



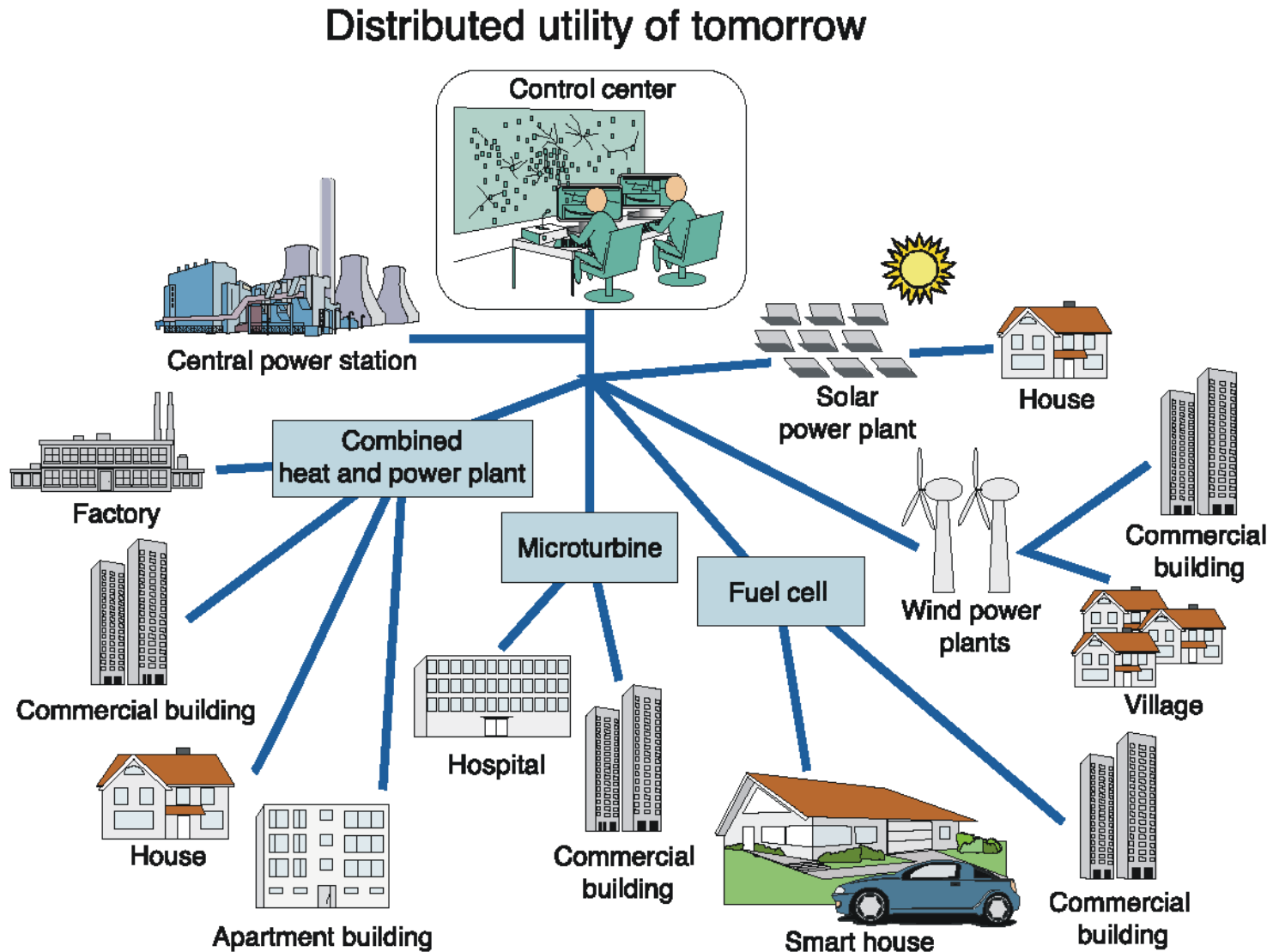
www.csiro.au

Renewable Power Integration

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Shift from Centralised to Distributed Energy supply



