



# **IMPROVING PLANT PERFORMANCE**

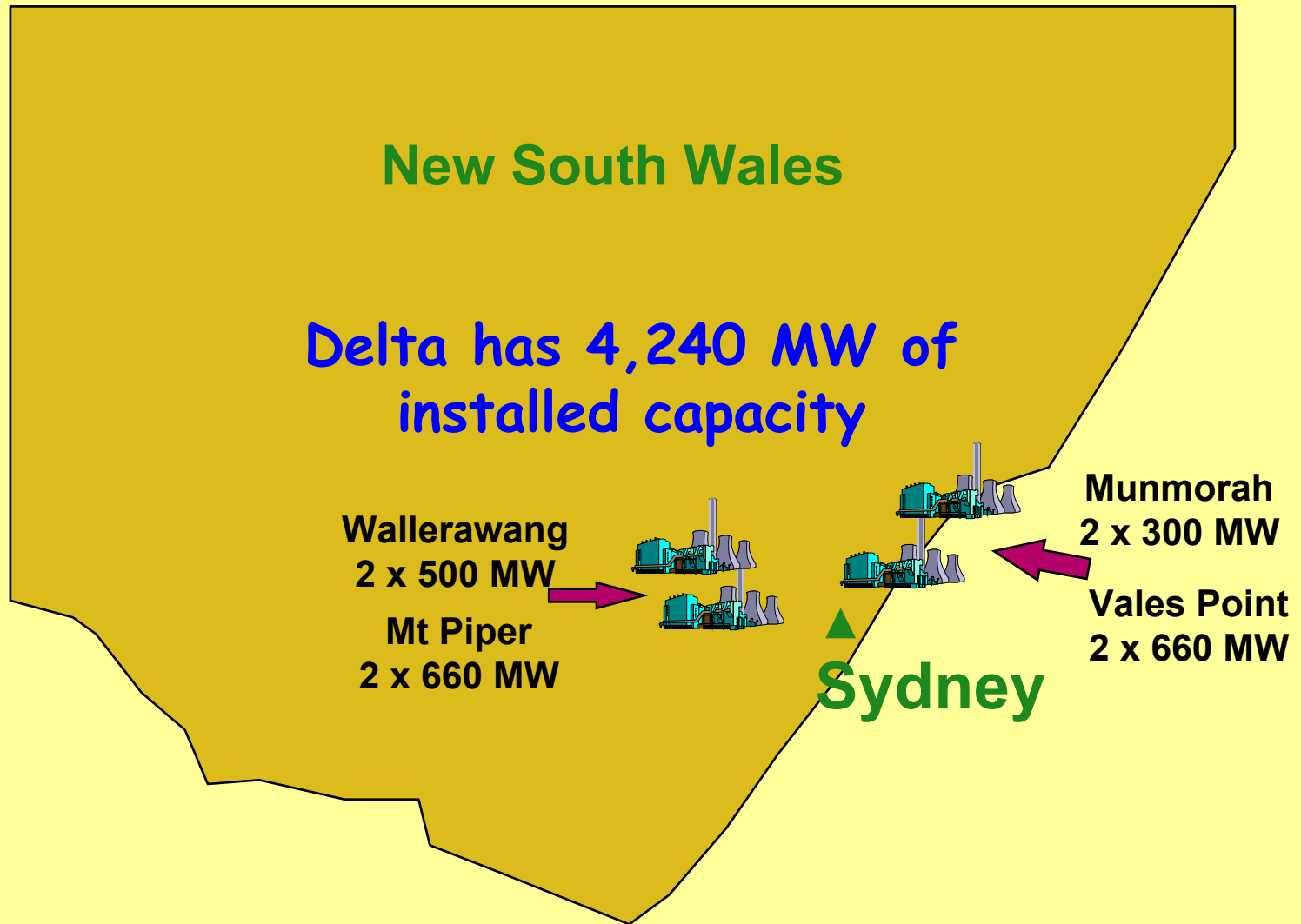
## **A STRATEGIC APPROACH**

**31<sup>st</sup> March 2004**

**Brian Roby  
Delta Electricity**

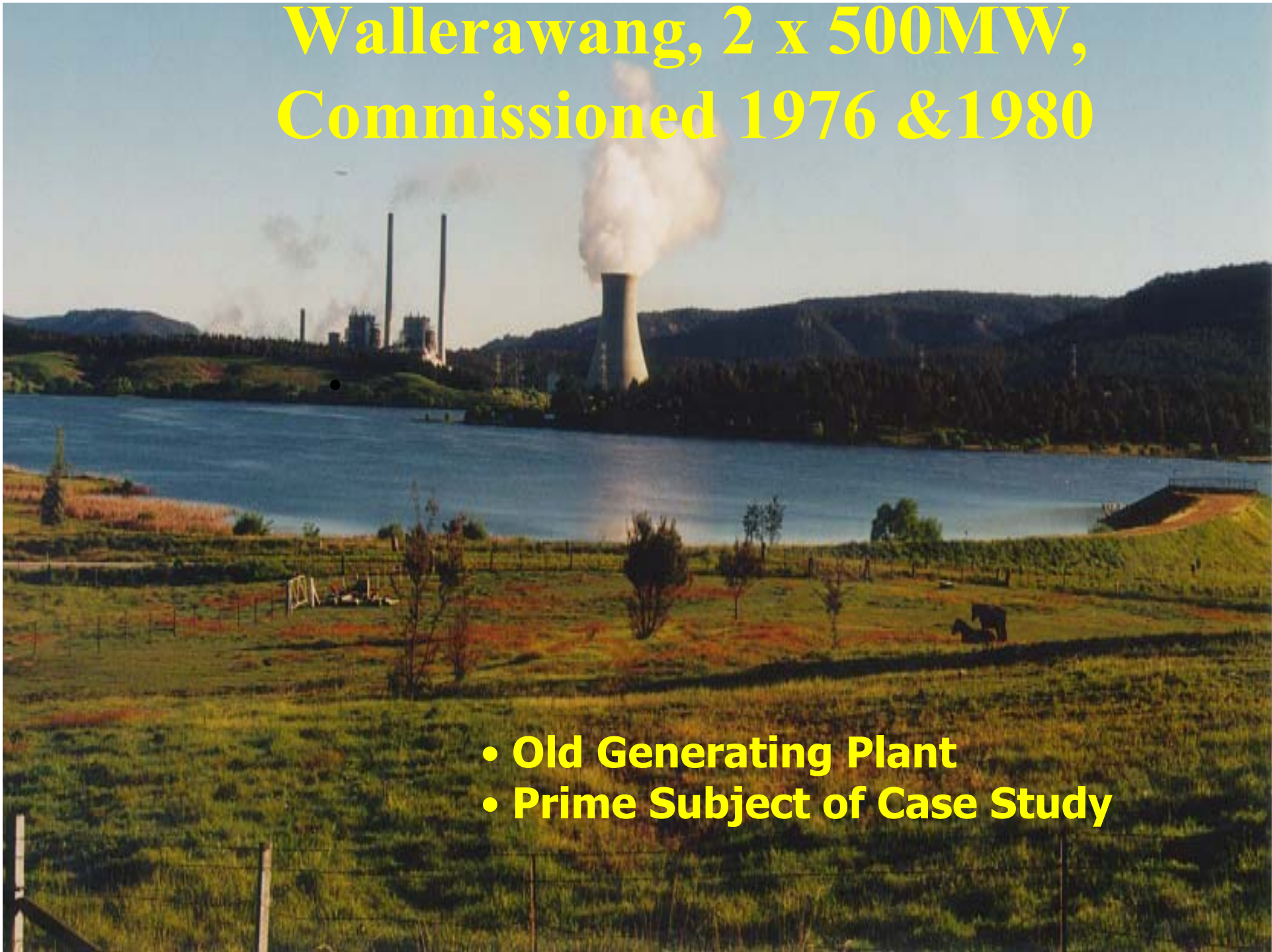


