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Hidden Energy Saving Opportunities in Tertiary Education Buildings

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Slattery Australia

Property and Construction Cost Consultants

Sustainability Consultants

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Today's Presentation

- Outline of the Challenge – Achieving energy savings in a tertiary education building

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Today's Presentation

utline of the Challenge – Achieving energy savings in a tertiary education building

ur approach and findings

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ur recommendations and further opportunities

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ur approach and findings

ur recommendations and further opportunities

essons learned

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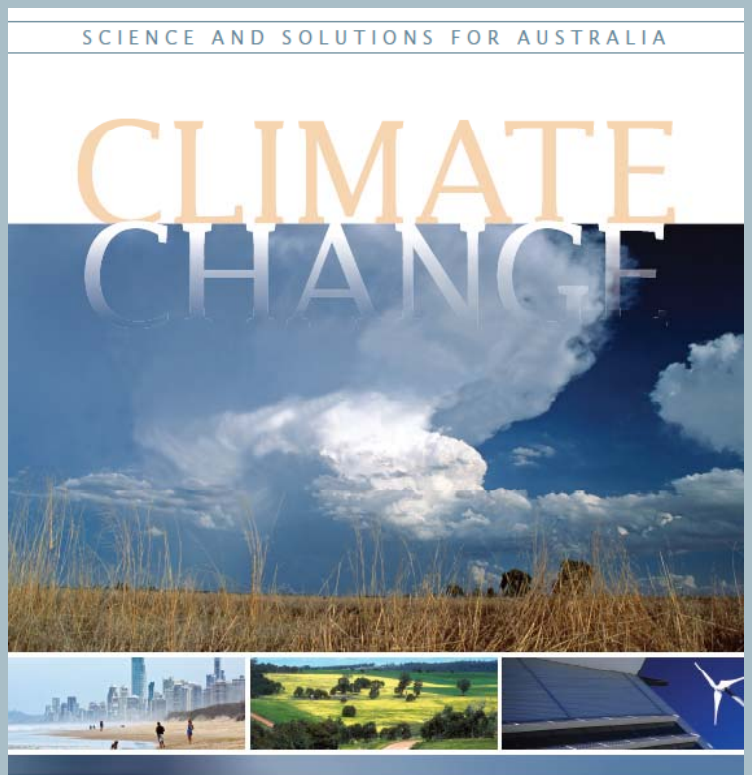
Why search for energy and carbon emission savings?



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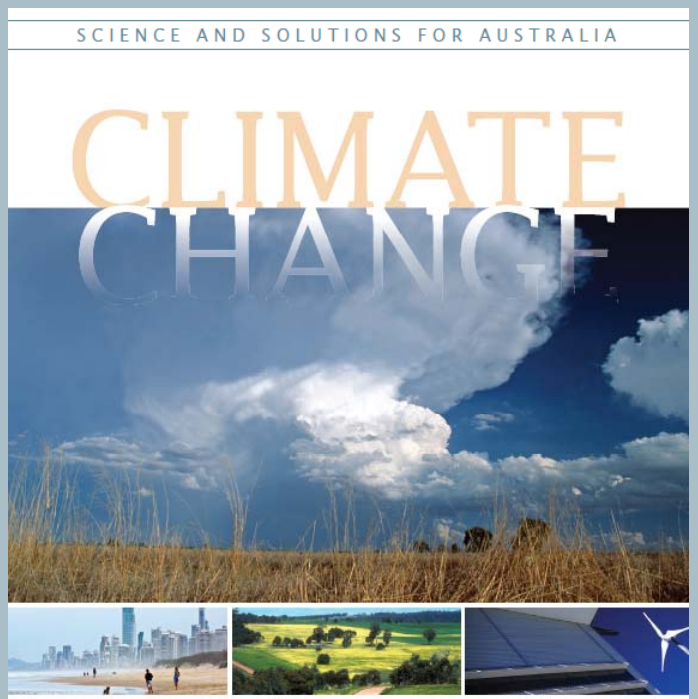
Climate Change

RIO, 2011



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Climate Change

RIO, 2011 – Future Climate Scenarios (SE QLD)

ess water for cities, industry, agriculture and natural
cosystems

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ower wheat crop quality, increased pest and disease risk

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Climate Change

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0% increase in intensity of 1-in-100 year rainstorm

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Institutional Citizenship

Carbon Emission Reduction Policies

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Institutional Citizenship

Carbon Emission Reduction Policies

Responsibility to inspire the next generation

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Financial Benefits

✓ Reduced Energy Costs

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Financial Benefits

- ✓ Reduced Energy Costs
- ✓ Reduced Peak Energy Use Charges

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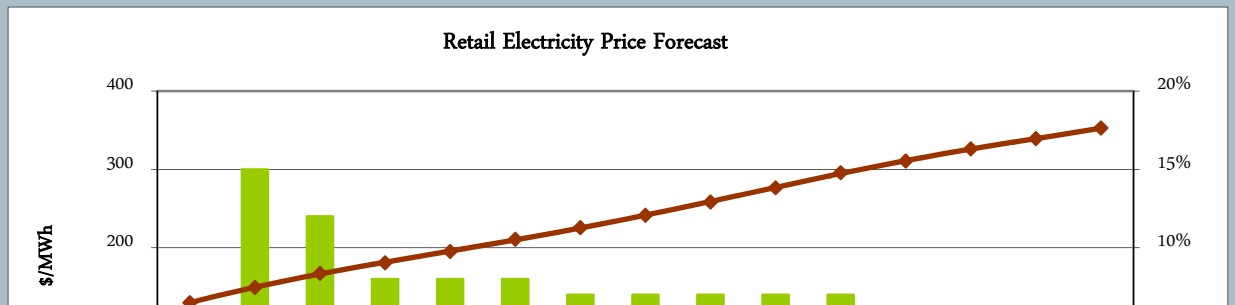
Financial Benefits

- ✓ Reduced Energy Costs
- ✓ Reduced Peak Energy Use Charges
- ✓ Reduced expose to energy cost escalation and potential Carbon Tax cost increase



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Financial Benefits

- ✓ Reduced Energy Costs
- ✓ Reduced Peak Energy Use Charges
- ✓ Reduced expose to energy cost escalation and potential Carbon Tax cost increase

= $PAYBACKS!!!

5 Year Net Present Value of $1 million

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Slattery Australia's Challenge...

- Building less than 10 years old with on-site BMS maintenance personnel

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Slattery Australia's Challenge...

- Building less than 10 years old with on-site BMS maintenance personnel

- Upgrades recommended by three other consultants have been implemented

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Slattery Australia's Challenge...

- Building less than 10 years old with on-site BMS maintenance personnel
- Upgrades recommended by three other consultants have been implemented
- 25% reduction of energy usage achieved based on 2007

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Slattery Australia's Challenge...

- Building less than 10 years old with on-site BMS maintenance personnel
- Upgrades recommended by three other consultants have been implemented
- 25% reduction of energy usage achieved based on 2007
- We were asked to seek an additional 20% savings, and beyond

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How we met the challenge....

