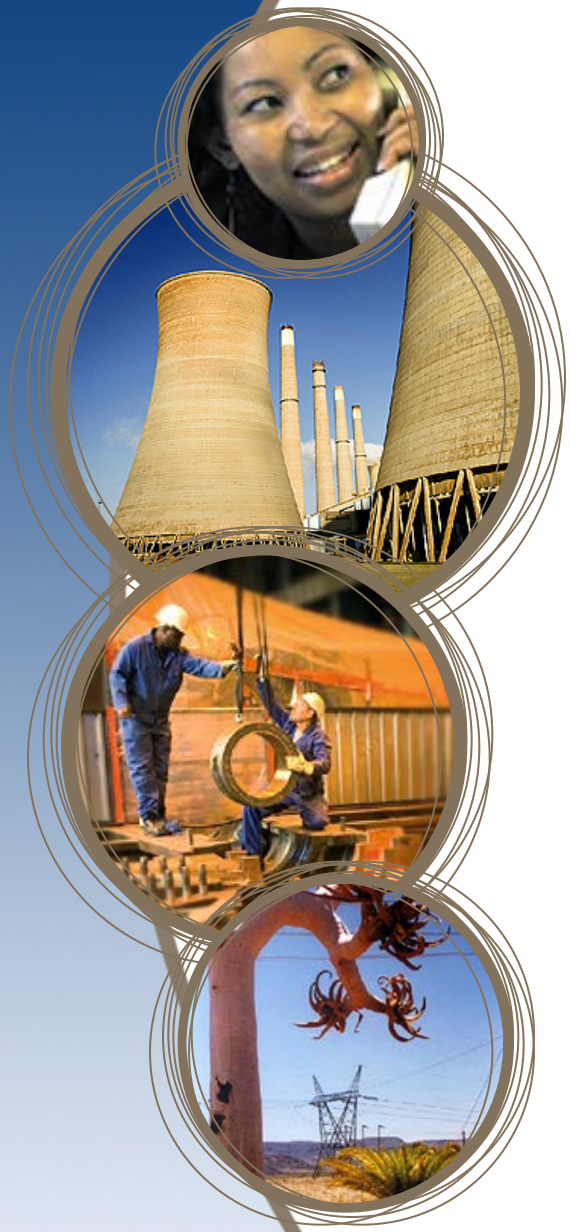


Realistic ambient air temperature specification for ACC's

Johannes Pretorius

ACC user's group meeting 2012
Gillette, Wyoming, USA

Overview

- Typical ACC temperature specification
- Trends from Matimba power station
- Measurements at Kendal power station
- Conclusion
- Acknowledgements
- References

Typical ACC temperature specification

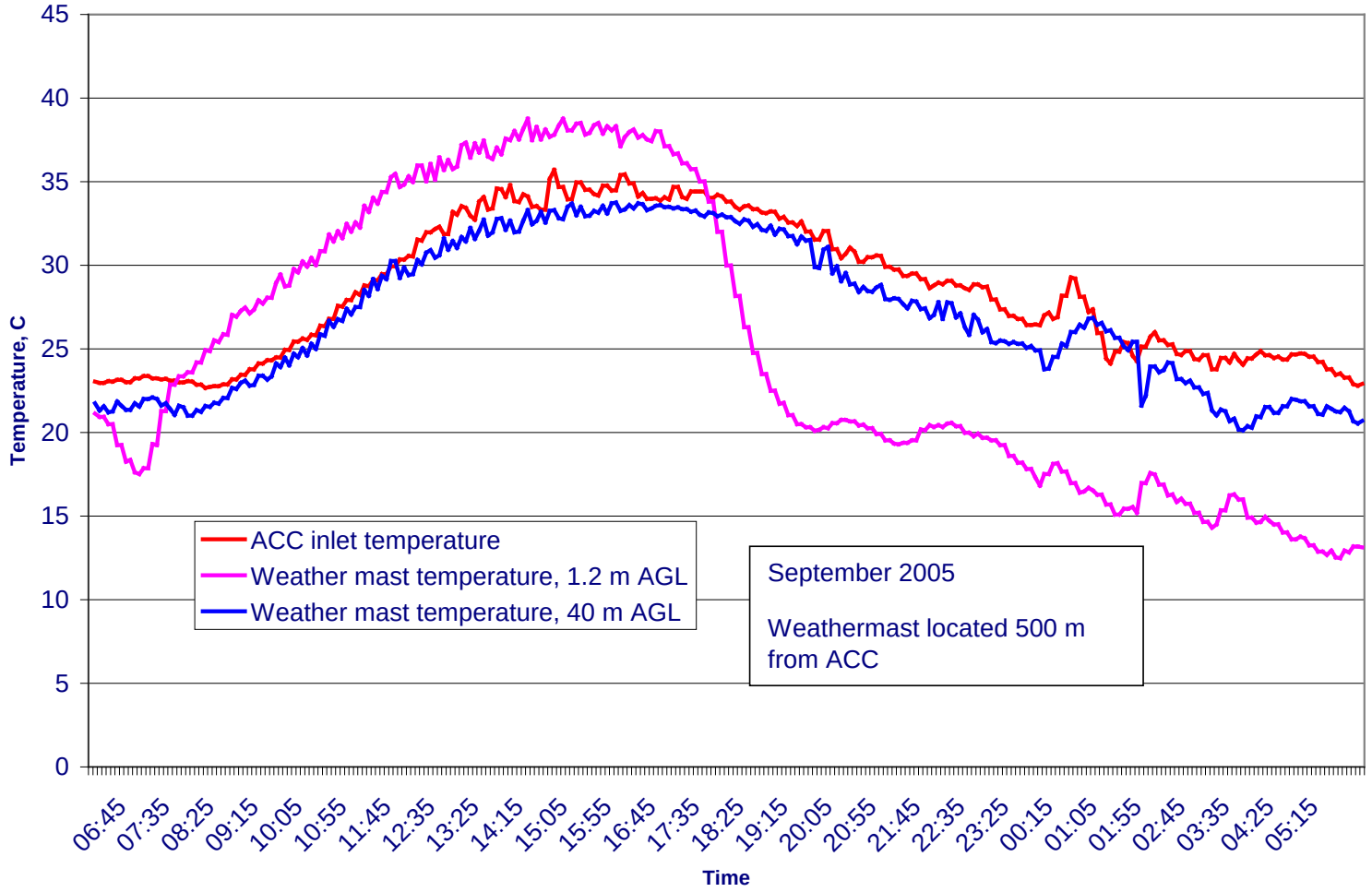
- Typical South African weather stations
    - Dry bulb ambient air temperature @ 1.2-1.5m AGL
    - Wind speed & direction @ 9-10m AGL
- Green fields / absence of dedicated weather masts in area, info from weather bureau used for site weather specification
- Cooling systems (wet or dry) specification thus based on air temperature near ground level

