

# The Wholesale Electricity Market A 10 year retrospective

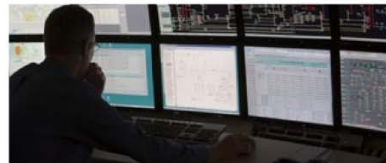
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# Summary

- Historical Perspective – Market Evolution
- Market Design Overview
- Market Operations
- Market Experience
- Issues For Market

# Historical Perspective - 1985

- 1985 Treasury review of electricity planning and generation costs
  - Failing to deliver electricity at lowest practicable cost
  - Systematic over estimate of demand growth 33% - 51%
  - Project delays, cost over-runs
  - Delivered production costs exceed estimates (100%)
- Reform minded Labour Government (1984)

# The Drivers For Market Evolution

- International Diversity
  - Unique features in each jurisdiction
- Common elements
  - efficiency
  - release of value
  - private investment
  - customer choice - competition

# The Evolutionary Path

- Regulatory reform
- Structural change
- Regulator and market operator
- Wholesale competition
- Retail competition
- Demand-side participation



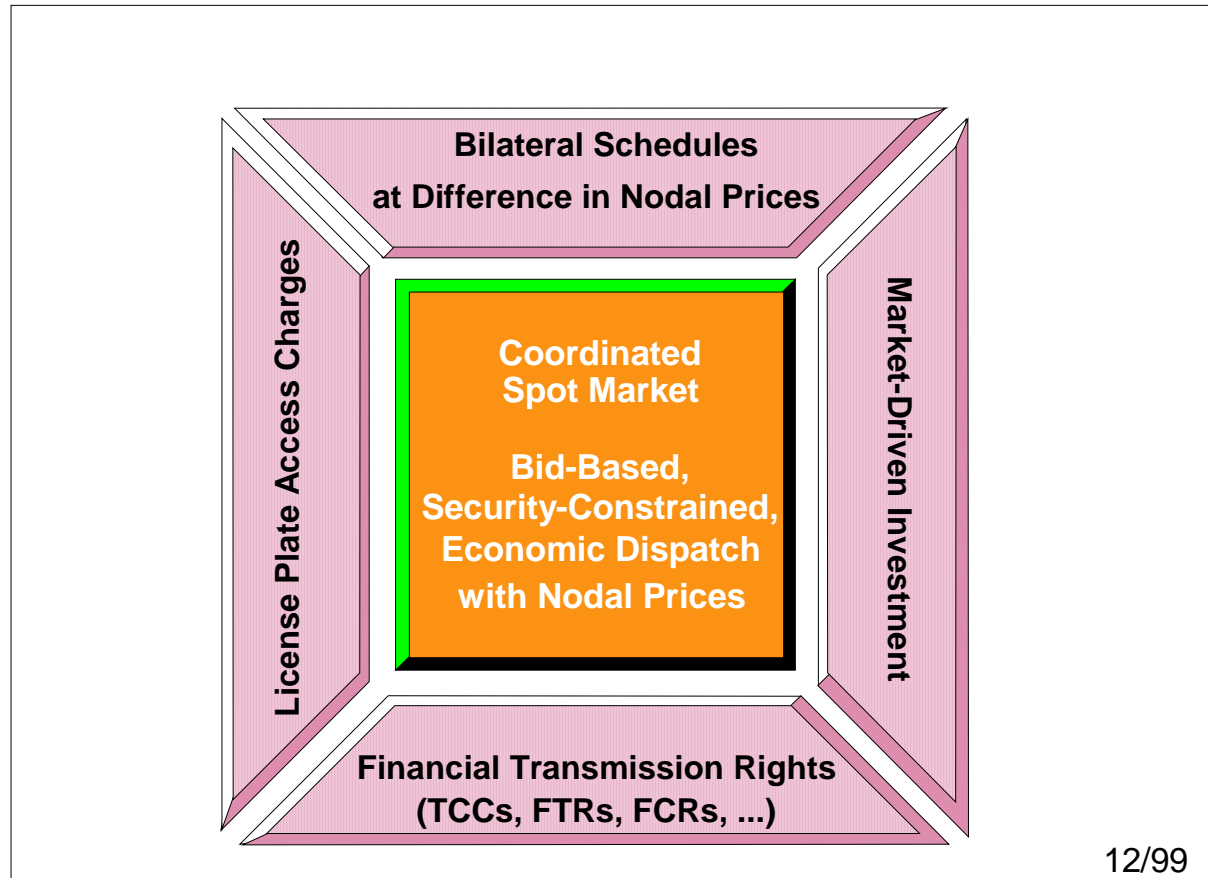
# Market Design Overview

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# The New Zealand Market Model