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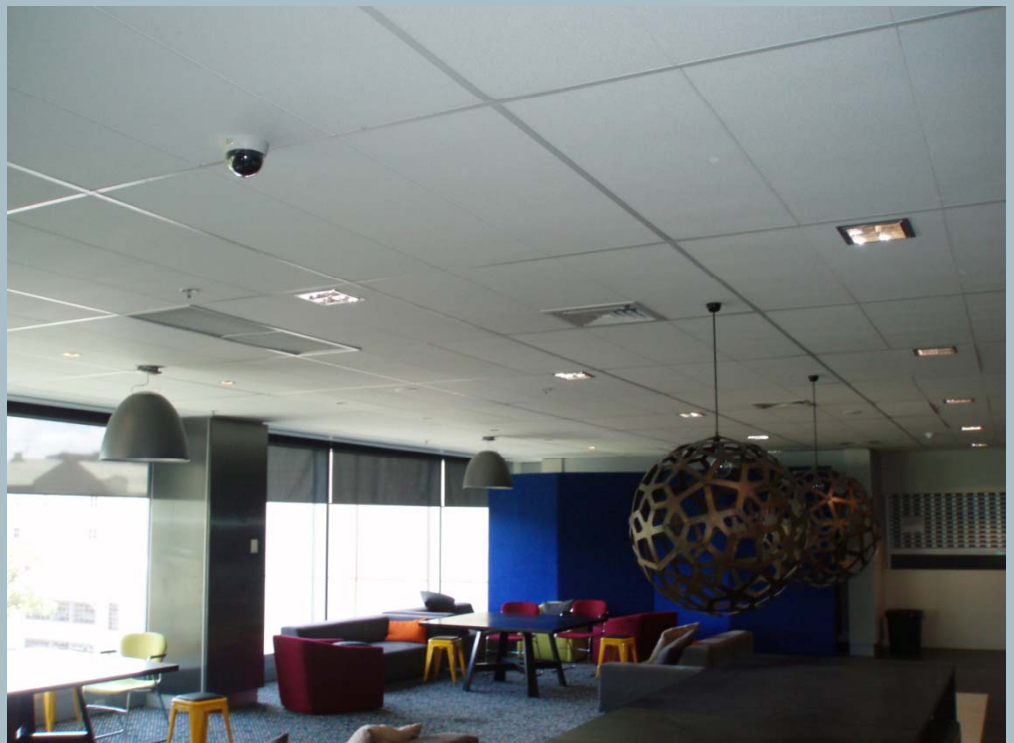
ge 1. Visual Site assessment



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ge 1. Visual Site assessment

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ge 1. Visual Site assessment

Variable Speed Drives locked out to 50 Hz and running at constant speed

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ge 1. Visual Site assessment

- Lead Boiler running at full load on a 19°C ambient day
- Department on Level 10 had adjusted setpoints!

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ge 1. Visual Site assessment

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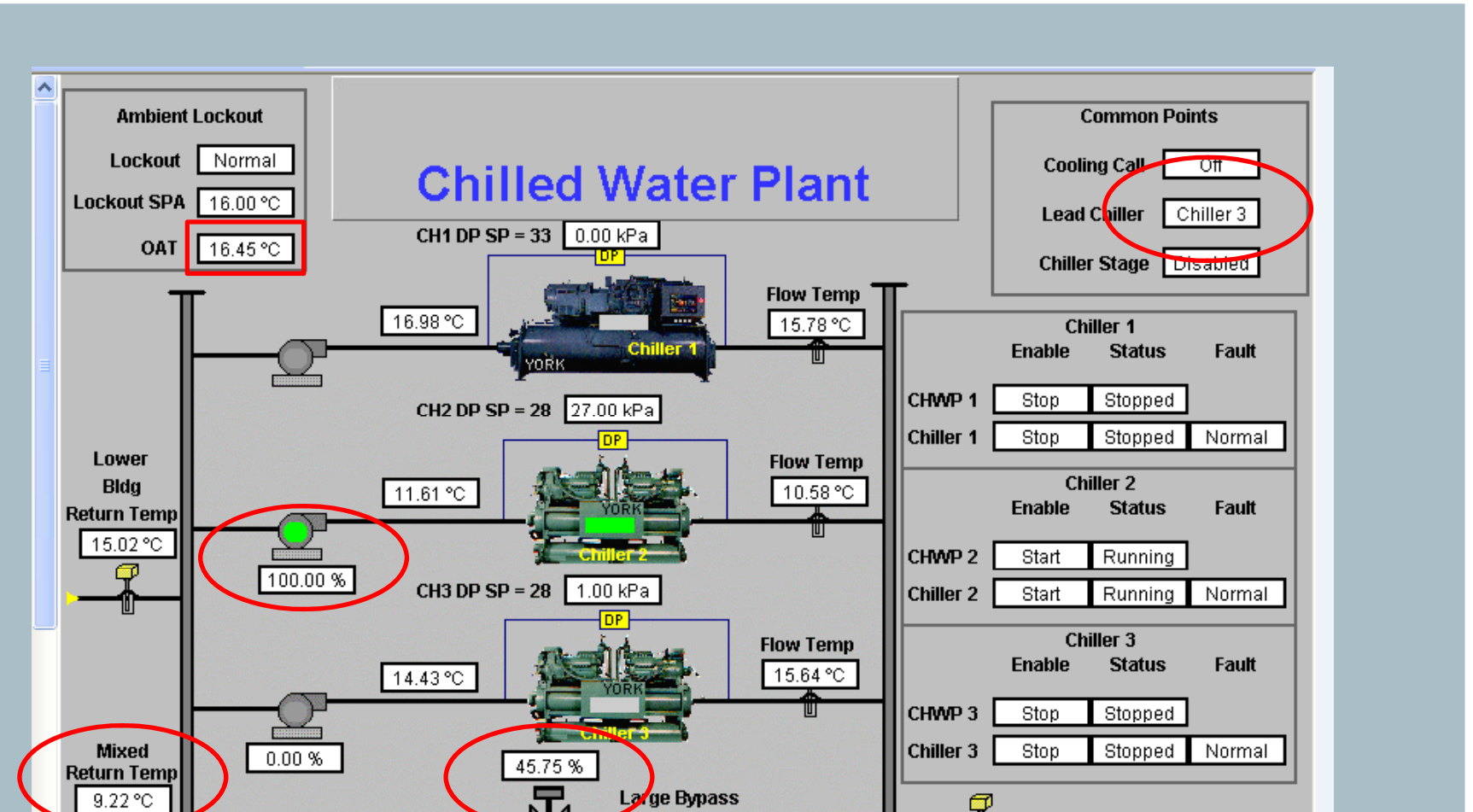
ge 1. Visual Site assessment



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tage 2 - Metered data review

- Only 2 logged electricity meters and monthly gas bills
- Electricity Meter 1 – HVAC & Lifts
- Electricity Meter 2 – Lighting & Power
- 30 minute electrical data for both meters