Distributed Energy Resources

Wind Turbines

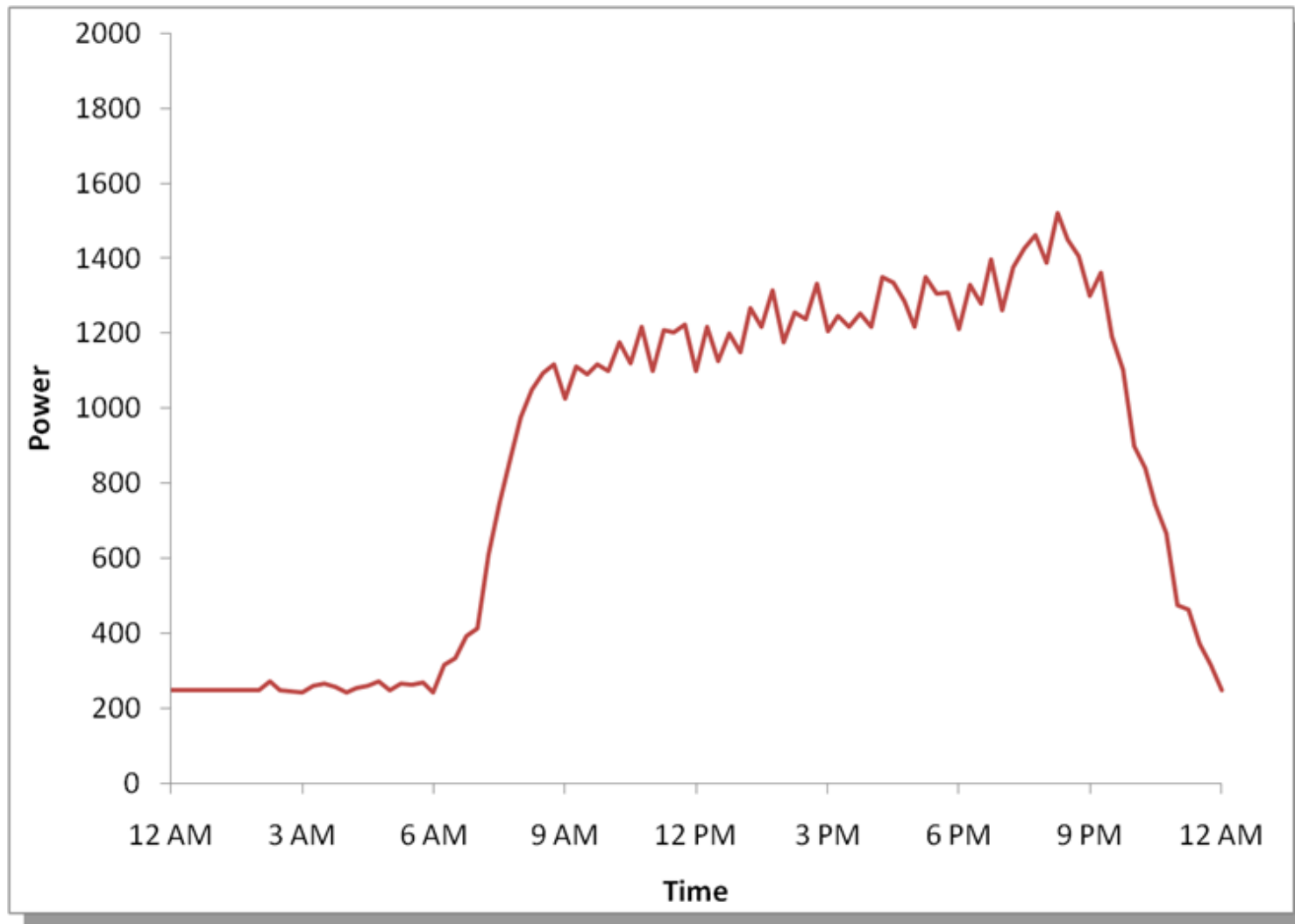


Solar – photovoltaic

Gas micro turbine
Combined heat and power