Source: William W Hogan

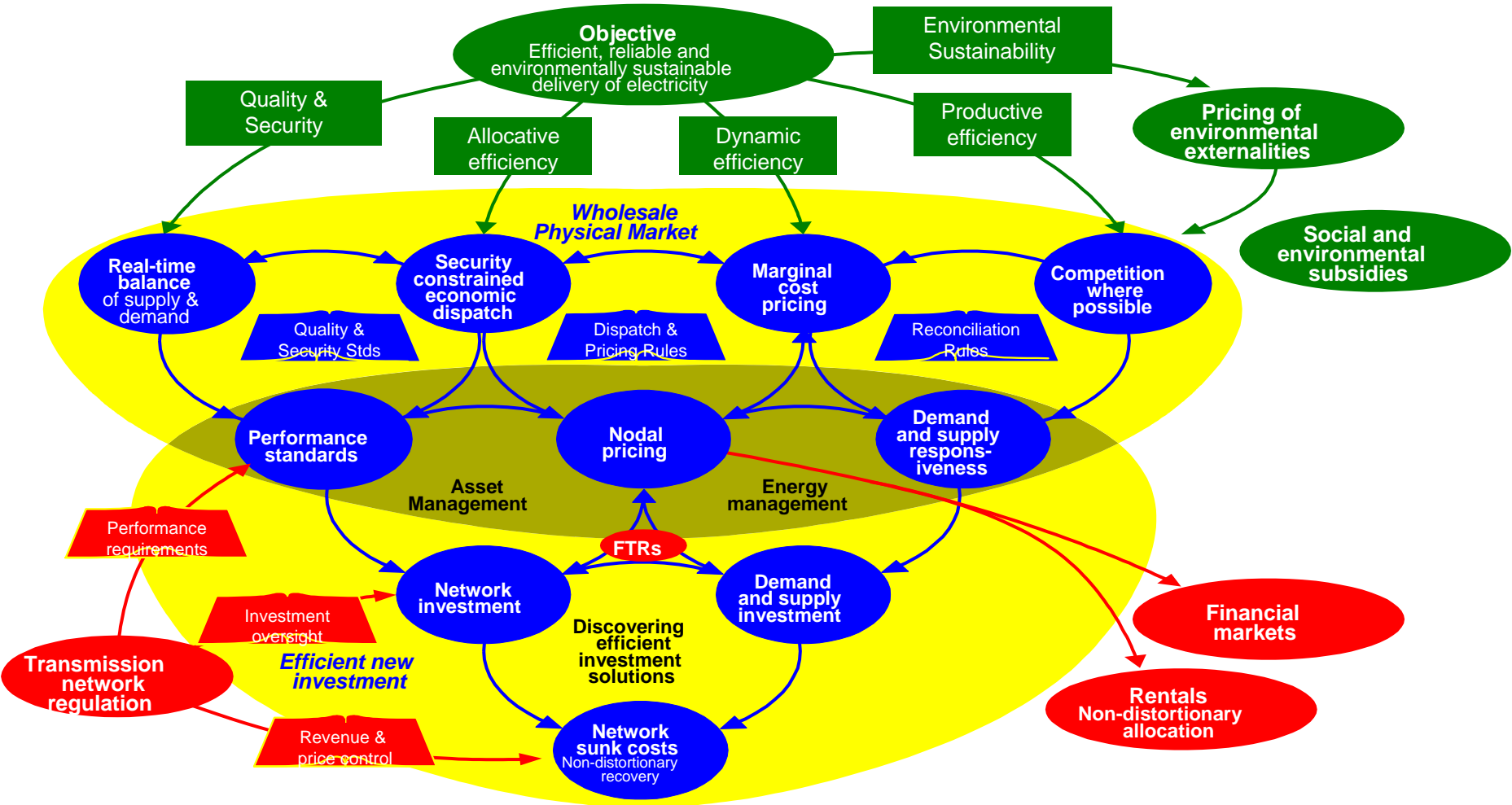
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# Market Design Consensus