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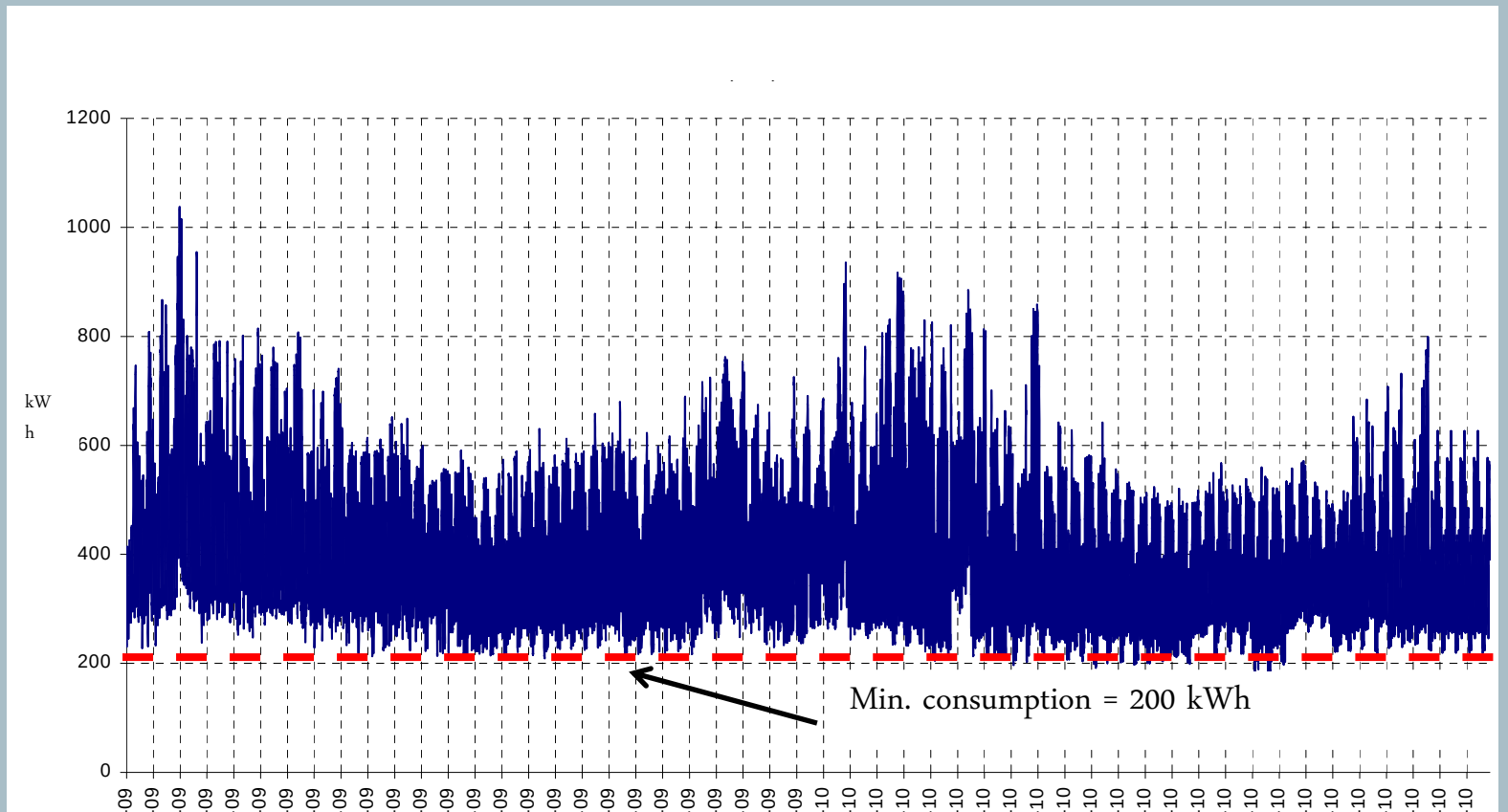
tage 2 - Metered data review

otal Electricity Consumption between 2nd Jan 2009 and 3rd Dec 2010(kWh)



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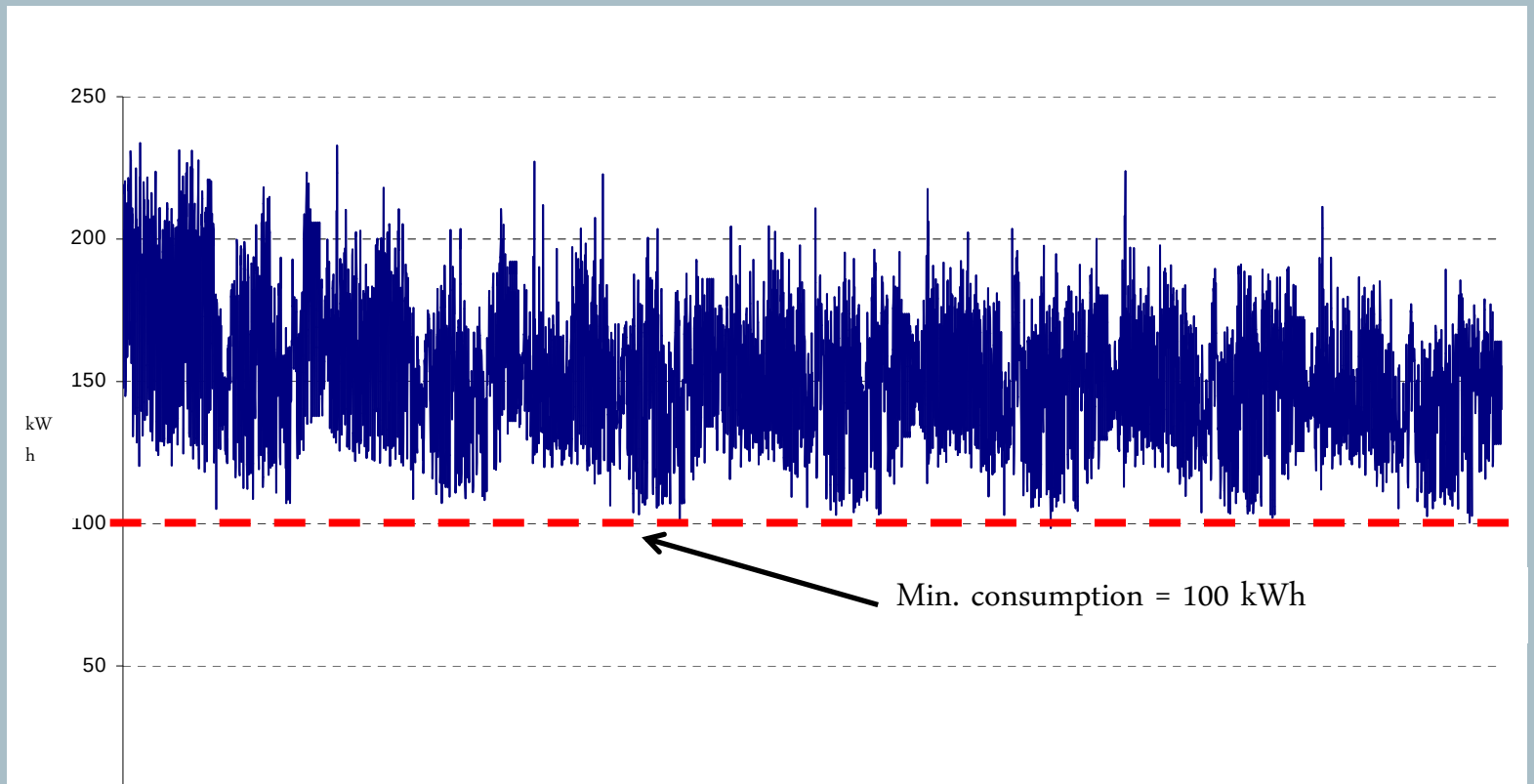
tage 2 - Metered data review

