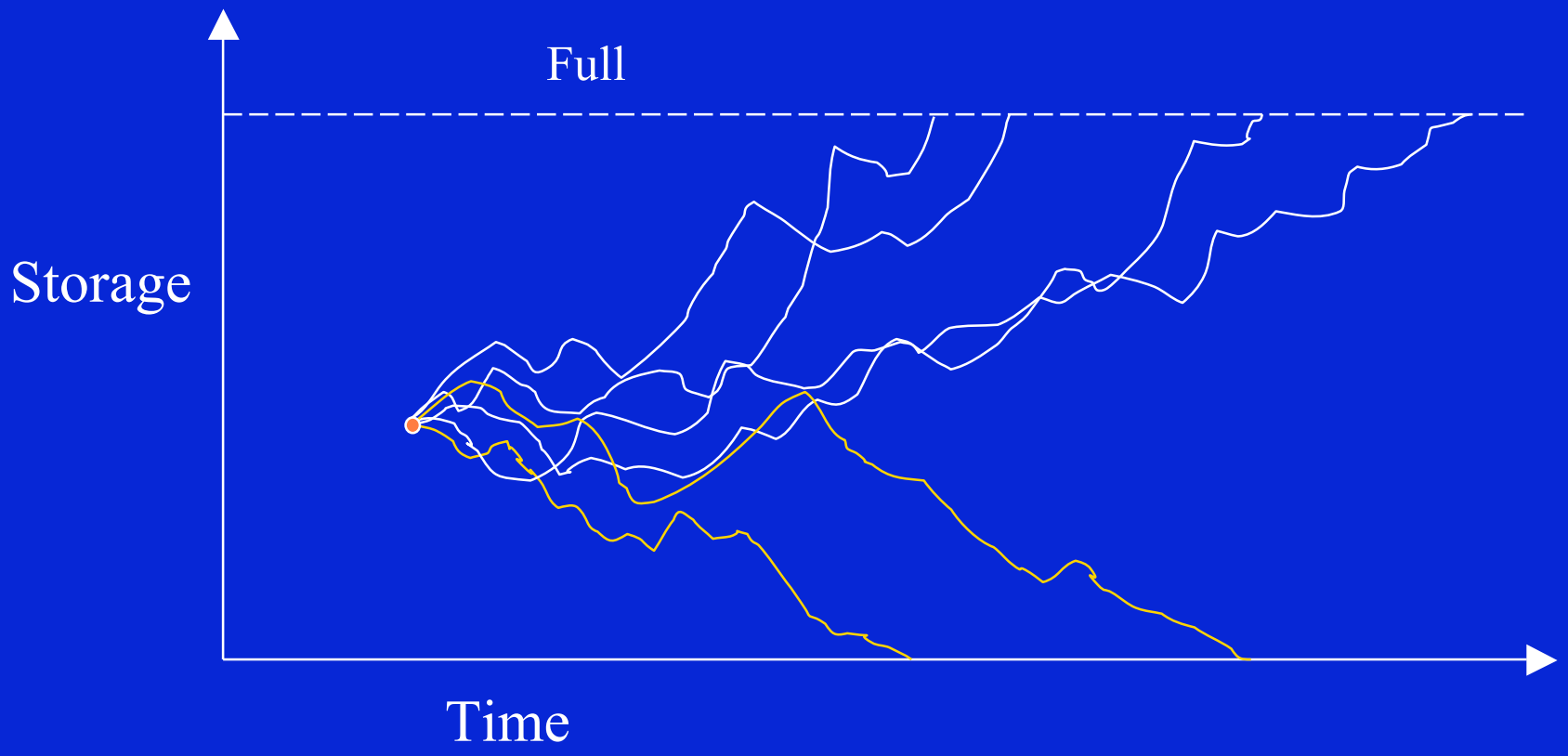
- Water values correct ‘across the grid’; consistently high end of year storage
- Aggregated grid
  - 184, 249 lines
  - more power flow iterations
- Getting prices and losses right on aggregated grids
- Equation constraints on aggregated grids
- Modeling the system under extreme stress
  - finer details of river chains
  - non-supply quantities
  - demand response
  - accuracy of inflows

Water Value Calculation in *EMarket*

- Basis of water values is a 1/n security level
- The cost of running short is not a direct input.
- Find the configuration for which shortage will occur 1 in every n years
- The water value reflects the likelihood of shortage occurring
- This likelihood is determined by projecting 73 sample inflow years from each point