A residential load profile

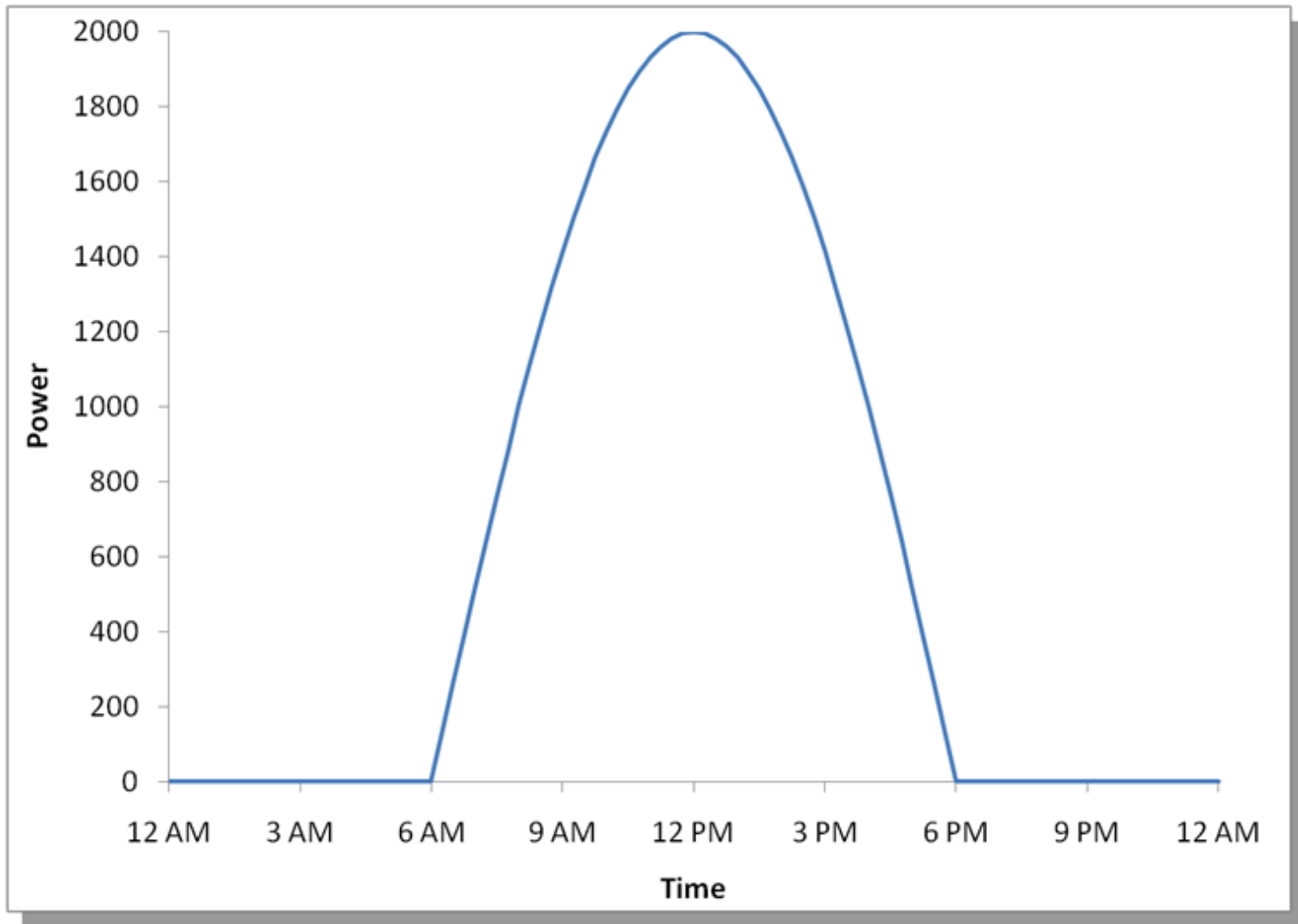


Source: Piette et al., 2007

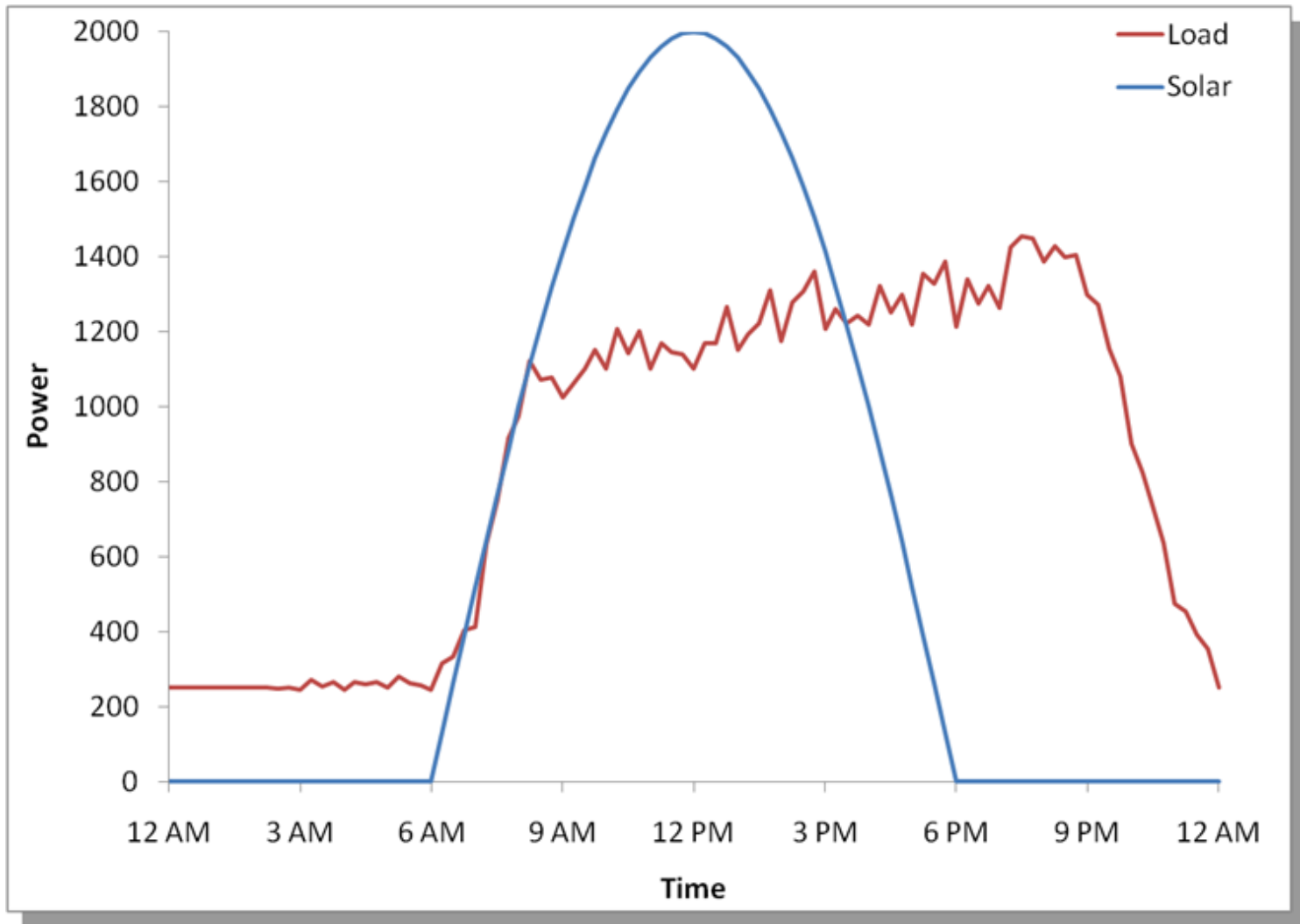
Slide 4



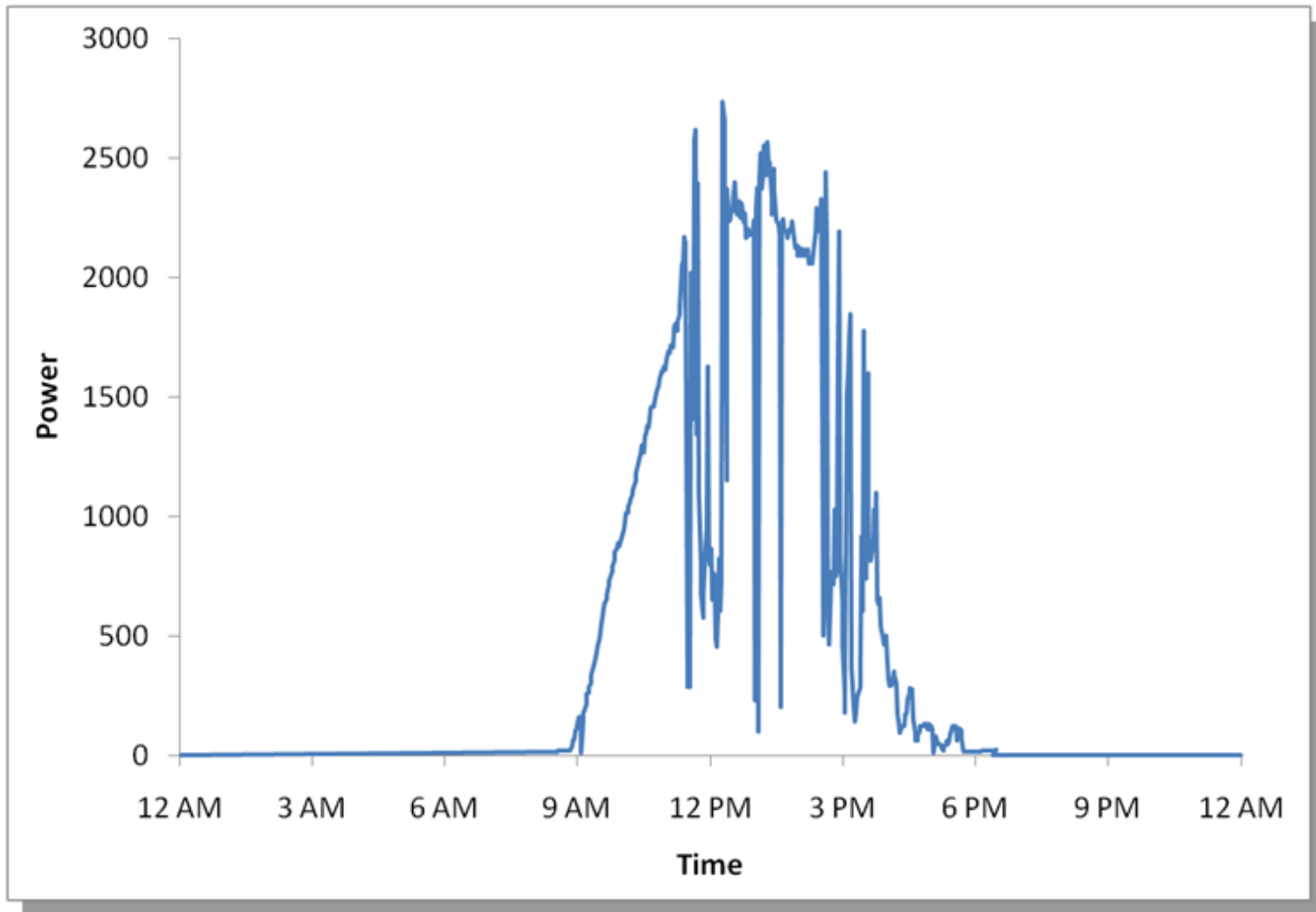