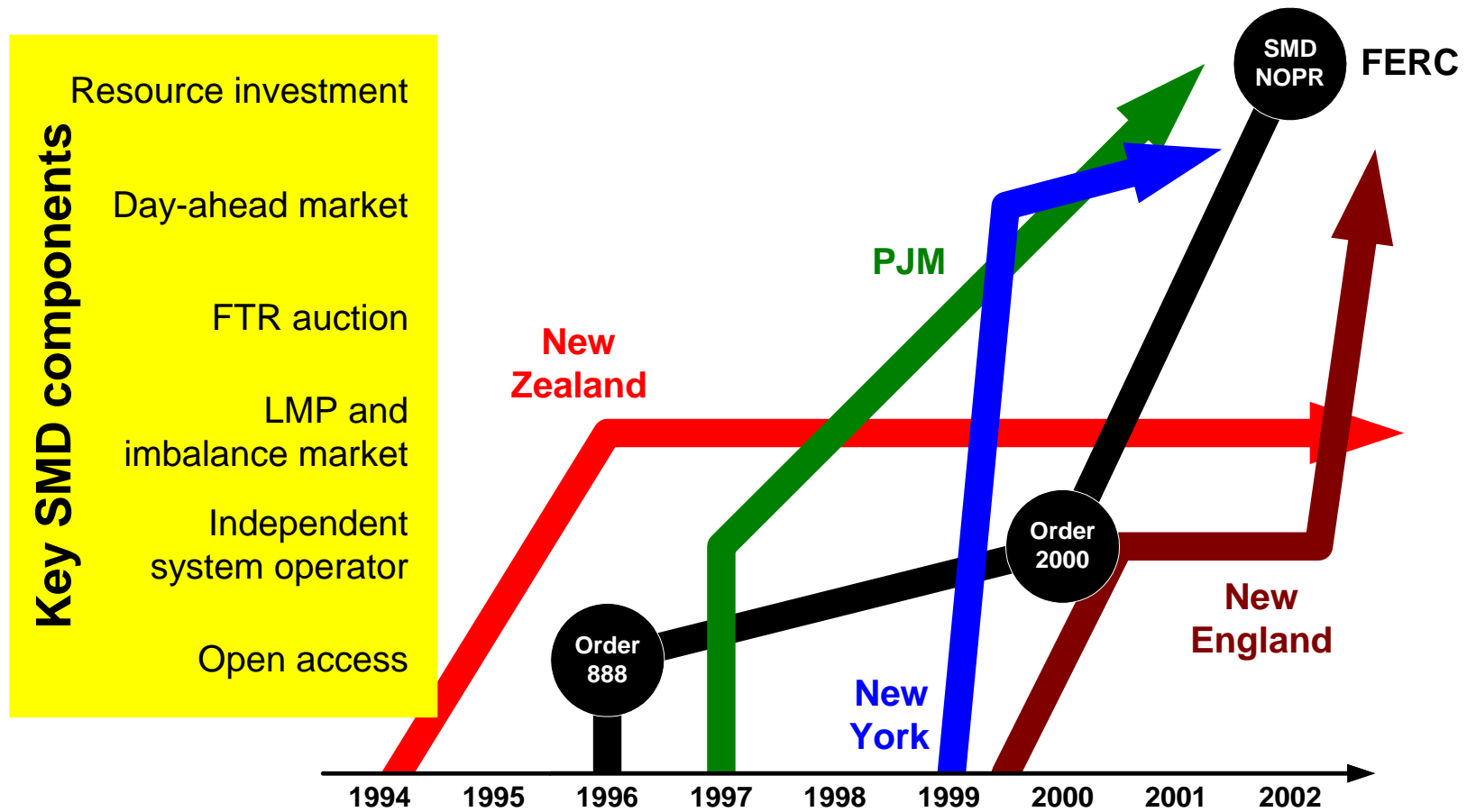
- Independent system operator
- LMP (locational marginal pricing) based dispatch
- Transparent constraint management
- Open access to transmission
- Co-ordinated ancillary services
- Market based pricing
- Market power mitigation
- Mandatory system security standards