# Delta Electricity Power Stations



# Wallerawang, 2 x 500MW, Commissioned 1976 & 1980

- Old Generating Plant
- Prime Subject of Case Study





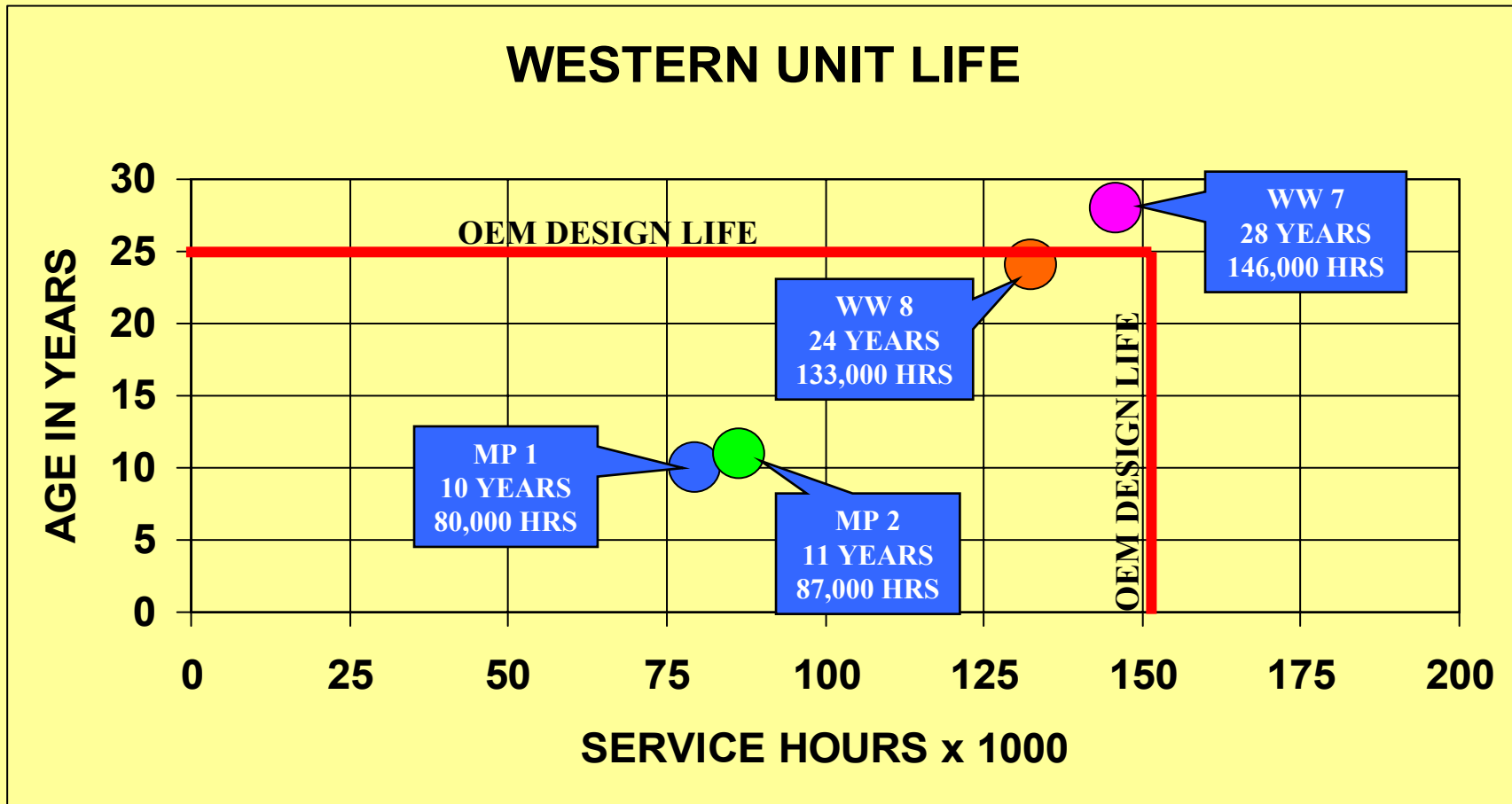
# Mount Piper, 2 x 660MW, Commissioned 1993 & 1994



- **New Generating Plant**
- **Secondary to Case Study**



# Western Plant Age and Life





# Plant Performance Measures

$$\text{Availability} = \frac{\text{MWh max} - \text{MWh loss}}{\text{MWh max}} \times 100$$