Hourly lighting and power electricity consumption during after hours
(00:00 to 06:00 hrs) arranged by hour of the day



tage 2 - Metered data review

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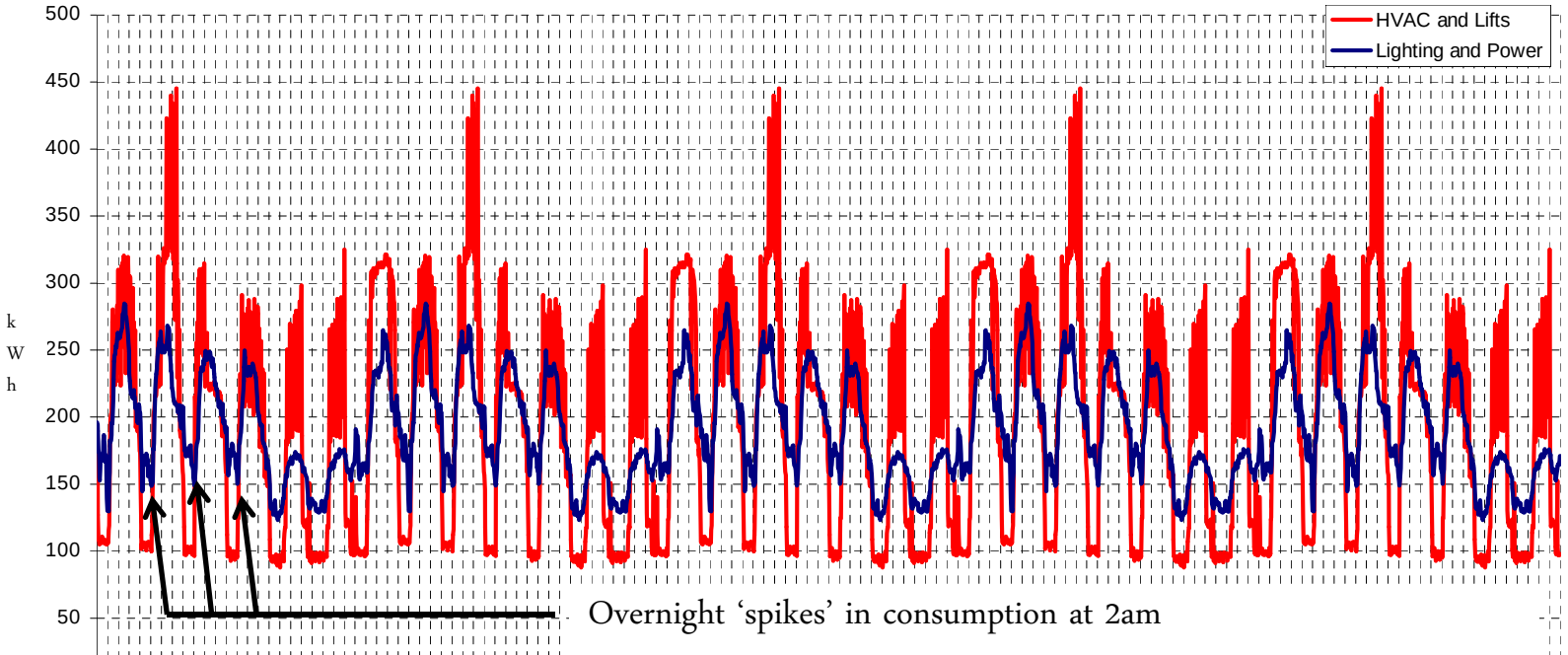
Electricity Consumption between 16th Nov 2010 and 19th Dec 2010 (kWh)



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tage 2 - Metered data review

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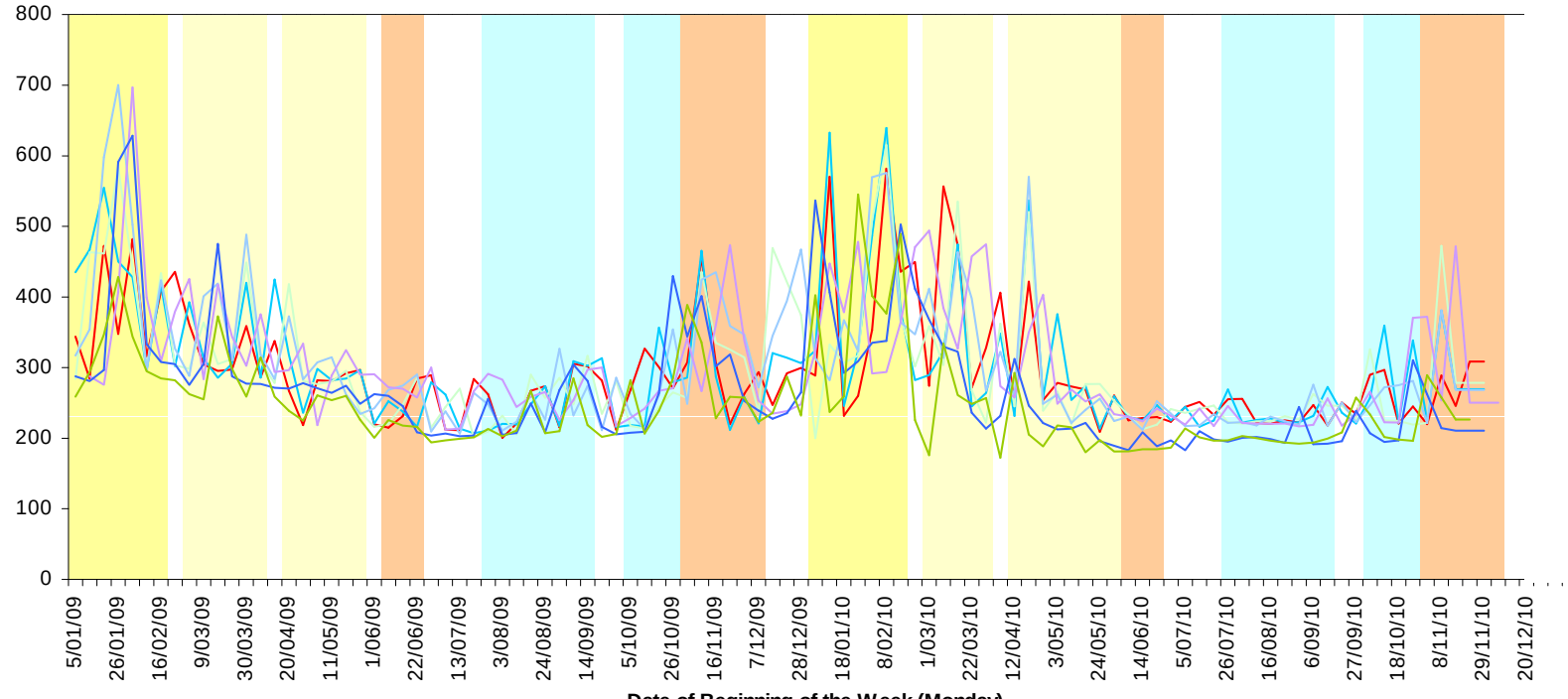
HVAC & Lifts electricity consumption at 12:00 hrs arranged by hour of the day