Matimba power station

- Temperature measurements taken at ACC inlet
- Temperature measurements on 60m high weather mast, located 500m away from ACC

Trends from Matimba

- Interesting trends from Matimba power station
- Weather mast & ACC air inlet temperatures indicate significant discrepancies
- Up to 10 °C difference between ground level and inlet temperature possible



Investigation

- Investigate whether similar trends are experienced on other sites
- Measurements at Eskom's Kendal power station
    - Indirect dry cooling system, however from literature similar principle should apply
    - Air drawn into cooling system from higher heights than ground level

Kendal power station

- 6 x 686 MW coal-fired
- Last Unit commissioned 1988
- Indirect dry cooling system

Measurements at Kendal

K2 monitoring station:

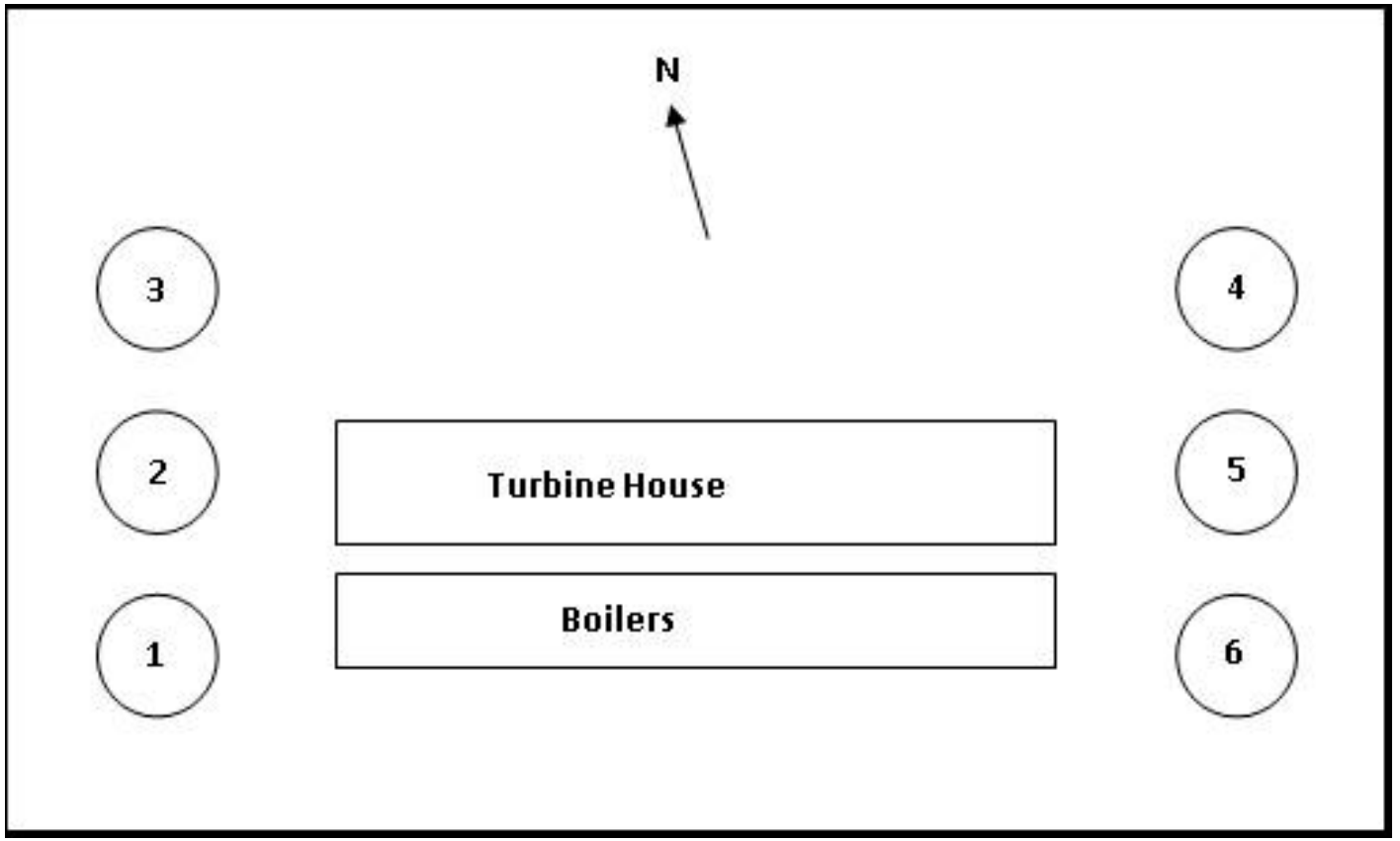
- **Located 2km SSE of Kendal PS**
- **Ambient temperature measured at 1.2m AGL**

Cooling towers:

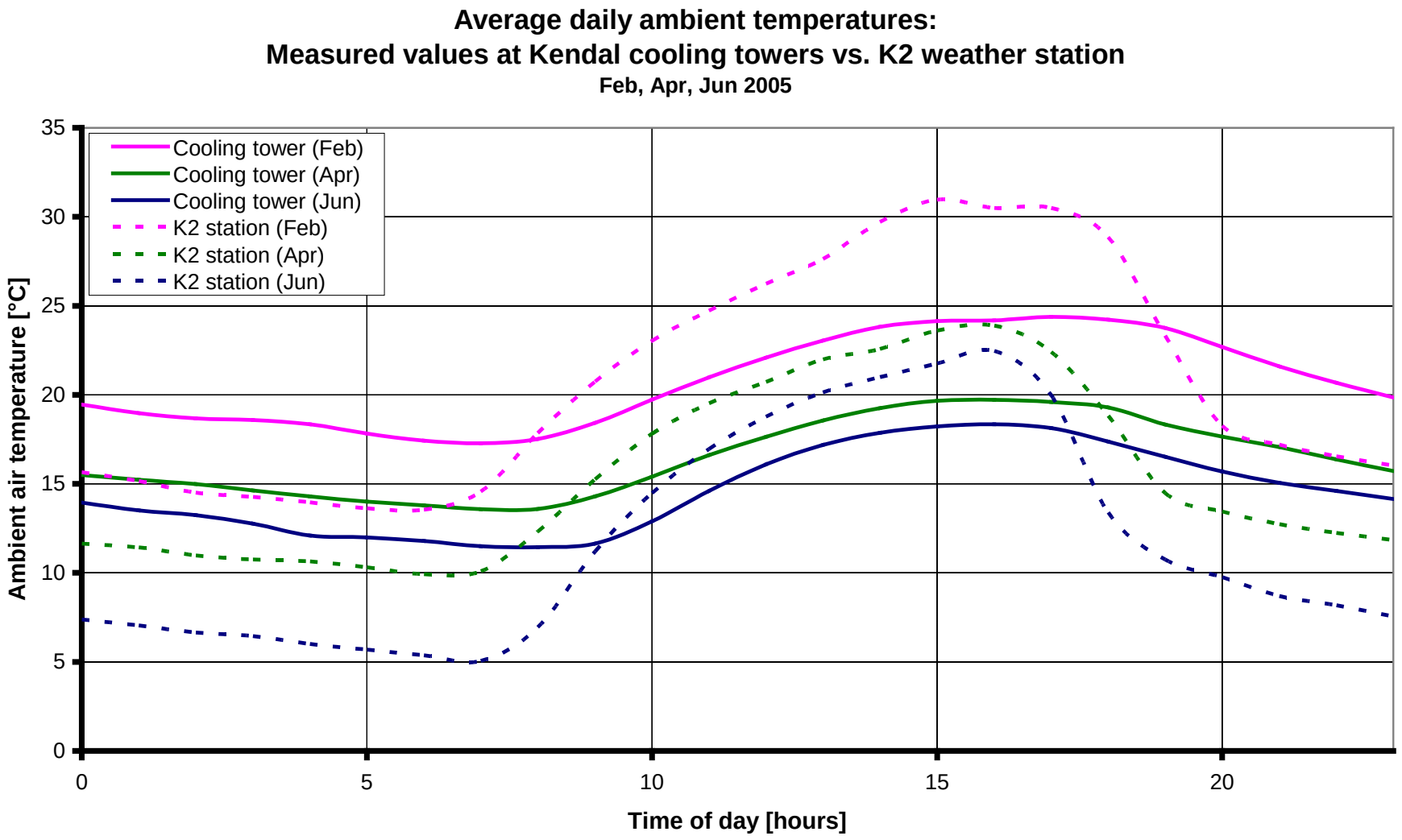
- **Ambient temperature measured at approx. 25m AGL**

Measurements at Kendal

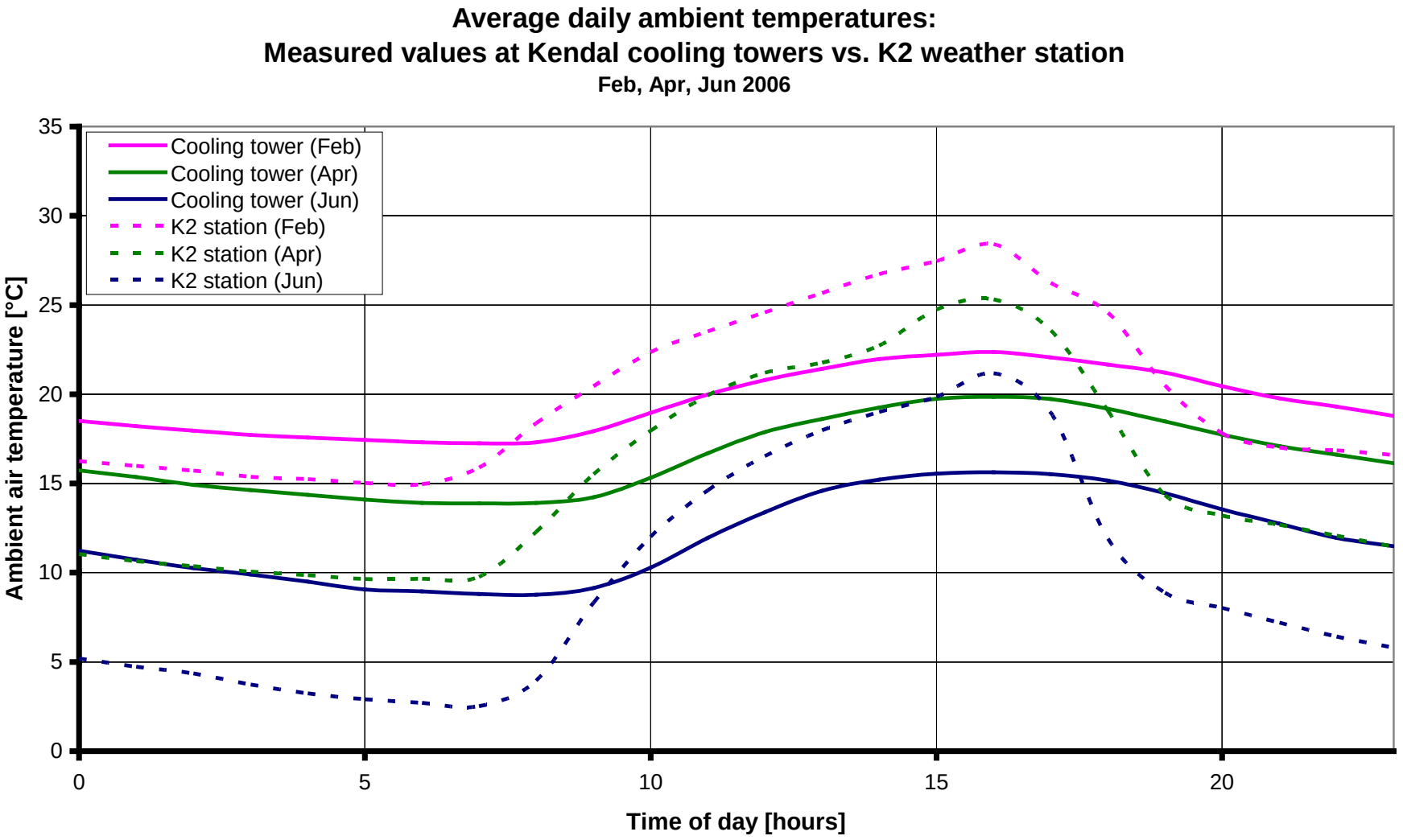
- Measurements from cooling tower 1
- Measurements from cooling tower 2 for comparison (adjacent)
- Relatively good data available for 2005-2006