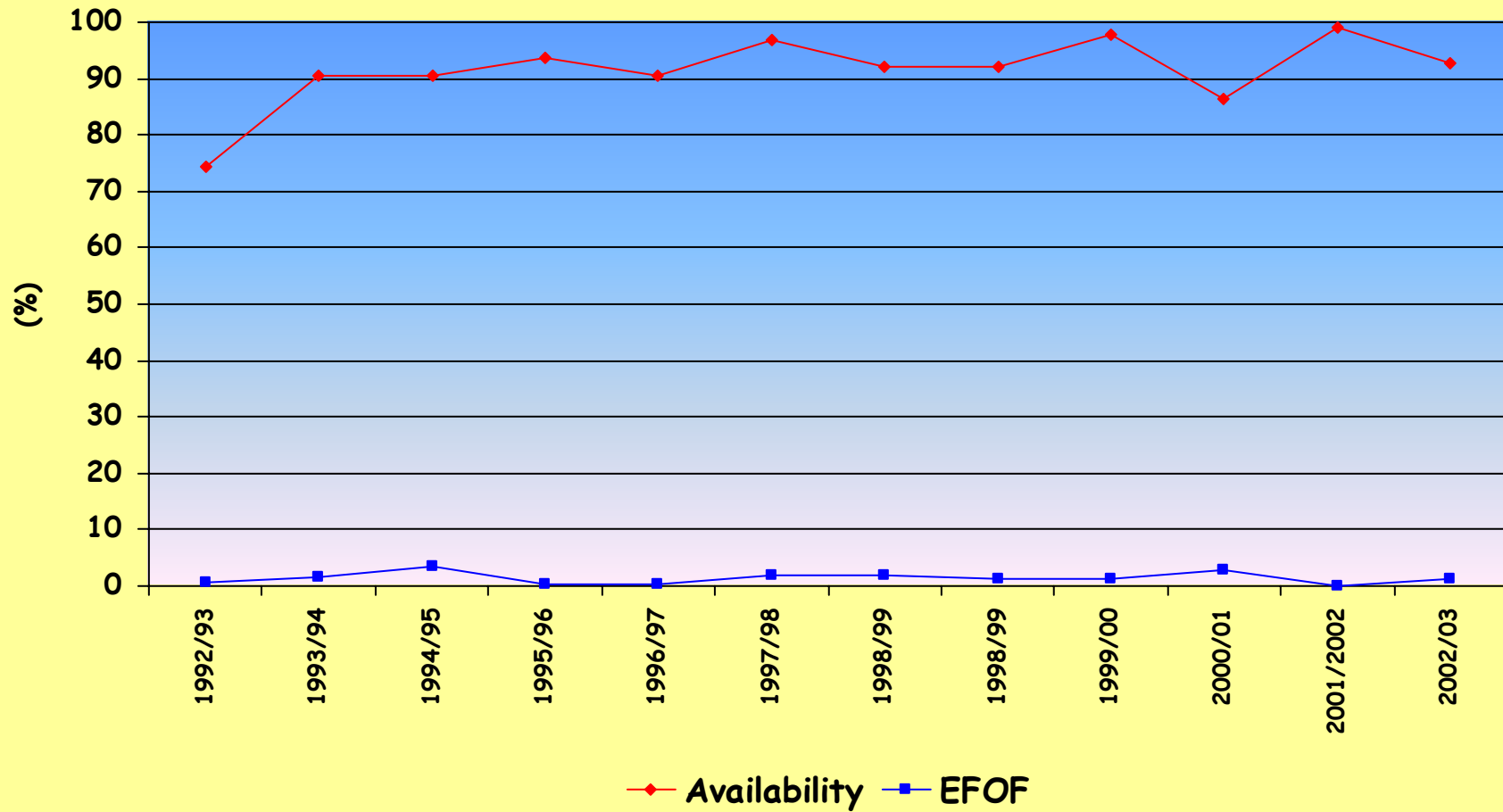
**Measures plant capability for energy generation**

$$\text{EFOF} = \frac{\text{All MWh losses forced \& partial}}{\text{MWh max}} \times 100$$