Water Value Calculation – Shortage Likelihood

- Illustration: A storage/time of year point with a 2/6 shortage likelihood

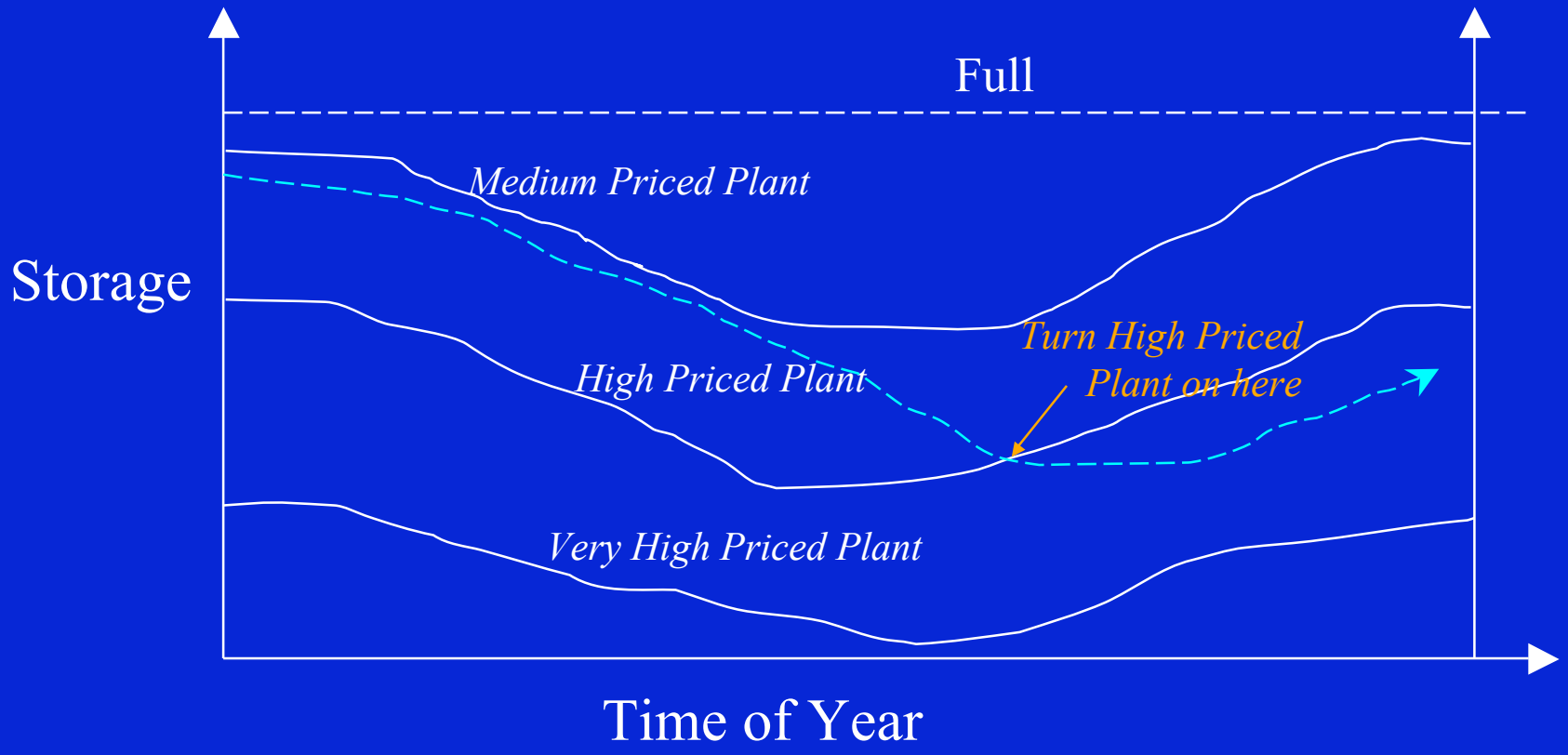


Water Value Calculation – Use of Sample Data

- This method helps capture the effects of long-term droughts
- Extended drought periods in the sample data have a large impact on the results
- It is difficult to extrapolate to 1/N security where N is greater than the number of sample inflow years

Water Value Contours

- Water value contours are calculated
- These represent the storage/time of year points below which displacing offers should be dispatched.



Water Value Contours

- Water values are calculated with minimal transmission modeling – for reasons of speed
- Fixed losses, a constraint on HVDC only
- When EMarket runs, the conditions should reflect those used in calculating the water values
- The $ value of the water value contour is adjusted to reflect the spot price differences between the hydro and the offering plant (averaged over the medium term)