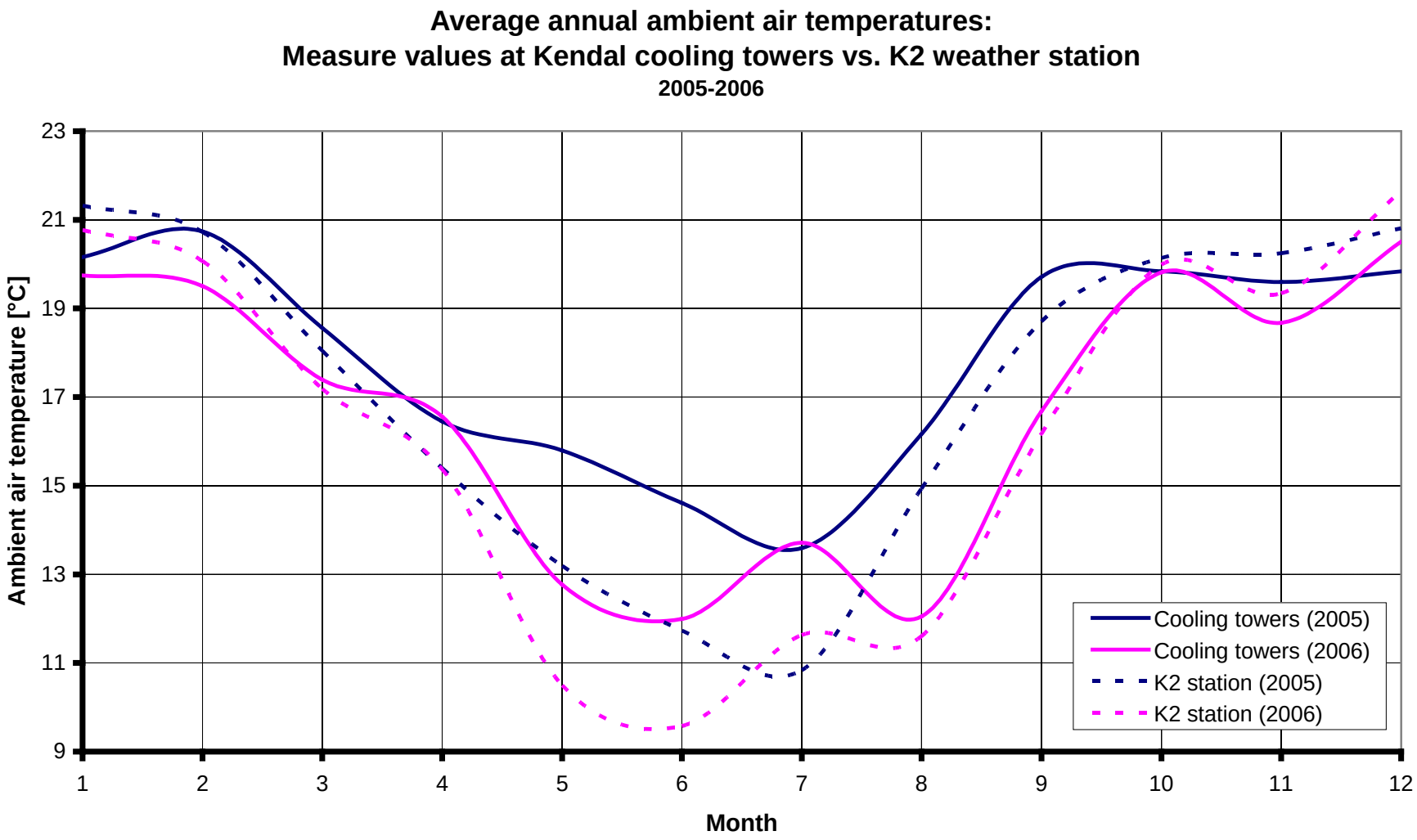
Measurements at Kendal



Measurements at Kendal

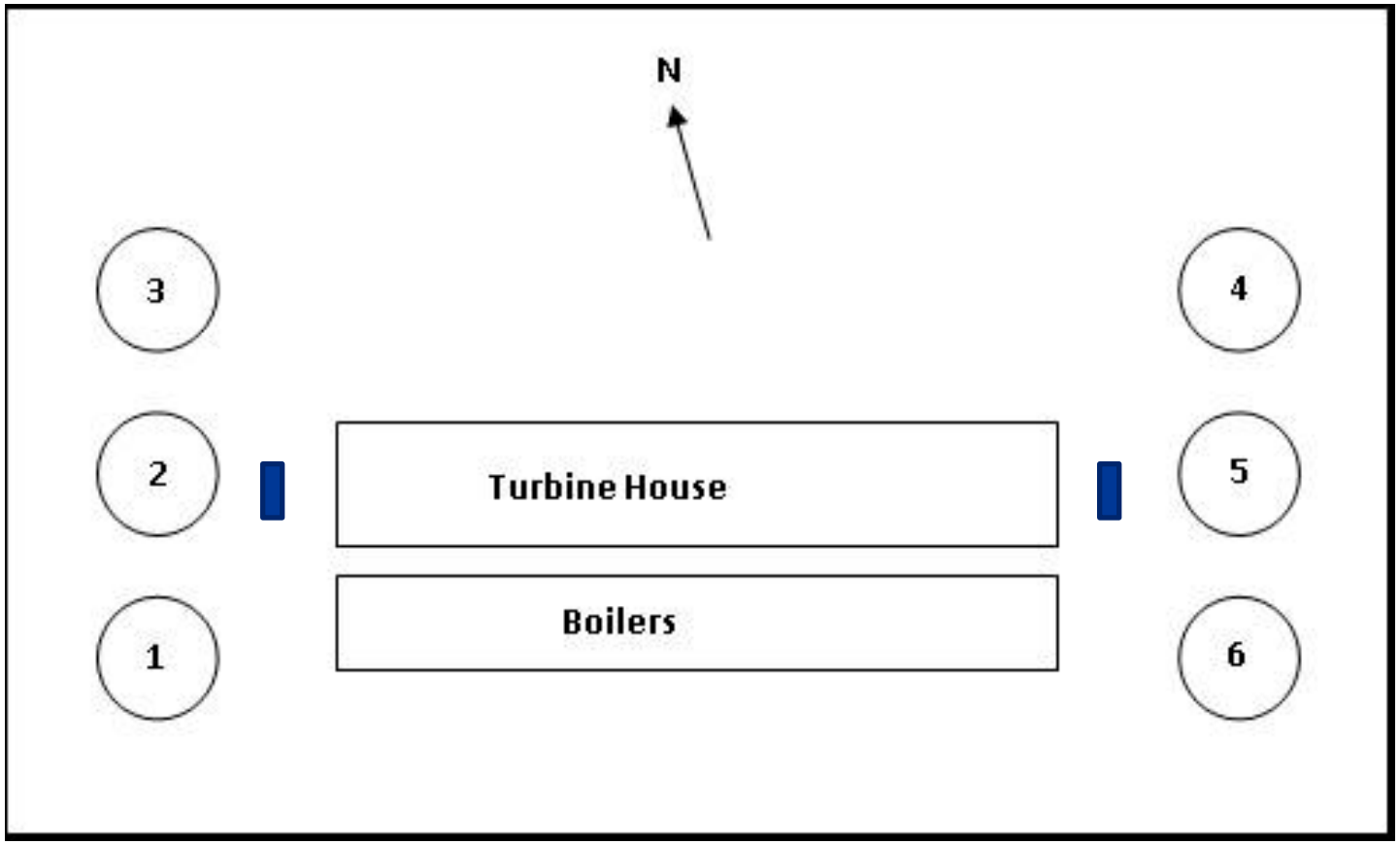


Measurements at Kendal

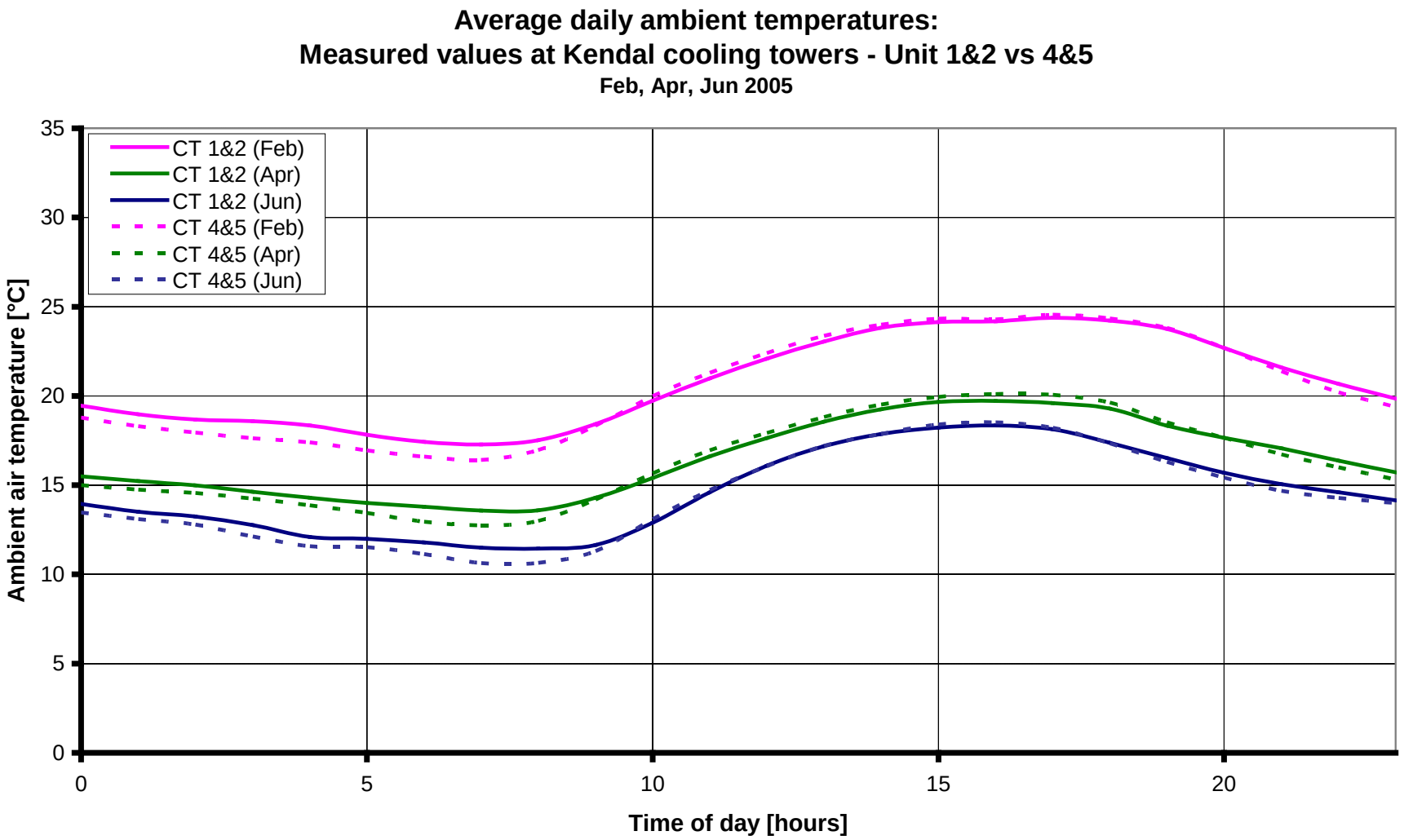


Measurements at Kendal

- Auxiliary cooling cells between turbine house and CT 2 & 5
- Nighttime winds from E, SE
- Potential effect on CT 1 & 2 measurements
- Evaluate measurements from CT 4 & 5