**Equivalent forced outage factor measures % energy lost due to all forced outages**

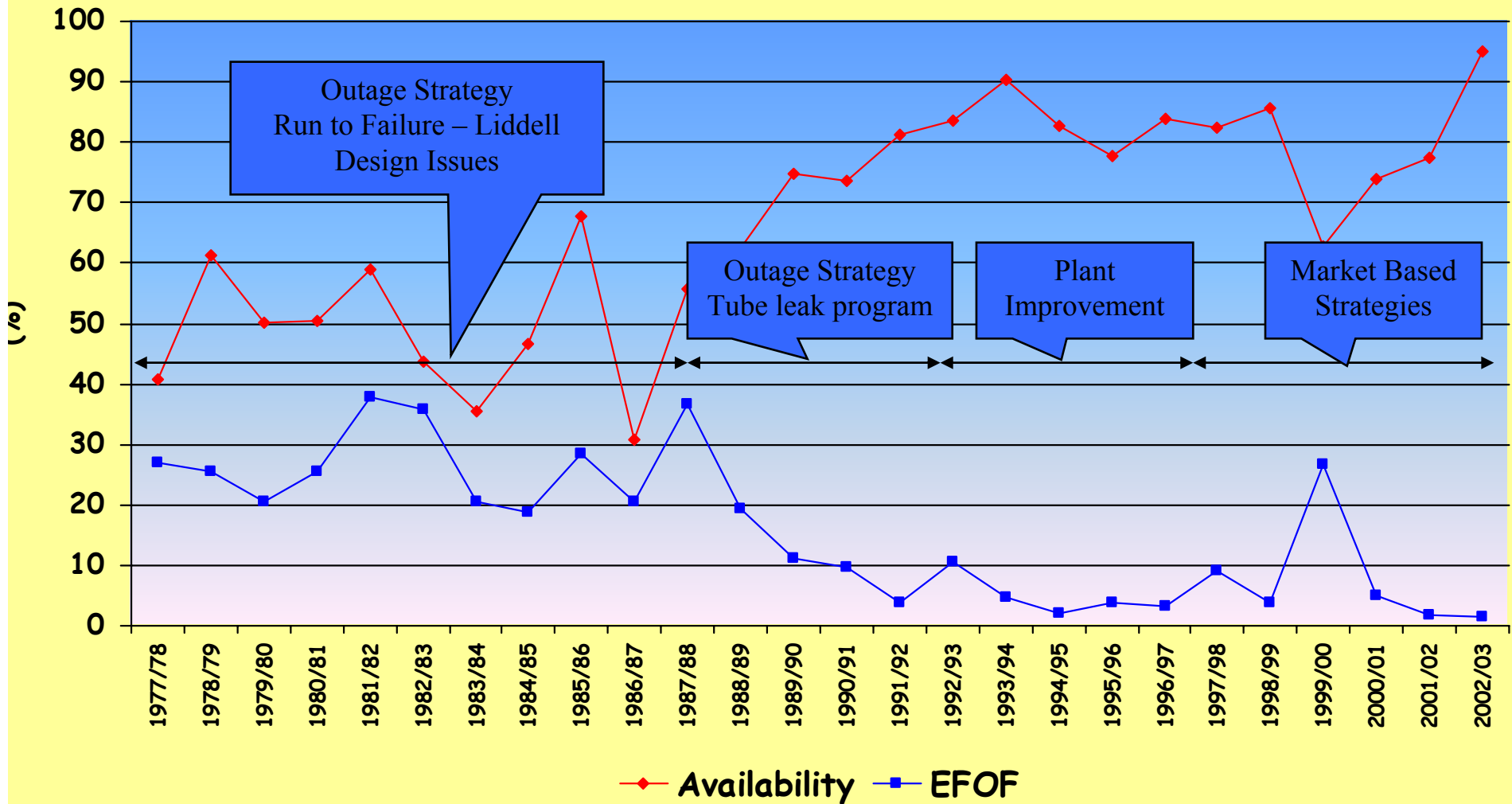


# Mt. Piper Plant Performance





# Wallerawang Plant Performance





# Electricity Market -1996

- Business
  - making electricity for profit
- Plant Role
  - Available to produce revenue whenever required
  - Reliable service when producing revenue \*
  - Maximize profit by reducing plant costs



# Improving Plant Performance

- Plant is a capability for generating revenue
- Analysis identifies improvement options
- Risk Management enables cost effective plant improvement
- Maintenance assures the capability



# Improving Plant Performance

**“Plant is a capability for generating revenue”**

- Identify the primary business drivers
  - making electricity for profit
- Create supporting engineering drivers
  - Available, reliable, low cost