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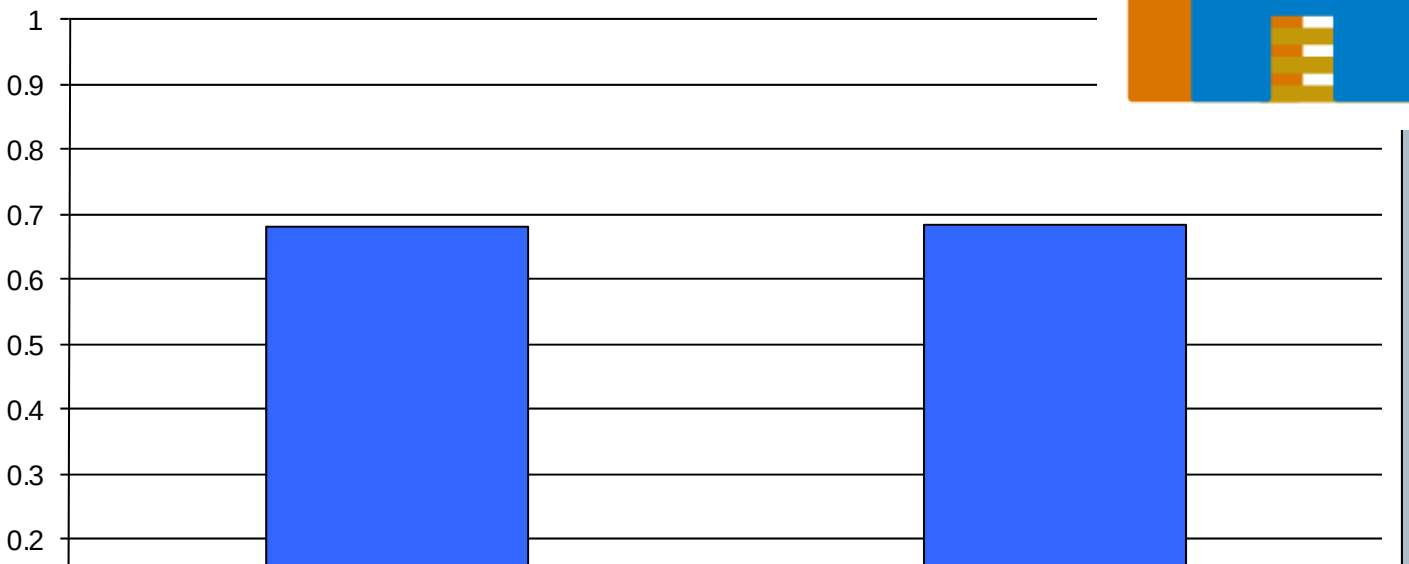
ge 3 – Benchmarking, Simulation and Calculation

TEFMA Annual Benchmarking Survey Report 2009

tefma

TEFMA Benchmark Energy Consumption per m^2/GFA



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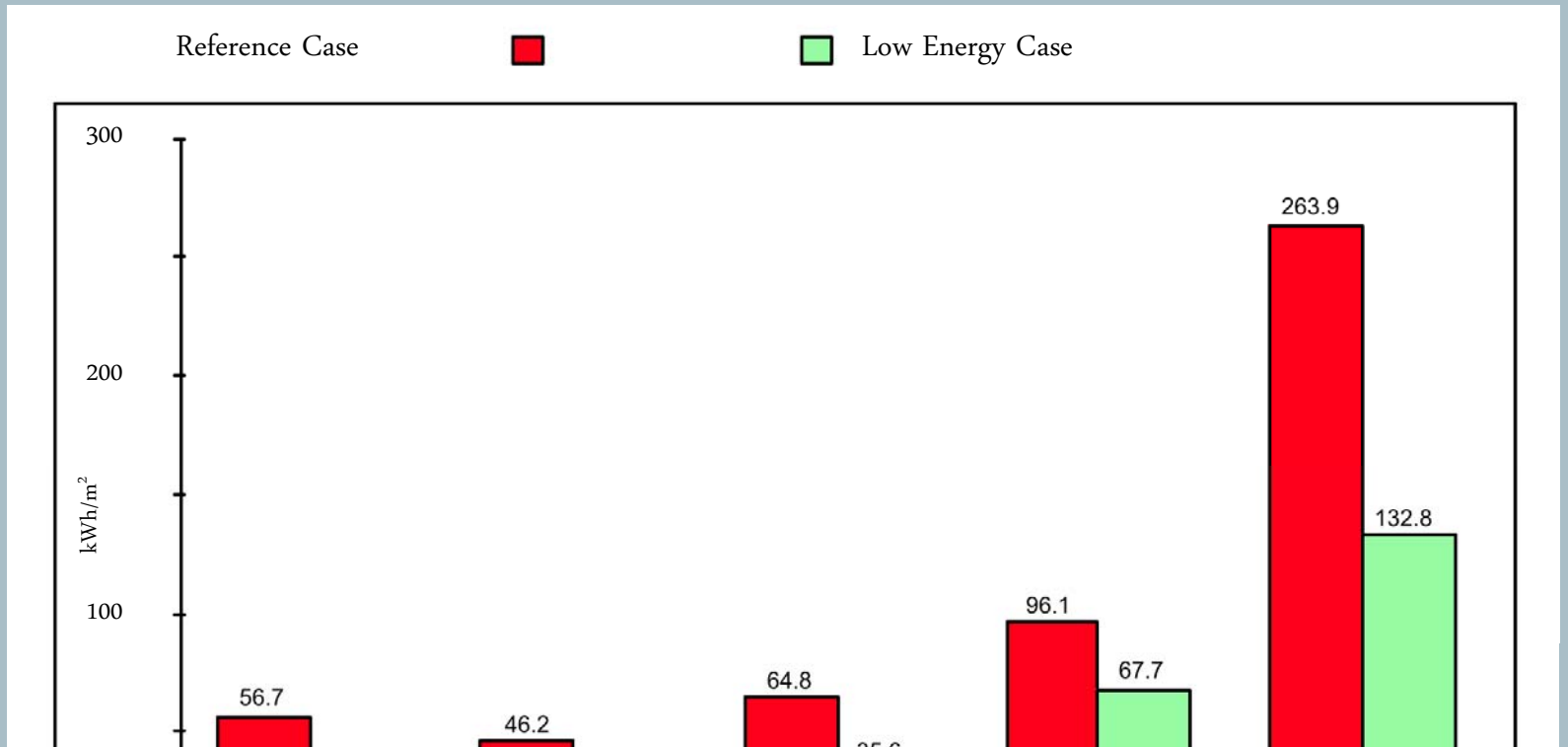
ge 3 – Benchmarking, Simulation and Calculation

Predictive Modelling – Annual Energy Use



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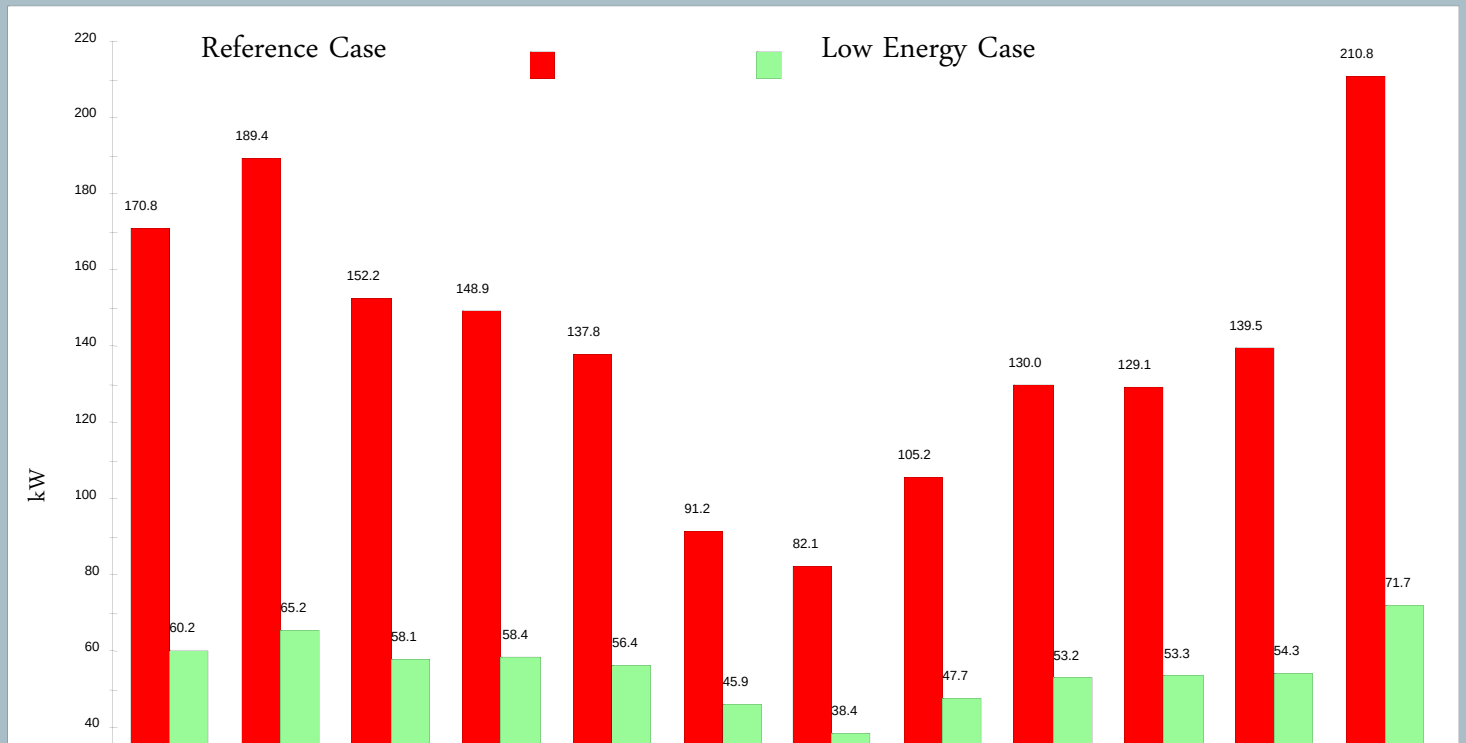
ge 3 – Benchmarking, Simulation and Calculation