Future Developments in EMarket Water Value Calculation

- Multiple year WV's

  Currently water values are based on a scenario that repeats the current year

- Multiple scenarios and recalculation triggers

  These would reflect changes in the state of knowledge, e.g. an unforeseen outage

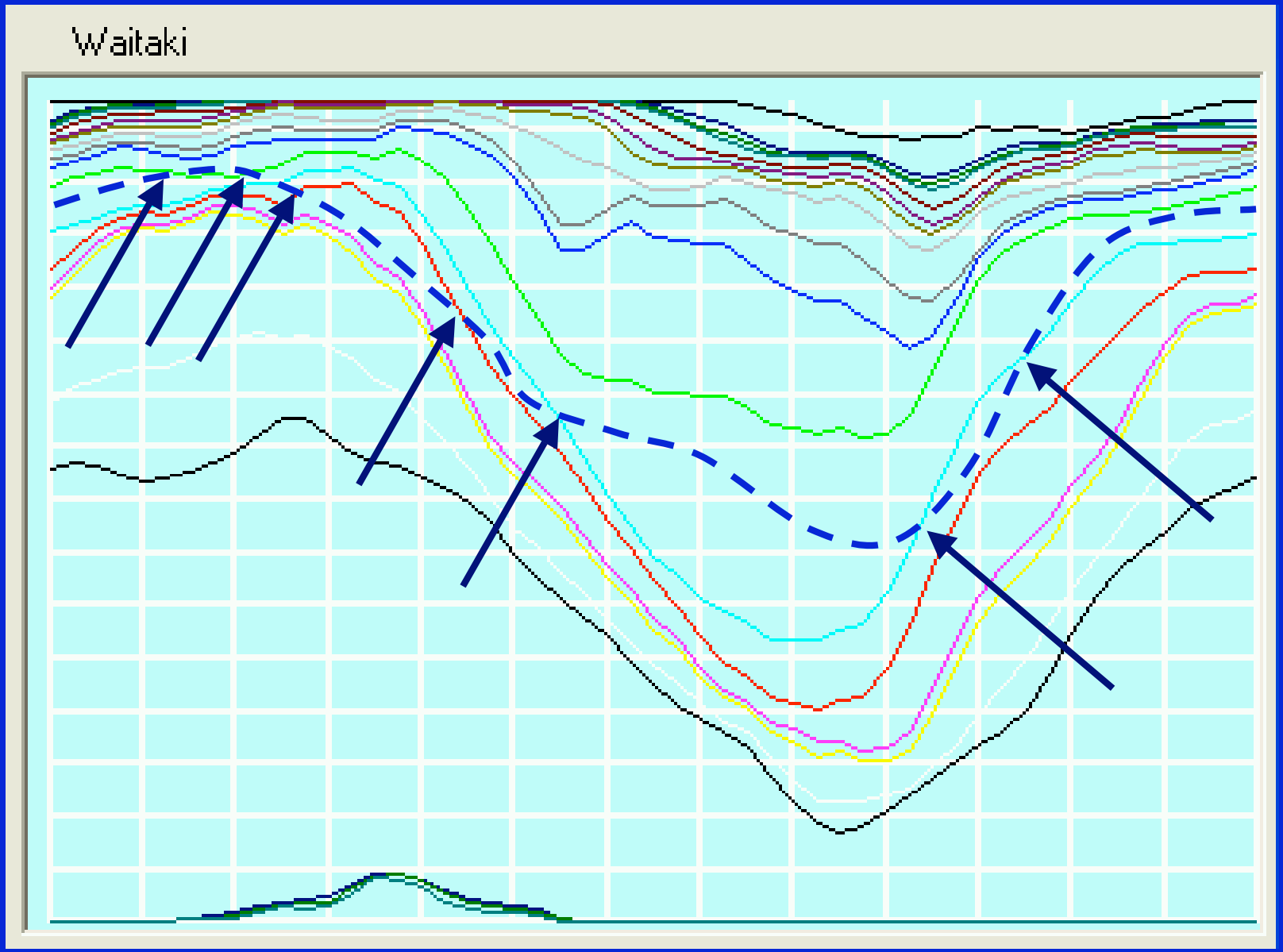
- Further transmission modeling

- The End

EMarket Water Values

- Water values need to be accurate
- Correct for differences between WVC calculations and simulations:
  - dynamic water value adjusters
  - ensures other plant comes on or off when Waitaki storage, in particular, crosses WVCs
- Assumptions changing about end of year storage:
  - allow for 1-in-N where N > 72 inflow years
  - draw storage up for dry autumn/summers like 1960

Water Value Contours as Trigger Points



South Island Storage

- Water value contours can be closely spaced or priced similarly:
  - high accuracy may be required
  - order of plant critical
  - effect of constraints not taken into account by water values?

- What does 1-in-60 imply for next year?
  - EC will be concerned with storage at end of summer
  - Increasing concern with this already eg 2001

Water Values and Storage Management

- Will the EC impose operating guidelines?
  - to ensure that hydro capacity is priced or withdrawn at the expected times to trigger more thermal generation?

- Or will the EC accept alternative operating plans from generators? Would need be satisfied that:
  - operating plans, taken together, will preserve security by running thermals early enough and hard enough
  - operating plans will not impose excessive costs eg WVCs that are 'too conservative' (for NZ inc) due to MP contracts?