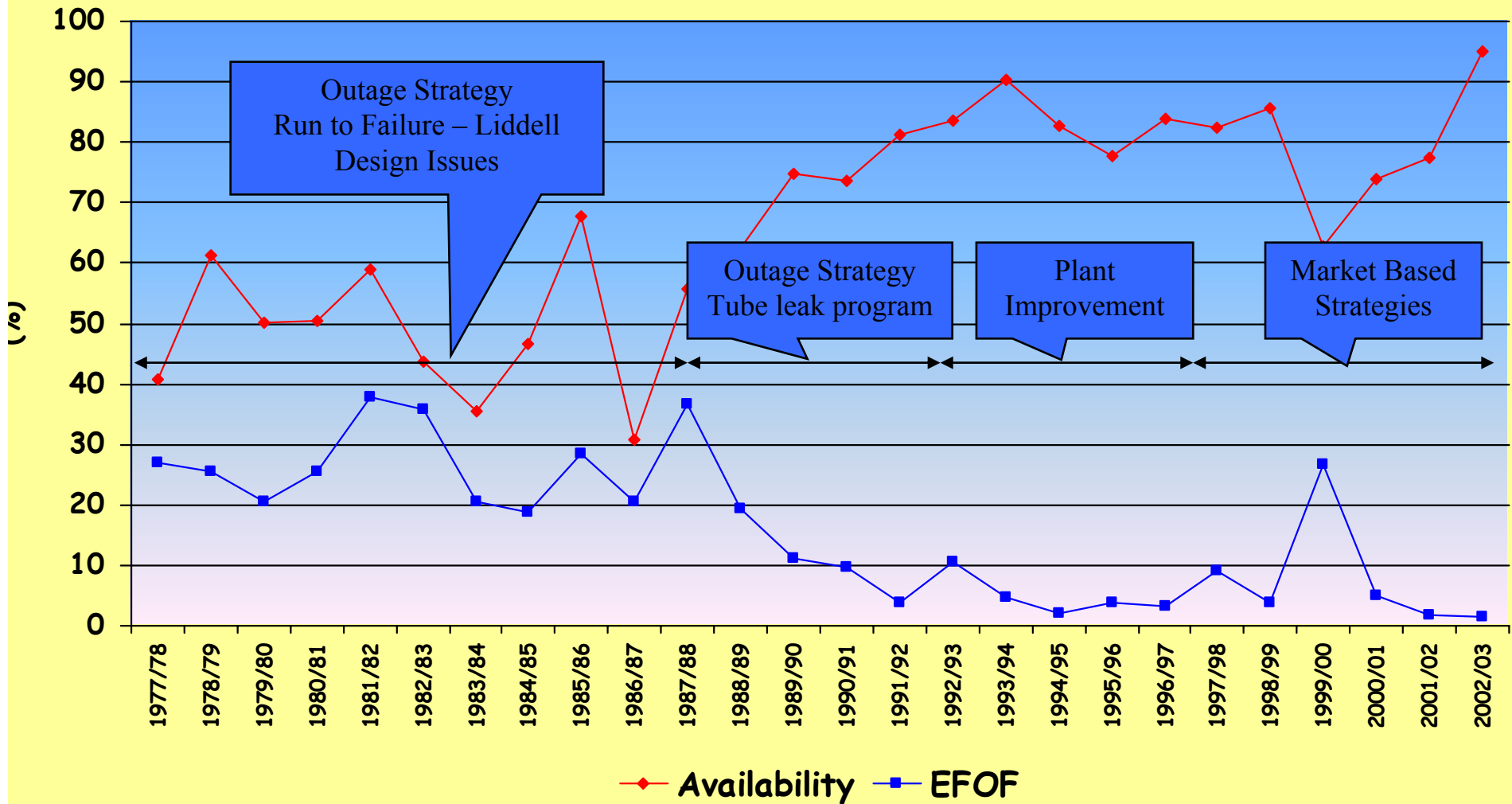
# Improving Plant Performance

**“Analysis identifies improvement options”**

- **Availability**
  - Minimize outage periods
  - Increase period between outages?
- **Unit Efficiency**
  - Greenhouse
  - Production Cost
- **Reliability**
  - Eliminate historical losses
  - Quantify risk of failures – prioritize & eliminate
  - High reliability demands pro-activity



# Wallerawang Plant Performance





# Improving Plant Performance

**“Risk Management enables cost effective plant improvement”**

- Quantify risk
  - Provides common language – engineering to business
- Risk determines corporate priorities
- Risk = probability x consequence
- Commercial packages available



# Improving Plant Performance

## Reducing plant costs

- Engineering owns the “controllable costs”
- Focus on the plant improvement logic – cost reduction follows
- Financial evaluation of options
- No failures – no unexpected costs
- Unit efficiency improvements
- Benchmarking