Predictive Modelling – Peak Demand by Month



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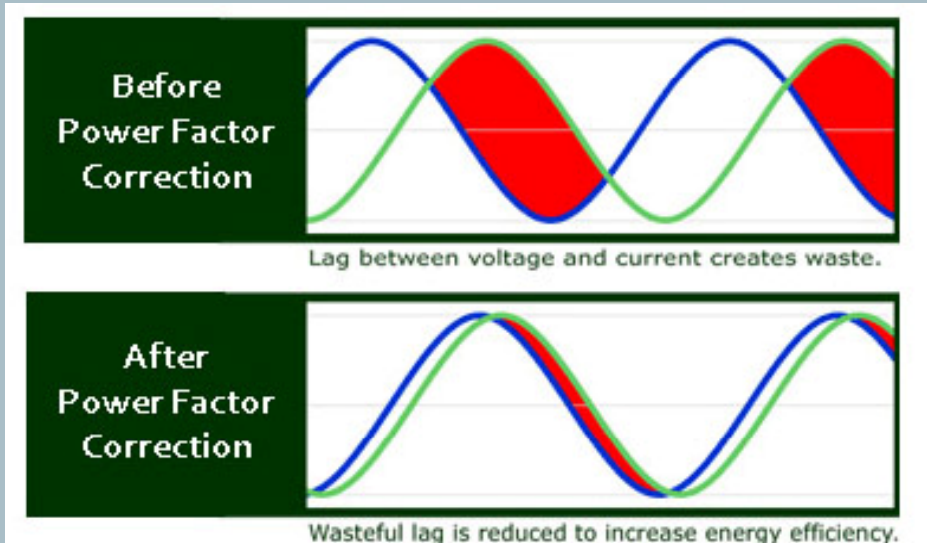
Selected Strategies

1) Power Factor Correction

Power factor of HVAC & Lift circuit drops as low as 0.75



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Selected Strategies

2) Perform a sub-metering test

Plant room loads

Typical floors loads

IT and Server

Overnight loads

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Selected Strategies

3) Implement re-commissioning and control strategies

Re-commission BMS Control System and Set Points

Re-commission major mechanical and lighting control systems

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Selected Strategies

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Chiller control review

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Selected Strategies

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Re-commission major mechanical and lighting control systems

Chiller control review

Refine Cleaner's procedure

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Selected Strategies

3) Implement re-commissioning and control strategies

Re-commission BMS Control System and Set Points

Re-commission major mechanical and lighting control systems

Chiller control review

Refine Cleaner's procedure

Activate Energy Star features for office equipment

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Selected Strategies

4) Perform an air leakage test and retrofit

European Airtightness Standards

- 2.5 $m^3/h.m^2$@50Pa
- 4.0 $m^3/h.m^2$@50Pa
- 2.5 $m^3/h.m^2$@50Pa
- 2.2 $m^3/h.m^2$@50Pa

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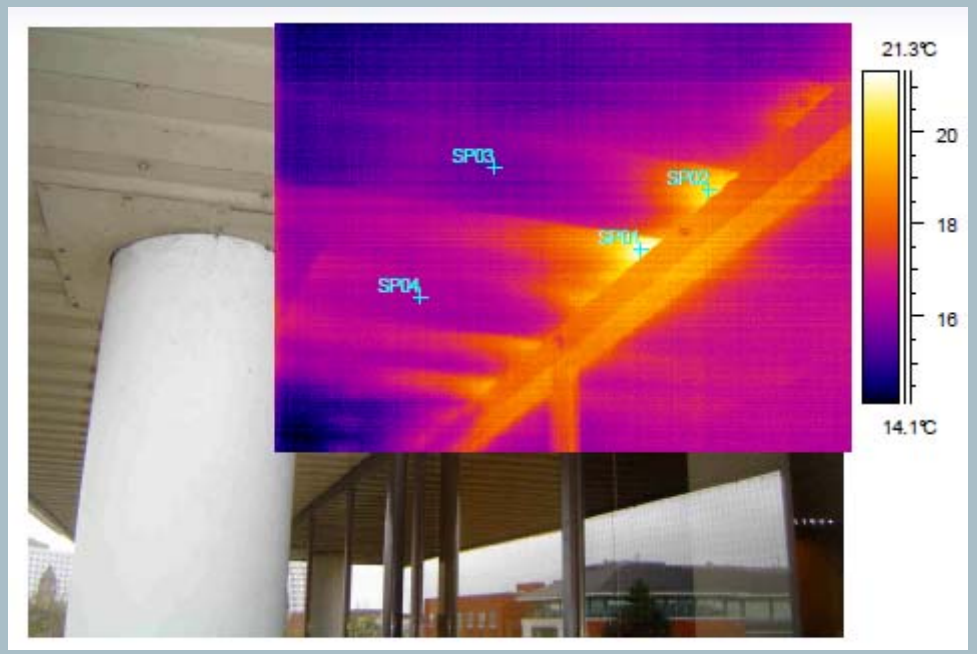
Selected Strategies