Measurements at Kendal



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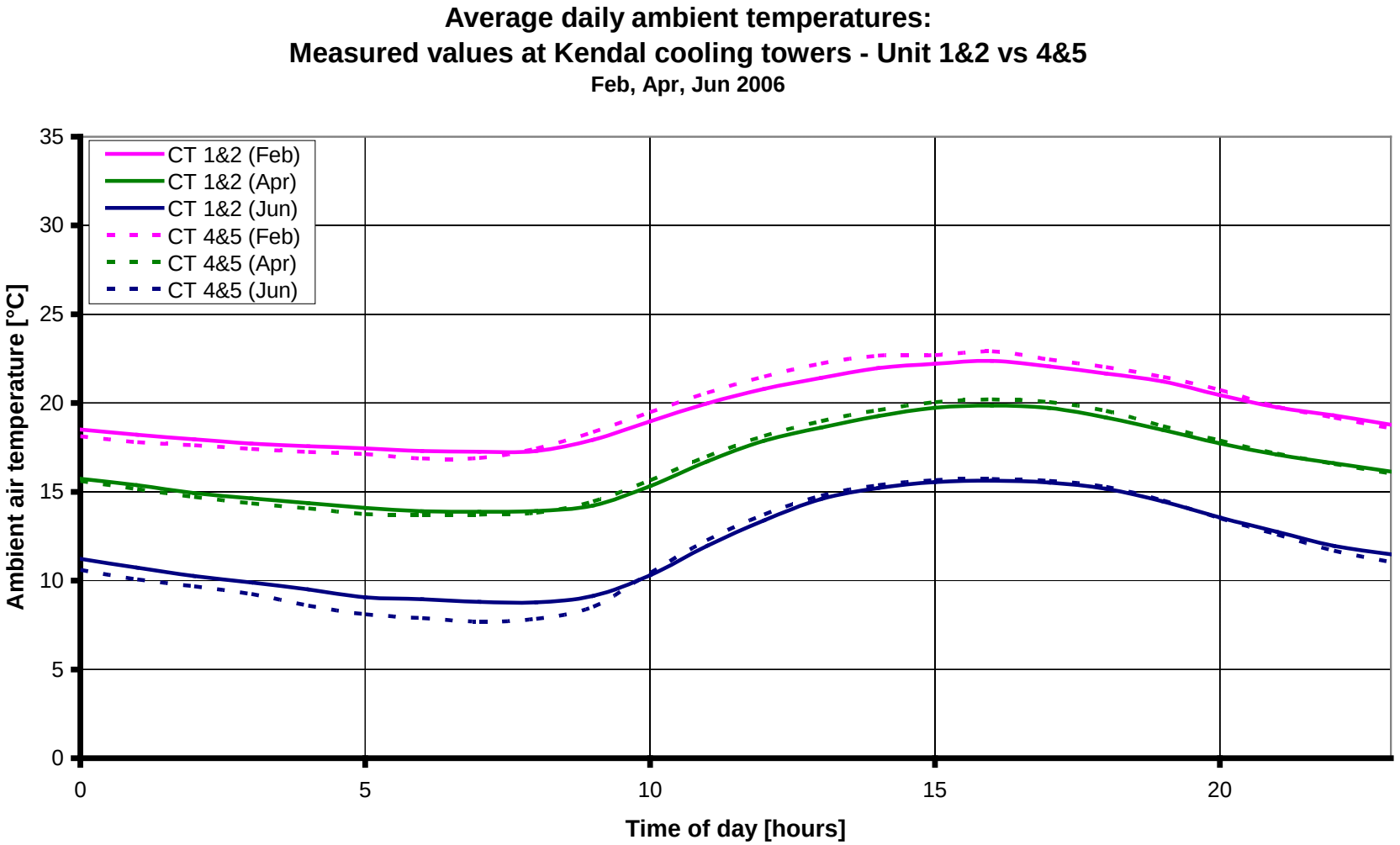
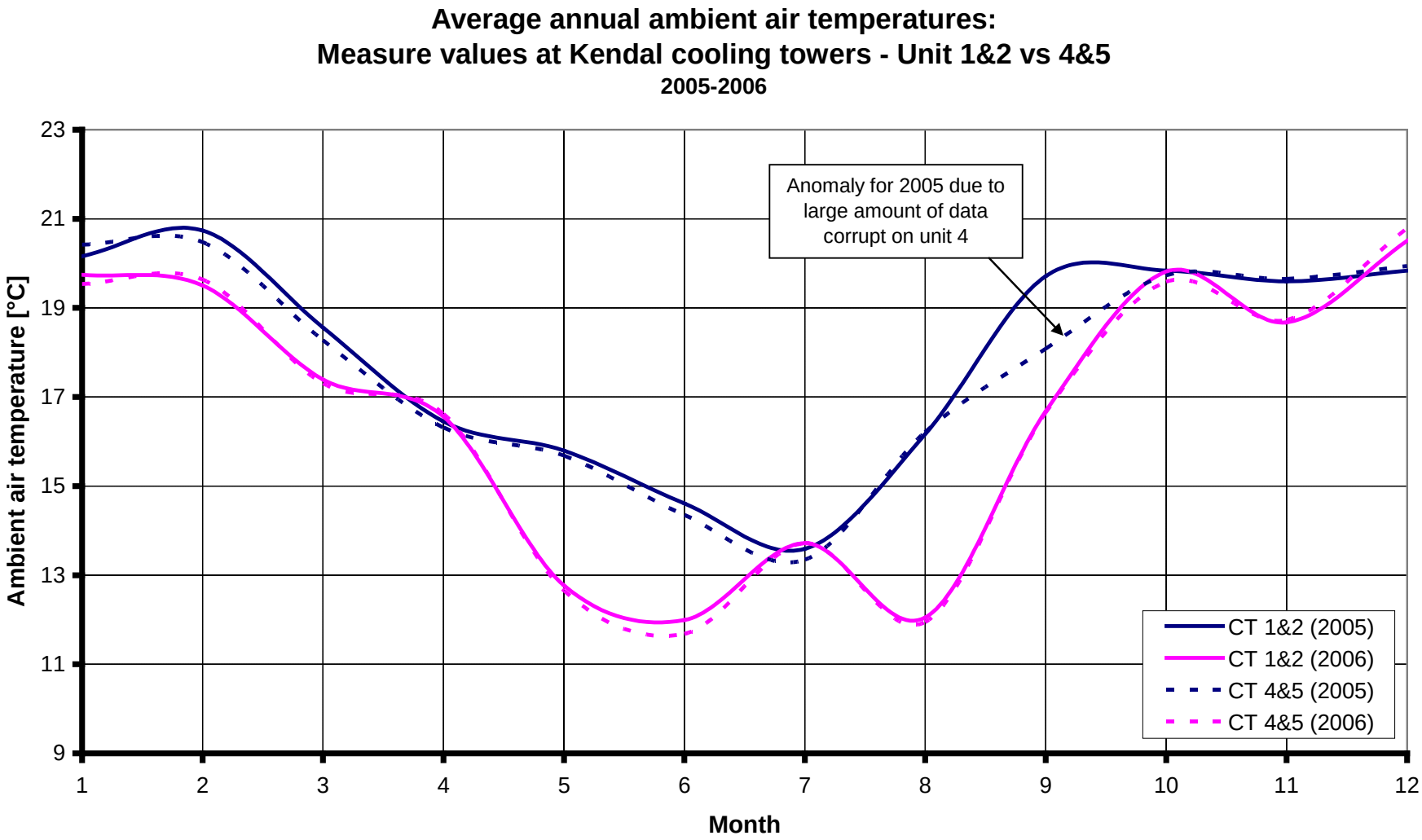