# Conceptual Industry Model



# New Zealand's electricity market

New Zealand - early experimenter



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# Market Operations

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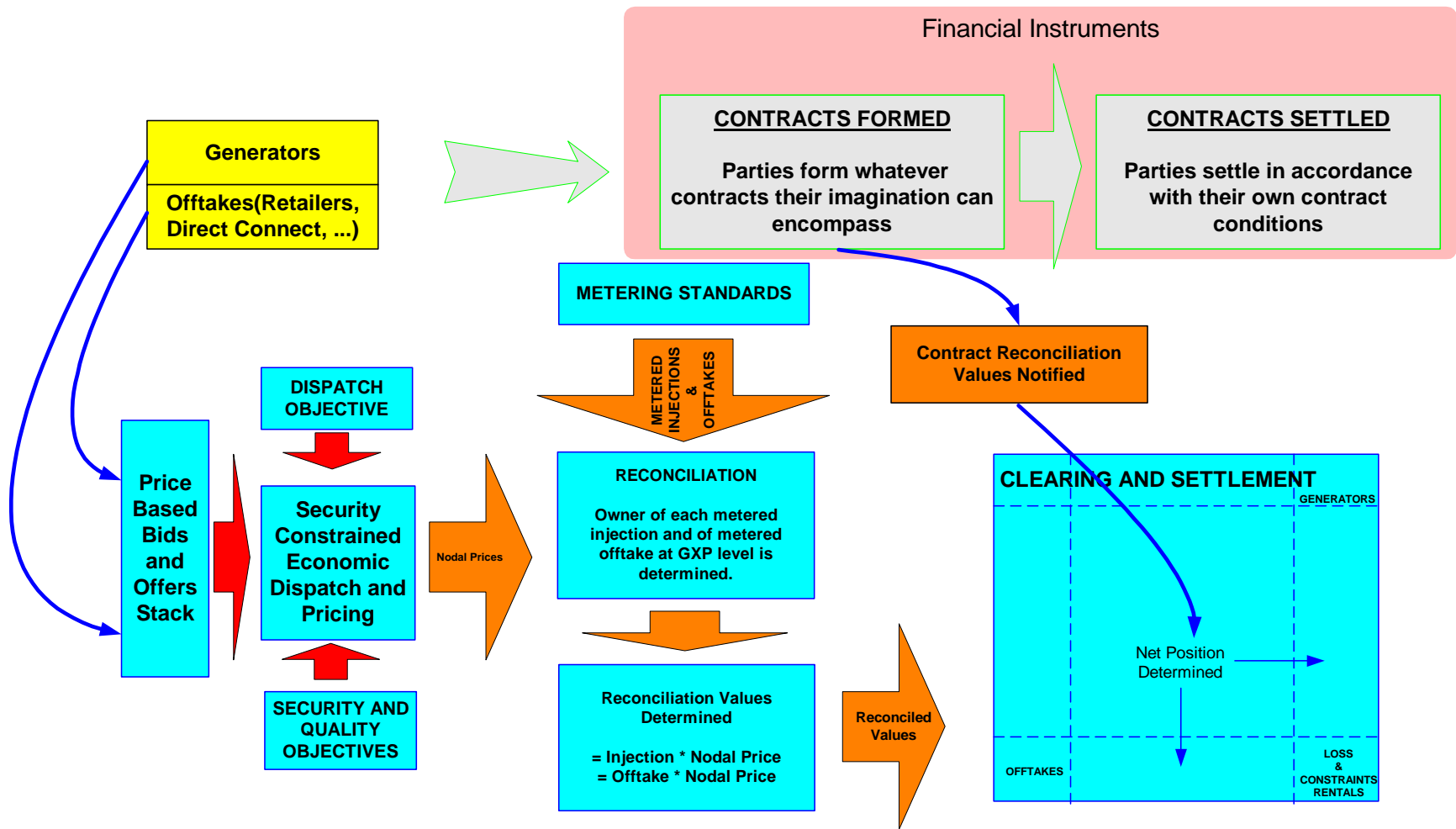


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# Features of the Wholesale Electricity Market

- Essential features:
- a single price based bid and offer stack
- real time co-ordination through a security constrained economic dispatch based on the single price stack
- mandatory gross reconciliation of physical injections and offtakes of power on the grid
- mandatory gross settlement against a dispatch based nodal spot price with voluntary net settlement for parties making that choice.