# Improving Plant Performance

**“Maintenance assures the capability”**

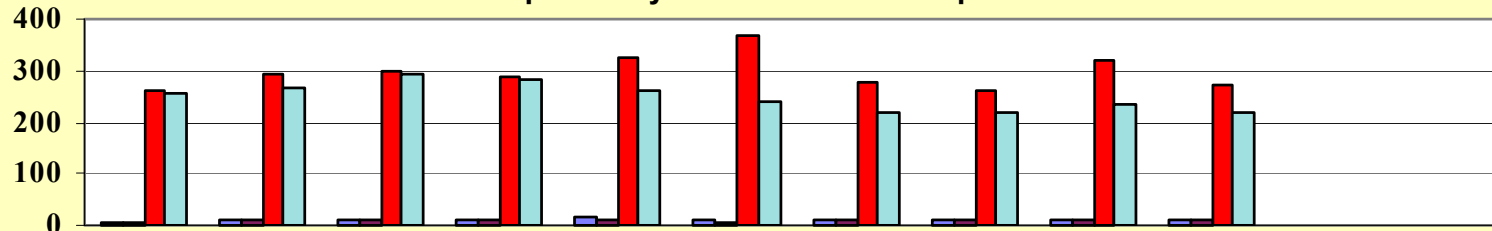
- **Preventive maintenance**
  - Routines in place?
  - Routines being completed?
  - Preventive controlling Corrective?
- **Corrective maintenance**
  - Defects raised & defects completed
  - Defects raised – trend
  - Backlog trend and content
- **Early warning for availability and reliability performance**



# Maintenance Measures

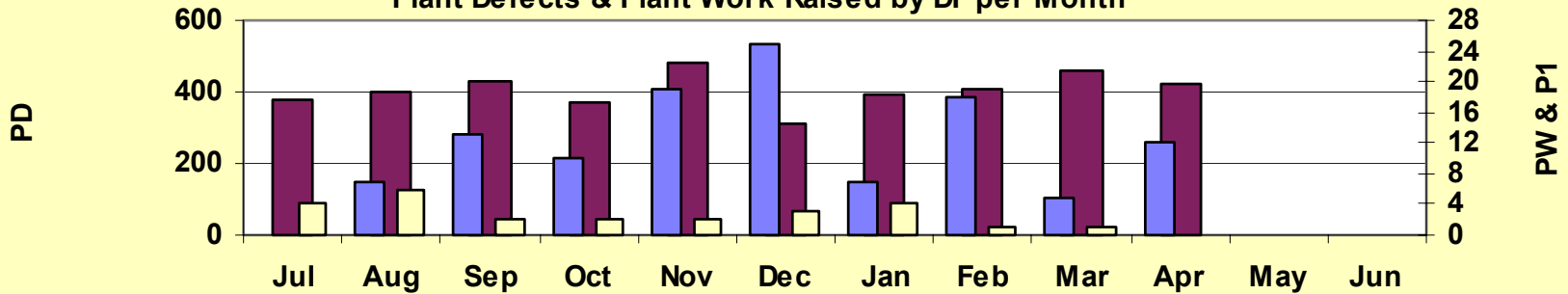
## Wallerawang

Routines Raised & Completed by Planned Start Date per Month



	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
■ OI by PSD Raised	7	11	12	12	15	12	10	10	10	11		
■ OI by PSD Comp	7	9	12	12	13	8	9	9	9	10		
■ PR by PSD Raised	259	293	299	287	328	367	280	263	320	273		
■ PR by PSD Comp	255	269	295	281	259	241	221	219	236	217		