Measurements at Kendal



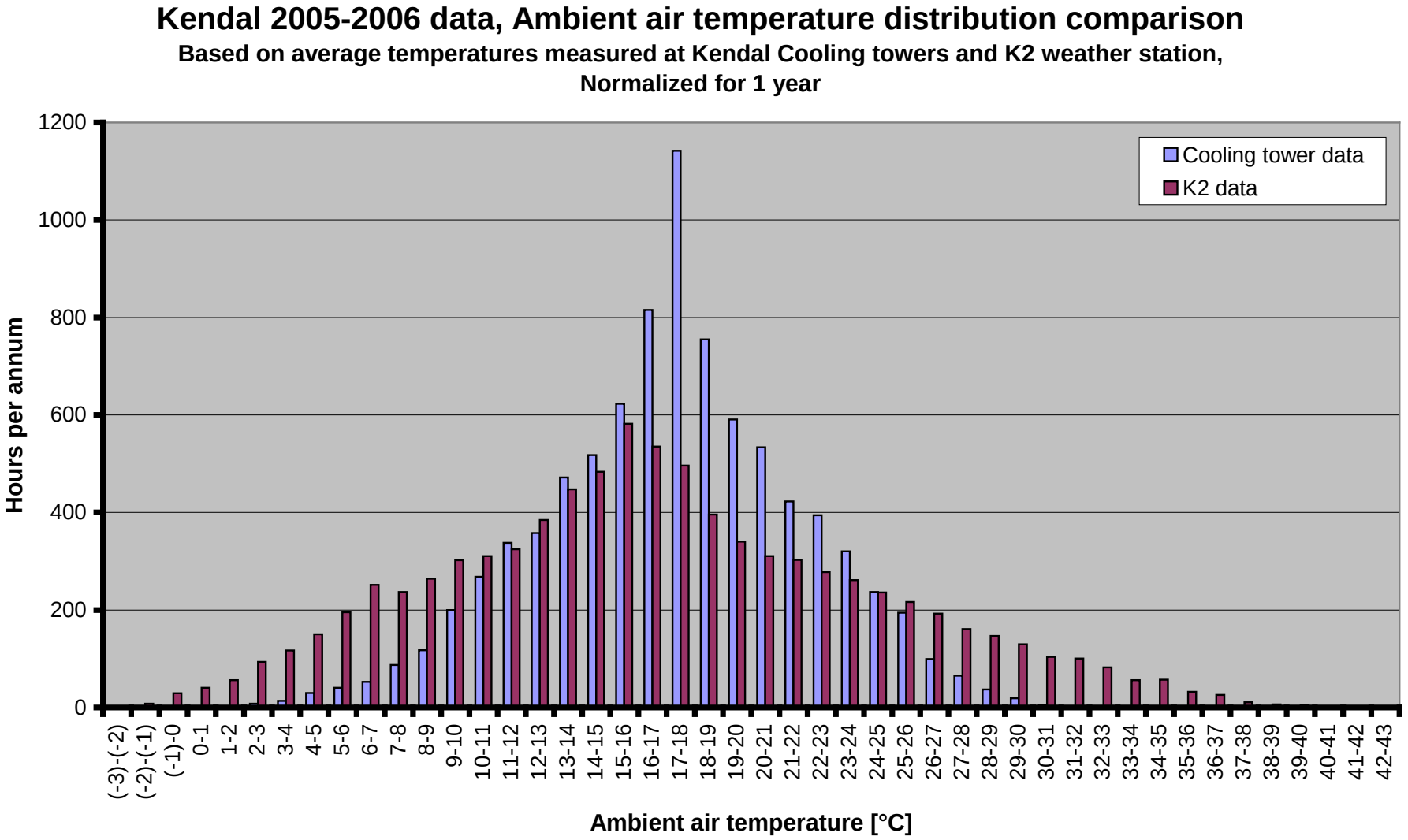
Measurements at Kendal – annual average

- Daytime = 06:00 – 21:00

	Avg. annual temperature [°C]	Avg. annual daytime temperature [°C]
K2	16.7	19.2
Cooling towers	17.2	18.1

- Does not seem like major difference
- However, dependent on specific site & plant operating hours
- For Matimba on average, temperature at 1.2m AGL is 4°C too low compared to what ACC actually experiences
- Also, e.g. peaking plant running in morning & evening – expected annual plant performance will differ significantly from actual performance

Measurements at Kendal – annual distribution



Measurements at Kendal – implications

- Assume ACC designed according to Kendal K2 temperature distribution
    - ACC will experience temperatures of air at higher levels, similar to those experienced at Kendal cooling towers
- ACC will in actual fact never see freezing conditions
    - ACC design could have done without anti-freezing features
    - More expensive
- ACC will in actual fact see max. ambient temperature 10°C lower than design
    - Potentially oversized ACC design (depending on specification)
    - More expensive

Conclusion

- From Matimba & Kendal measurements, dry cooling systems experience air inlet temperatures similar to air at higher level instead of near ground level
- Important for ACC Purchaser to consider
  - ACC may experience different conditions to those specified in design specifications
  - Overall plant performance potentially affected
  - ACC may be more expensive than necessary & include unnecessary features
- Purchaser responsible to specify correct ACC design air inlet temperature
- Purchaser to develop knowledge
  - Sourcing appropriate data or installing weather mast at intended site
  - Weather mast at site & trending

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Hein Goldschagg (Matimba)

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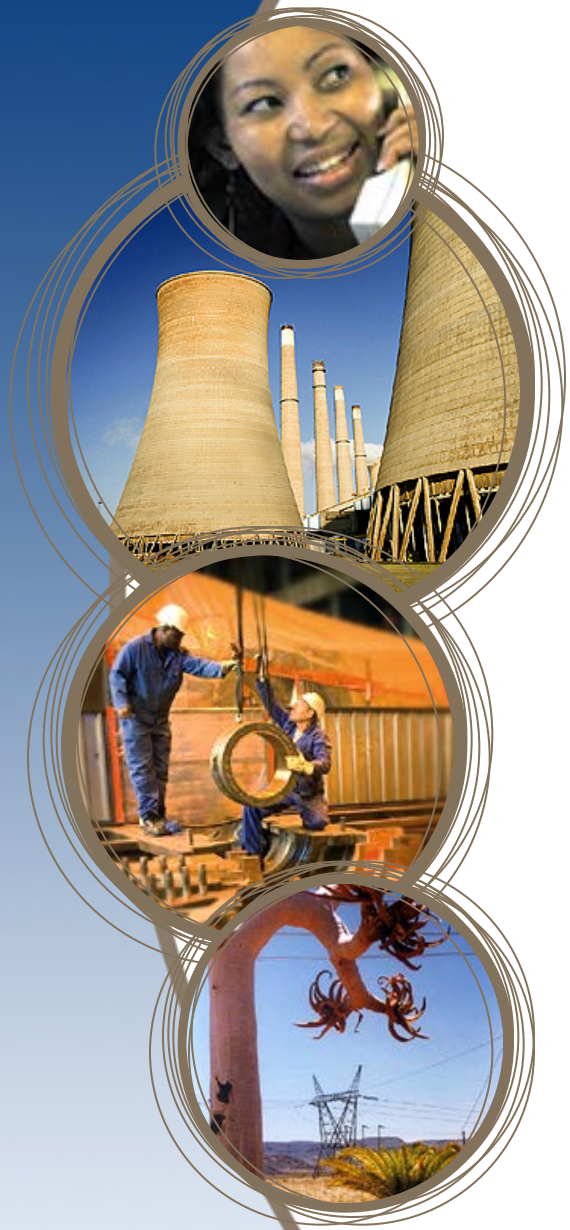

Thank you