4) Perform an air leakage test and retrofit



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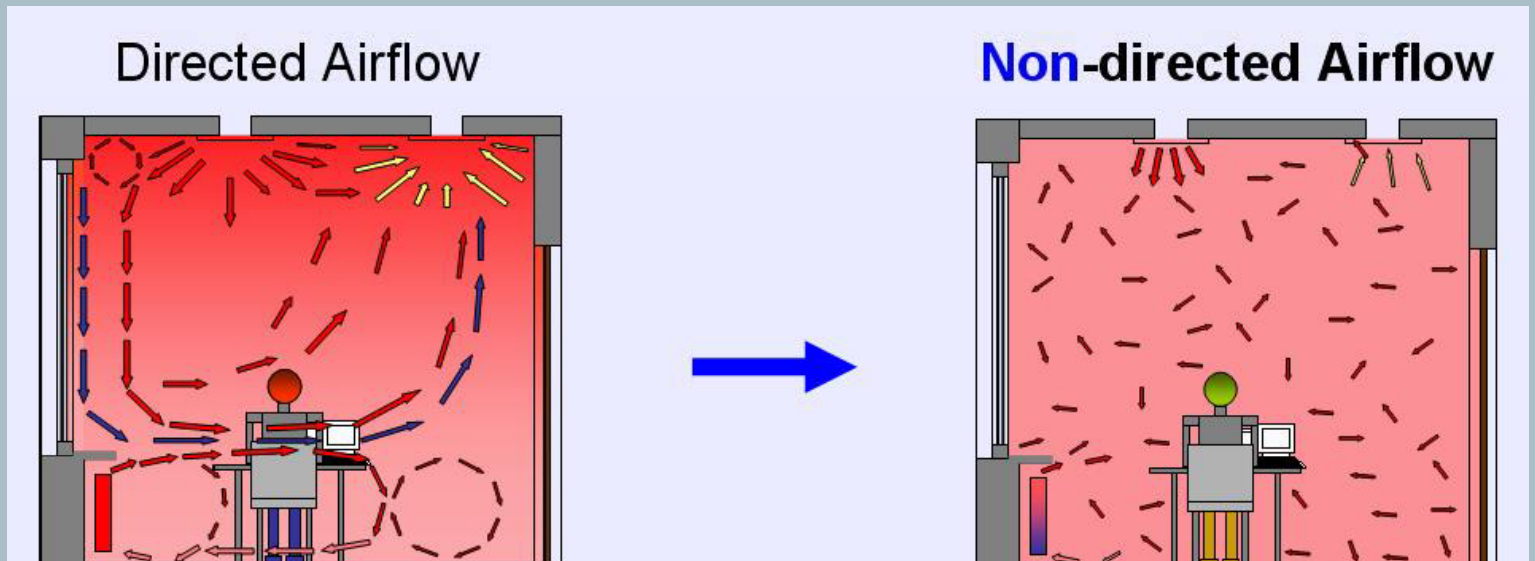
Selected Strategies

5) Retrofit HVAC Optimising Control System

Trial in a lecture theatre



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Selected Strategies

6) Lighting Retrofit

Perimeter lighting to be modified to provide daylight dimming

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Selected Strategies

6) Lighting Retrofit

Perimeter lighting to be modified to provide daylight dimming

Halogen downlights replaced with LED globes

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Selected Strategies

6) Lighting Retrofit

Perimeter lighting to be modified to provide daylight dimming

Halogen downlights replaced with LED globes

Delamping of some 2 * 36 W flourescent tube fittings

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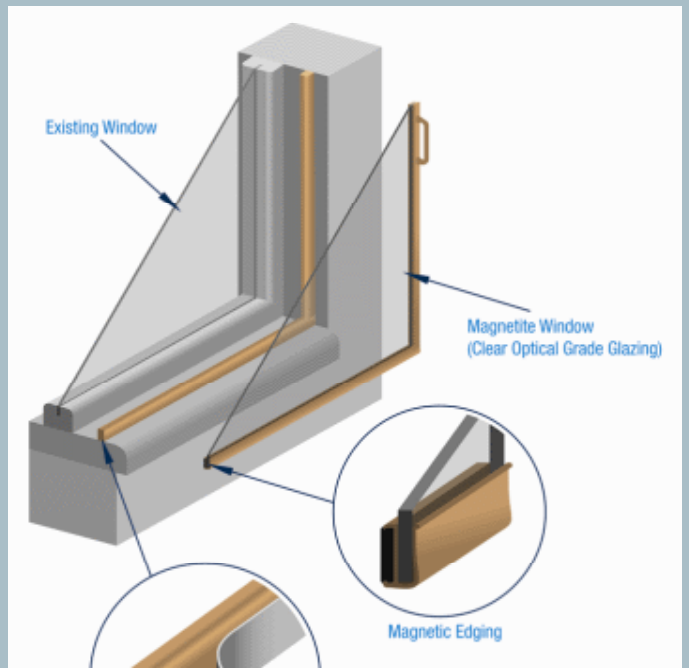
Selected Strategies

7) Glazing Retrofit



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Selected Strategies

Summary

Power Factor Correction

Perform sub-metering test

Implement re-commissioning and control strategies

Perform and air leakage test and retrofit

Retrofit HVAC optimising control system

Lighting retrofit

Glazing retrofit

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Selected Strategies

Summary

Power Factor Correction	= 0 - 2% saving
Perform sub-metering test	= 8% saving
Implement re-commissioning and control strategies	= 15% saving
Perform and air leakage test and retrofit	= 16% saving
Retrofit HVAC optimising control system	= 10% saving
Lighting retrofit	= 7% saving
Glazing retrofit	= 8% saving

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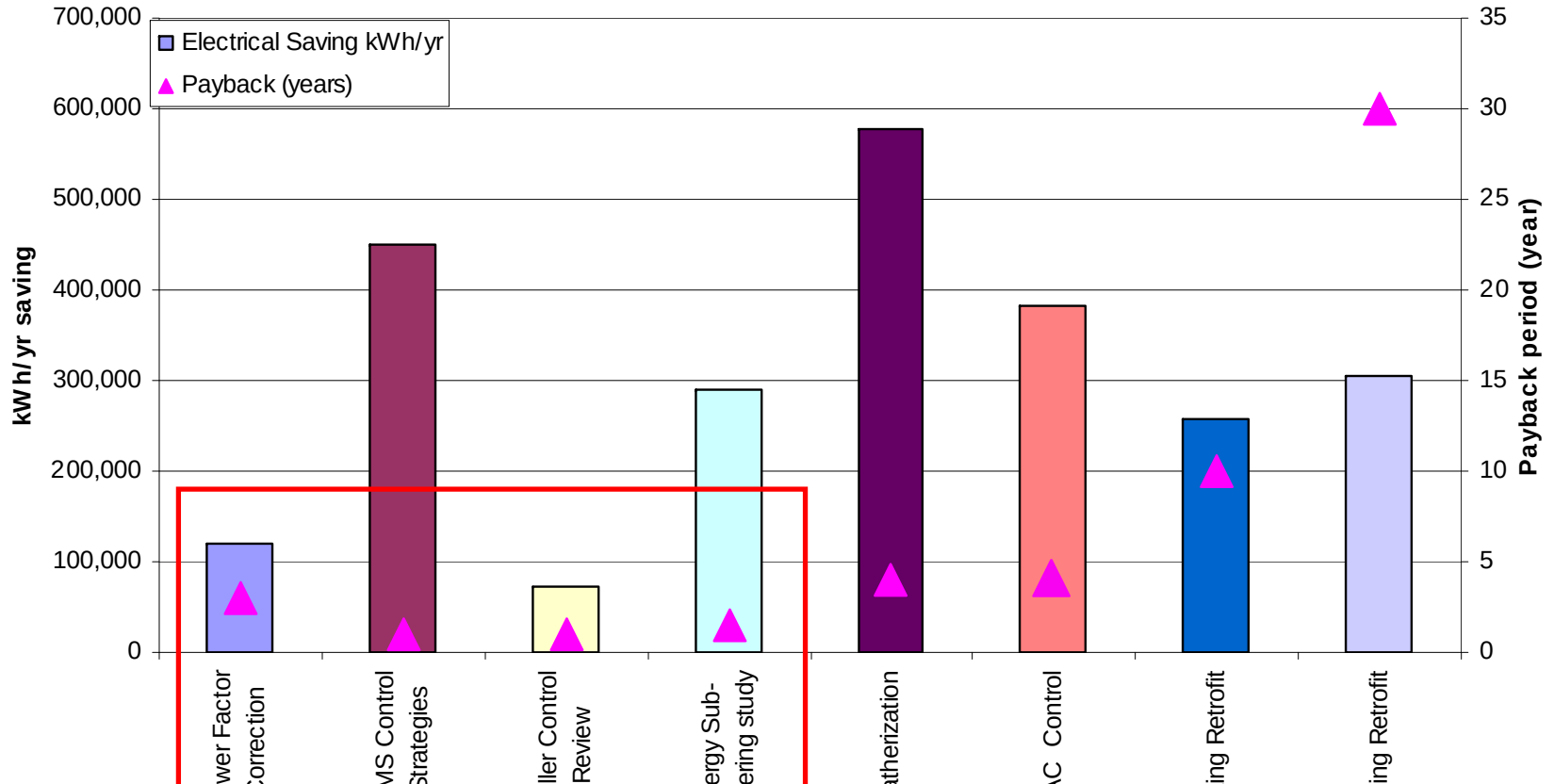
Selected Strategies