# THE WHOLESALE MARKET - an overview of the NZ model



# Market Experience

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# 10 Years Experience

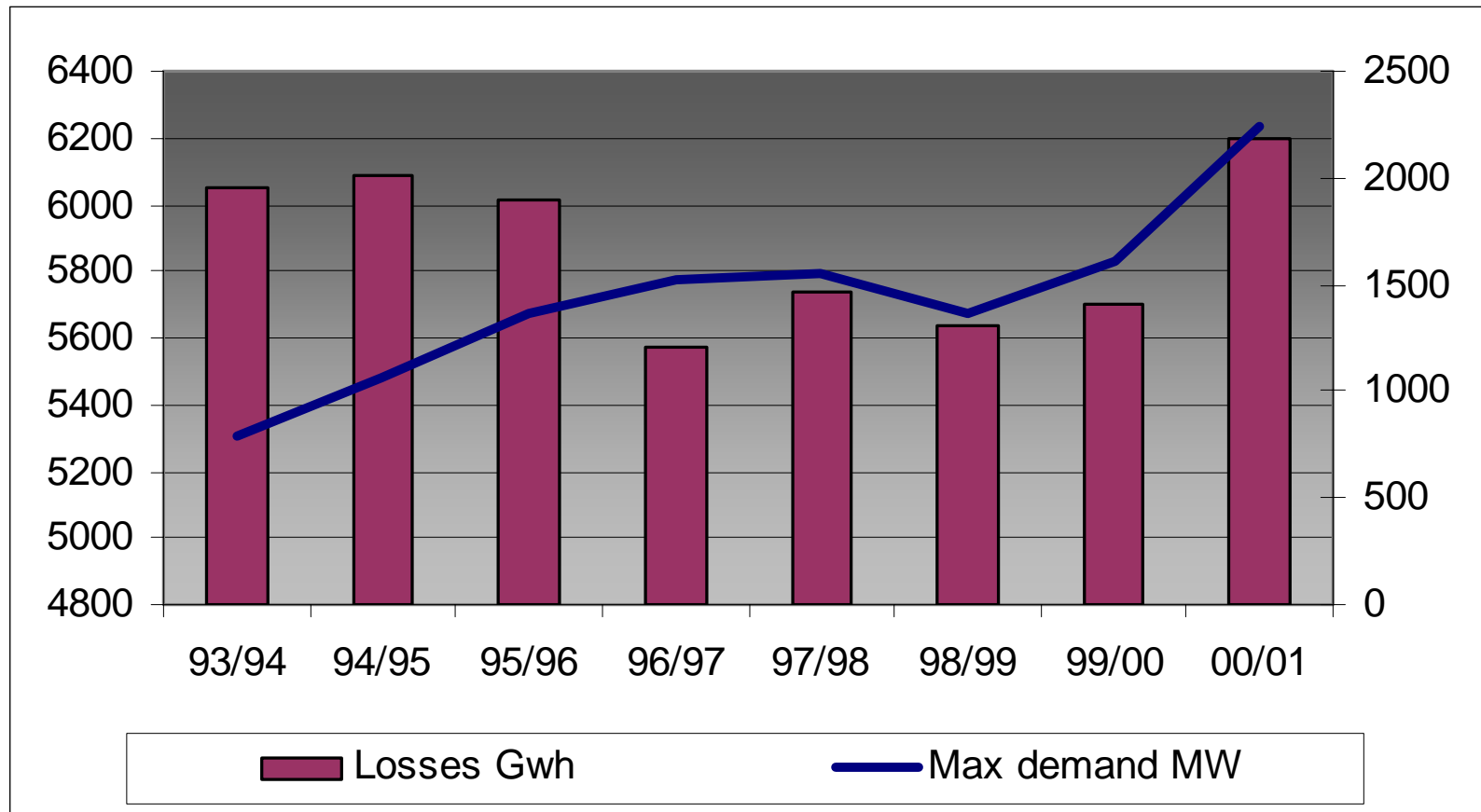
- System Operations
  - 176,000 trading periods
    - Dispatched successfully (40 million dispatch instructions)
    - Error rate less than 1 in 100,000
- Market Operations
  - 1 pricing intervention
  - Highest spot price \$10,000
  - Average spot prices lower than ECNZ 1991 predictions
  - Operated through 3 dry years

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# Load & Generation Balance 1997 - 2001