Solar photovoltaic output



Solar vs. load



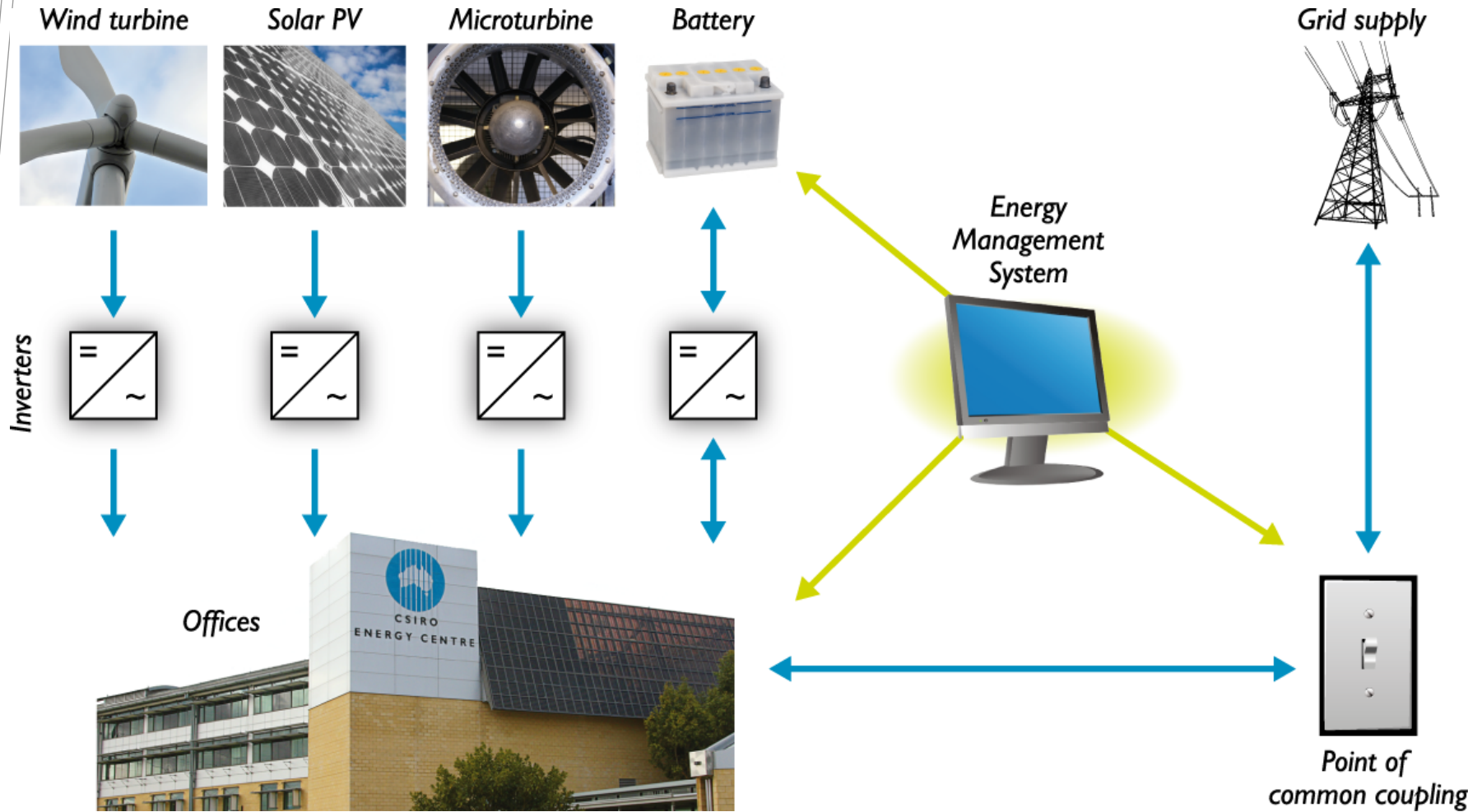
Photovoltaic's Dark Secret



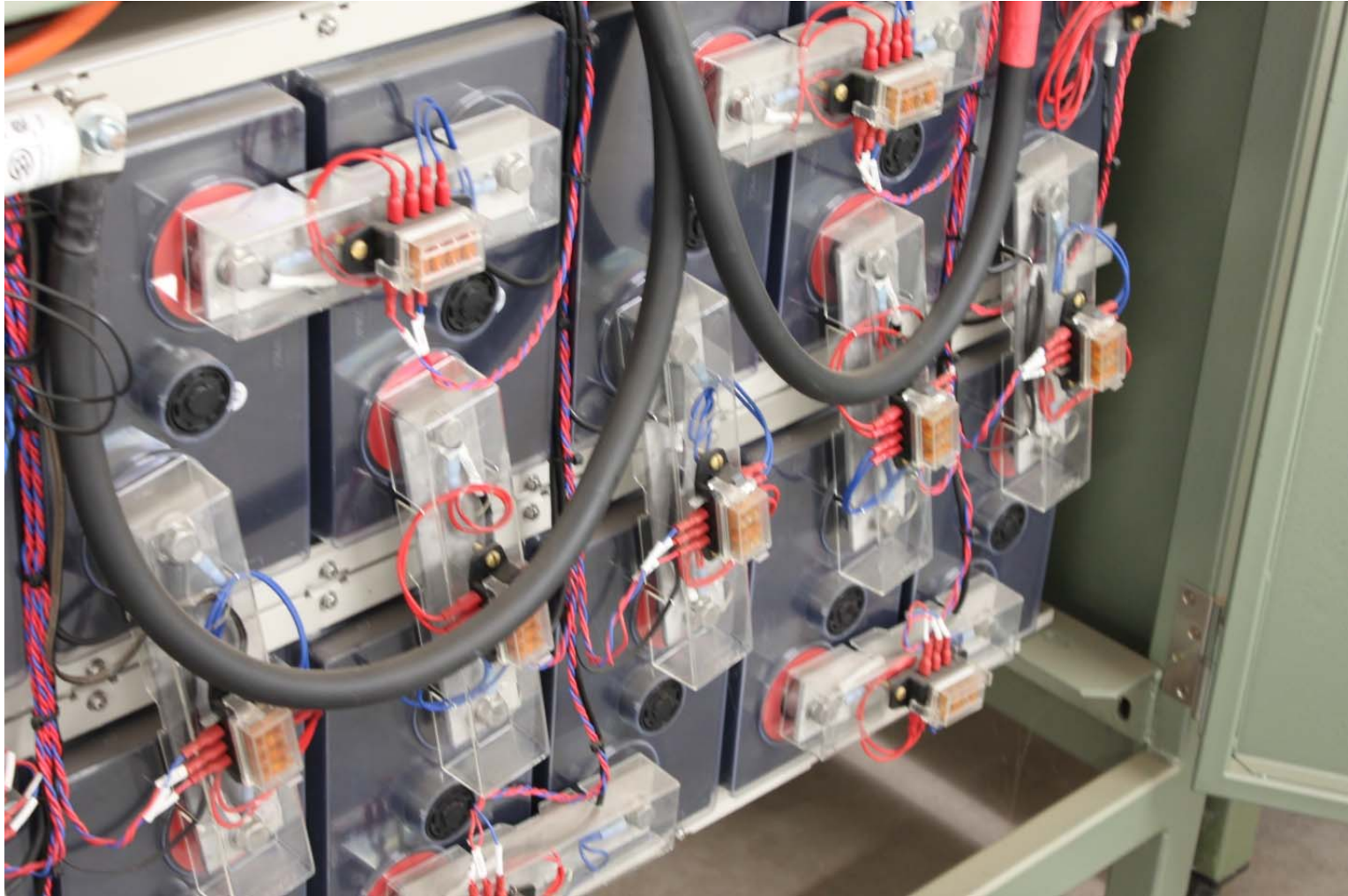