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Selected Strategies

Outcomes

Strategies with total savings above 50% have been identified

20 - 25% electricity savings can be achieved with an estimated cost below $80,000

15 Year Net Present Value of >$1 million

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Recommendations – Existing Buildings

1) A Building Energy Champion

2) Consider installing additional Sub-metering

3) Re-commission systems

4) Engage building departments and drive behavioural change

5) Consider FM vs. Capital Works procurement strategy - look past Year 1 Capital Costs

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Lessons learned – New buildings

1) Allow adequate BMS sub-metering and logging

2) Rigorous Commissioning Phase (CIBSE/ASHRAE), followed by:

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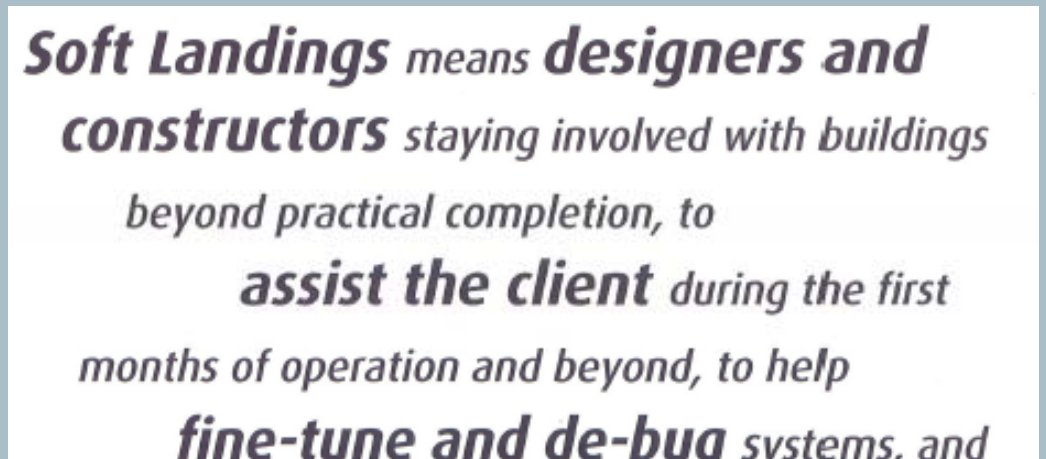
Lessons learned – New buildings

1) Allow adequate BMS sub-metering and logging

2) Rigorous Commissioning Phase (CIBSE/ASHRAE), followed by:

3) Building Tuning/Soft Landings Framework



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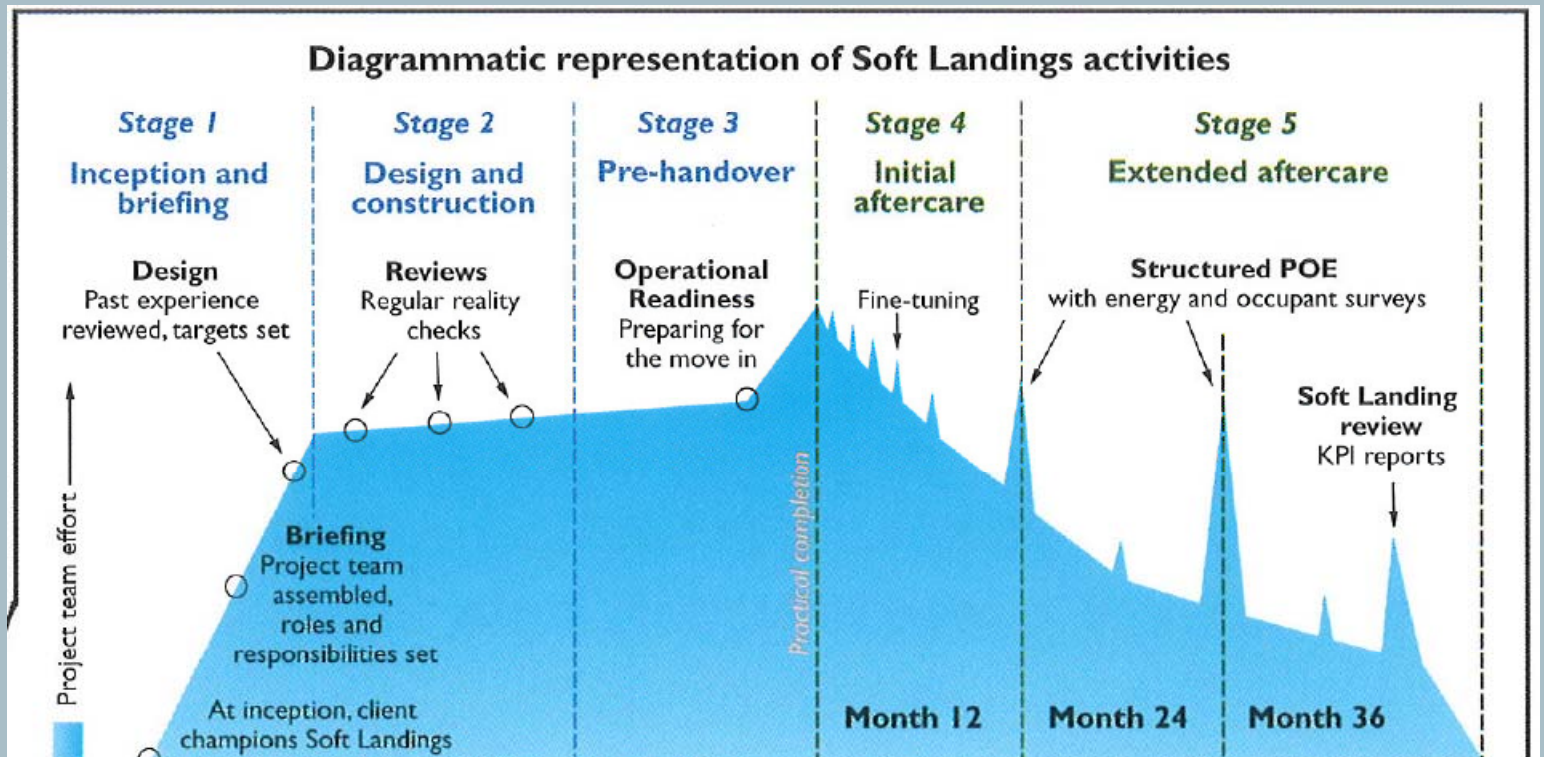
Lessons learned – New buildings



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Any Questions....?

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Good Practice Initiatives

- Install outside air louvres to Cooling Tower 2
- Carry out a review of primary pump and fan motors
- Upgrade large fan and pump motors to high efficiency motors
- Check CHW coils in AHU's and PAC units for blockages
- Implement a clear light switch labelling system
- Review location of thermostats