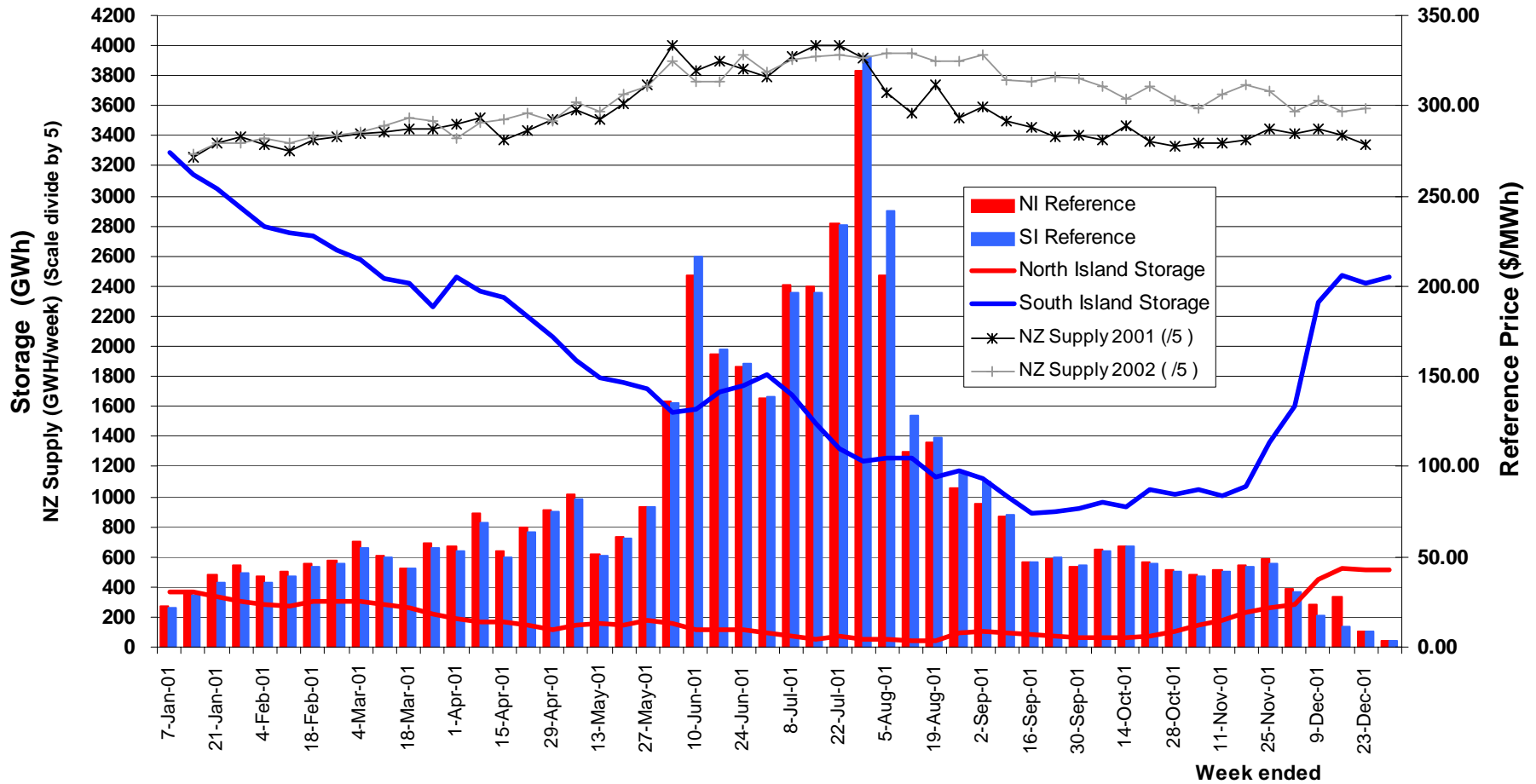
Change in use of transmission network due to availability of resources & locational signals



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# Coping in Crisis - Storage Demand and Price 2001



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# Market Issues

- Hogan 2002
  - NZEM
    - “at the forefront of best practice”
    - “aligned with the best international practice for a competitive electricity market”
    - Lacking long term transmission rights
- Wolak 1997
  - Market power issues. SOE’s acting as market leaders private generators providing competitive fringe.

# Market Issues

- Hedge Markets – loss and constraint rentals
- Nodal price severe volatility (constraint impacts)
- Ancillary Services – reactive power, markets/uplift
- Renewables in a market environment - Wind Energy
- Demandside participation
- Competition – wholesale and retail
- Capacity Margins –Security of Supply
- Generation Investment
- Transmission Investment

- Further Reading
  - Electricity Market Design and Creation in Asia Pacific - 2001 World Energy Council
  - ENERGY MARKET REFORM - Lessons Learned and Next Steps with Special Emphasis on the Energy Access Problems of Developing Countries - World Energy Council August 2004
  - Alternating Currents or Counter-Revolution? Evans L T, Meade R B – VUP
  - Electricity Markets Pricing, Structure and Economics Harris C. Wiley