Plant Defects & Plant Work Raised by DF per Month

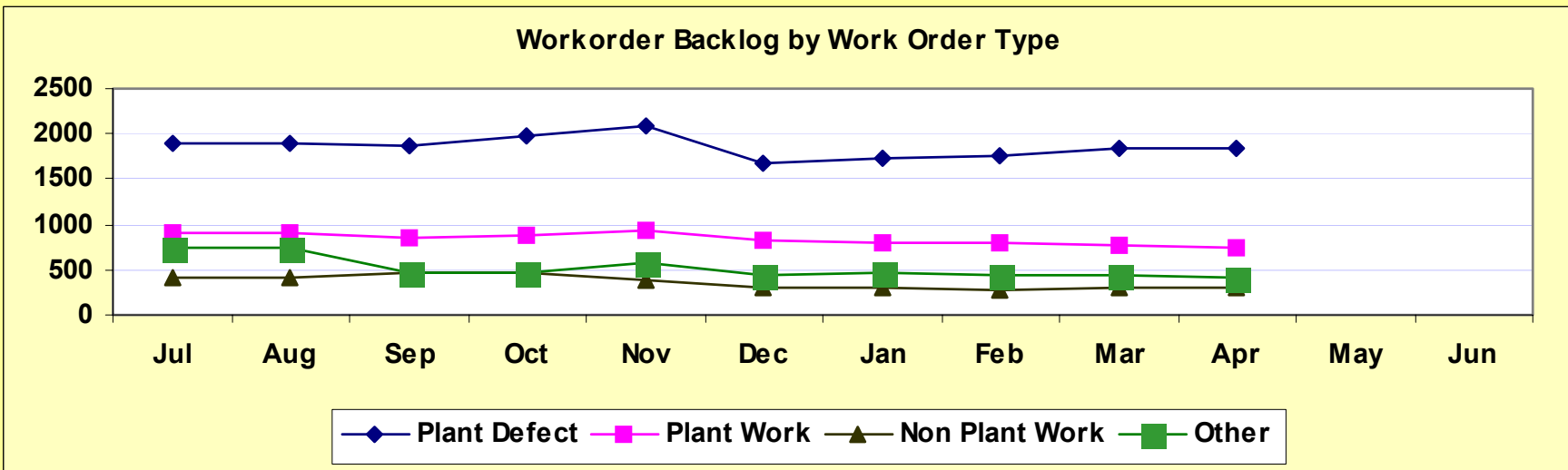
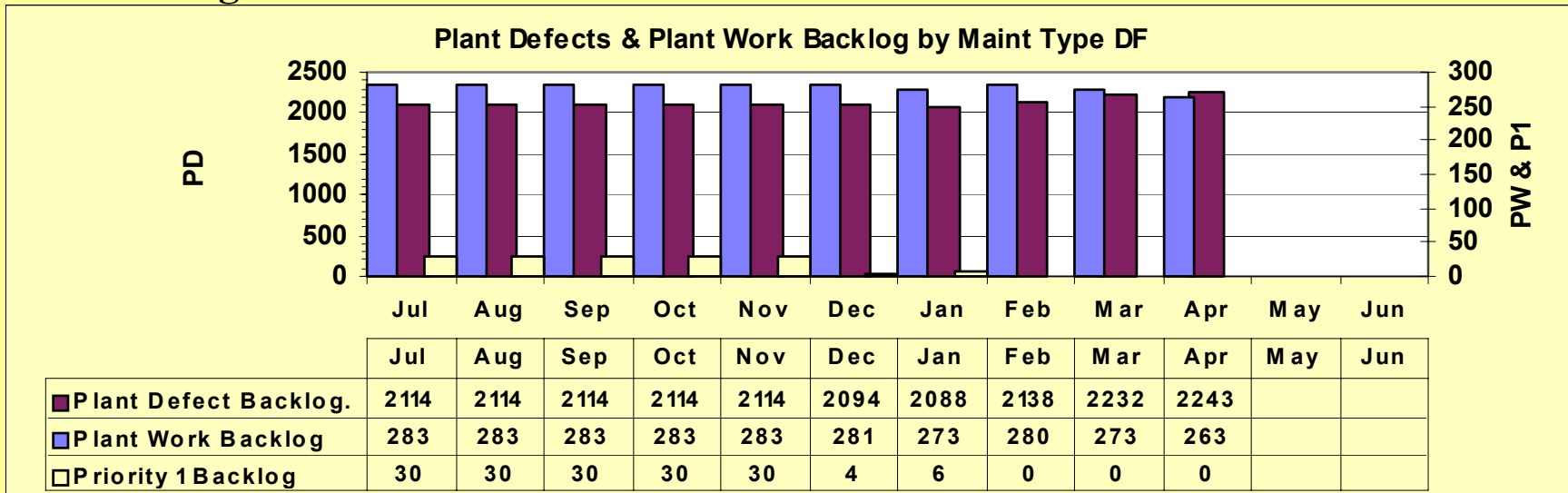


	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
■ Plant Defect Raised	375	398	428	371	478	309	395	405	460	425		
■ Plant Work Raised	0	7	13	10	19	25	7	18	5	12		
■ Priority 1 Raised	4	6	2	2	2	3	4	1	1	0		



# Maintenance Measures

## Wallerawang





# Strategies for All Plant

- Plant History
- Current Plant Conditions
- 10 Year Plan
  - Outage Strategy
  - Financial Plan
  - Budget Flexibility
  - Emerging Issues



# The Challenge is Greater!

- “Fixed costs” increase
- “Controllable Costs” become as fixed as “fixed costs”
  - Labour, material and expense
  - Outage and non-outage
- Controllable costs have more impact on the business
- Corporate Controls increase when pro-activity is required
- Benchmarking requires engineering interpretation
- Operating vs capital expenditure



# Early Warning Received ...What Next?

- Analyse corrective maintenance and .....
- Convert to preventive maintenance
- Continue to Identify and Mitigate Risks
- Adopt a more conservative strategy