Solutions for intermittency

1. Combine multiple sources
2. Add storage
3. Demand management
4. Prediction of generation and load to plan schedules

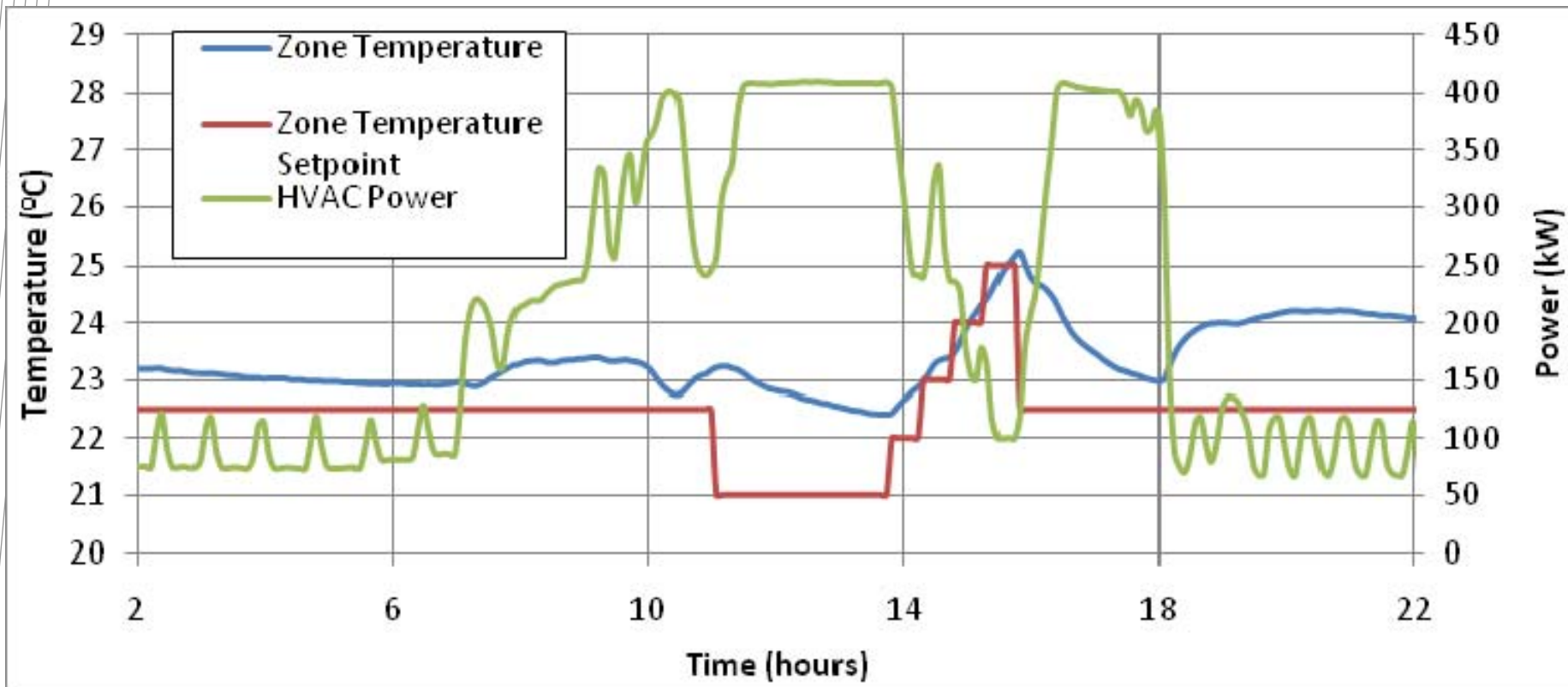
Combine multiple sources



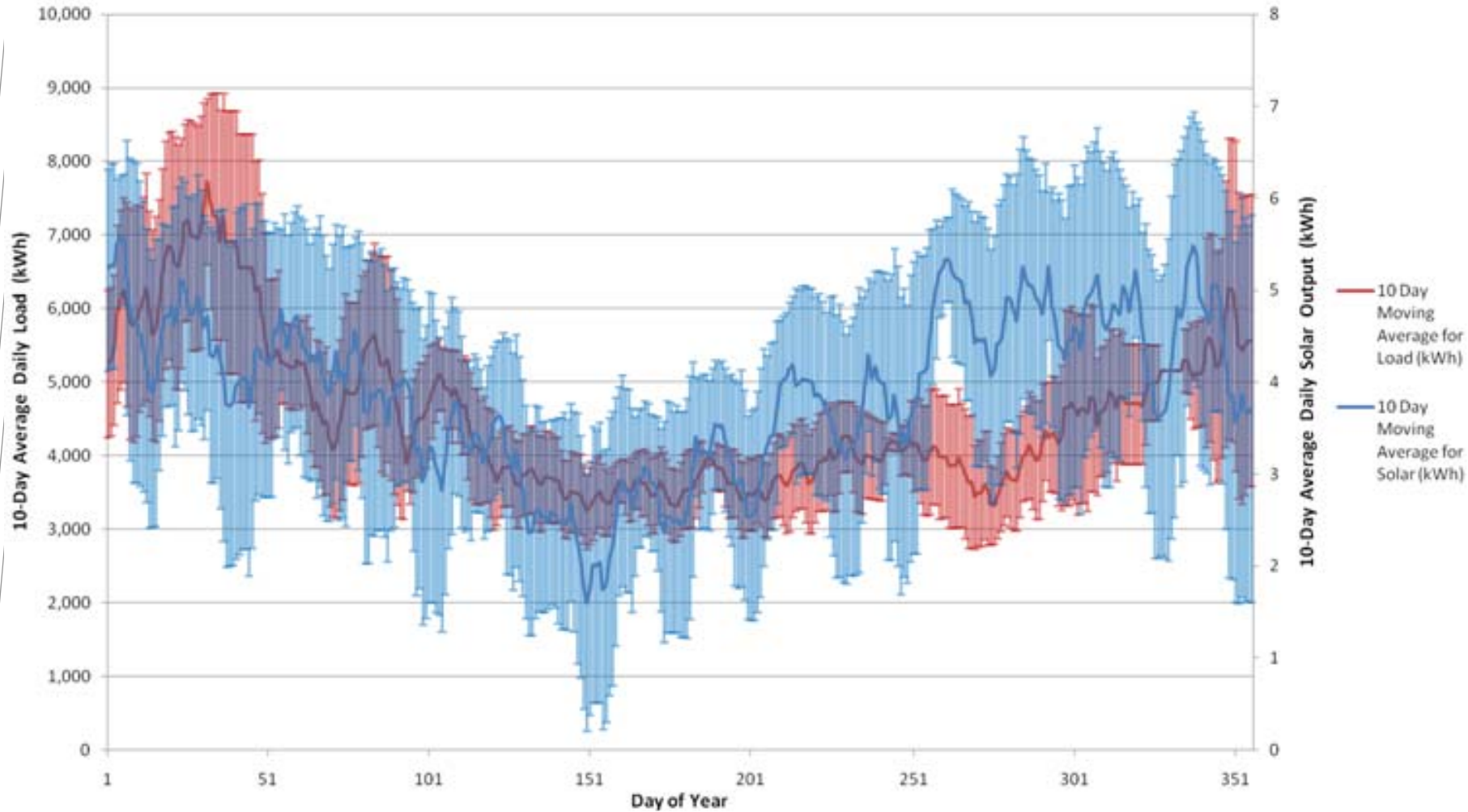
Storage



Demand management



Prediction of generation and load



Our new renewable energy laboratory



REIF control room



Newcastle to be Australia's first Smart Grid Smart City



Summary

- Renewable energy has an important part to play in the reduction of greenhouse gases
- How to integrate with the grid is not trivial
- We have a new world-class laboratory in Newcastle