

Leisure Services Carbon Awareness



London Borough of Richmond upon Thames

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Impact of Carbon Driven Economy



- Depleting fossil fuels
- Climate change
- Volatile energy costs
 - Extraction/delivery
 - Legislative/environmental

London Borough of Richmond Energy Consumptions & Costs



Utility 2006-07	Energy Consumption		Cost		CO ₂ emissions
	kWh/year	%	£/year	%	Tonnes/yr
Electricity	9,690,000	26.6	£872,100	51.9	4166.7 5439.6
Gas	21,484,800	59.0	£644,544	38.3	
Oil	5,213,060	14.3	£164,733	9.8	
Total Energy	36,387,860	100	£1,681,377	100	9606.3

Escalating Prices: Now £2m+

Energy prices



Carbon Management



- Developed a Carbon Management Action Plan
- Adopted a target to reduce CO₂ emissions by 25% by 2012/2013

Actions:

- Improve data management
- Adopt a corporate energy policy
- Invest in energy efficiency and renewable energy
- Provide training for all staff
- Work closely with schools and leisure centres

Low Carbon Economy



- Reduce dependence on fossil fuels
- Energy efficiency
- Renewables
- Biomass
- Nuclear power

INCREASING URGENCY

Financial costs of flooding across Europe now 10 billion Euros annually



In the Czech Republic: two weeks of heavy rains led to massive flooding.

In Germany: Dresden train station submerged in water.

In Austria: northwest of Vienna, flood waters engulfed towns and villages.

Business Financial Benefits



- Energy cost savings
- Releases funds for higher value uses
- Gains are internal and risk-free
- Provides a competitive advantage
- Encourages business development via:
 - enhanced customer satisfaction
 - greater staff morale



Energy Awareness



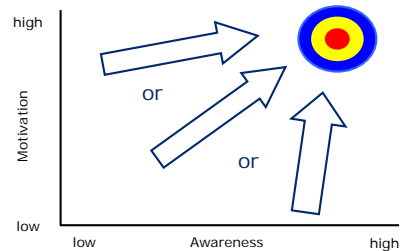
Why is energy an issue for Sports & Recreation managers?



- All leisure facilities use energy
- Energy accounts for around 33% of running costs.
- Energy is not just a fixed overhead
 - it will respond to management
- 20% savings are typically available
 - by reducing waste (not the level of service)



Establish whether awareness, motivation or both should be targeted



Target areas of known waste...



- Every business has them...
- Rooms with windows open when the heating is on
- Equipment left running when no one is using them
- Use or need for supplementary heating
- Defects to TRVs, controls etc.



Creating a new culture



Being part of the solution rather than part of the problem

Critical mass needed to change attitudes

Dispel the myths



- 'Turning monitors off is bad for them'
- 'It uses less energy to leave the light on'
- 'Screensavers save energy'
- 'Photocopiers should be left on'
- 'Better to leave heating on than let building go cold and heat up again'

Understanding Energy



Reporting problems



- Establish communication channel for reporting and rectifying problems:
 - Over or under-heating
 - Broken or draughty windows and doors
 - Flickering fluorescent lamps
 - Water leaks and drips



Display Energy Certificates



Utility Monitoring



Meter reading and monitoring
 Electricity kWh
 Natural Gas m³/ft³ to kWh
 Water m³

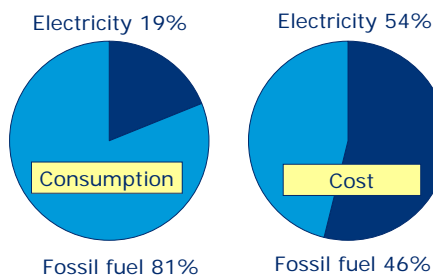
Monthly consumption graphs

Understanding Energy Units

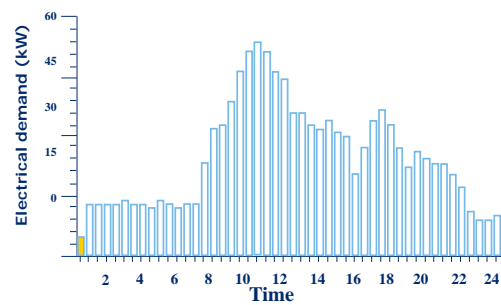


Energy Consumer kW – Power (rating)
 Utilisation h – hours operated
 Energy consumption kWh – units consumed
 Charge cost p/kWh – unit cost
 Cost £ - bill charge

Energy use in sports centres (with pools)



Daily Electrical Load Profile



Breakdown of energy use (Sports centres with pools)



	kWh (%)	£ (%)
Space heating	52	29
Water heating	29	17
Fans & pumps	12	35
Lighting	4	11
General power	3	8



What is an energy walk-round?



A walk around your premises to:

- Assess what uses energy
- Assess when energy is used
- Identify areas for savings
- Common sense – practical ideas
- Open minded, creative



When should I conduct an energy walk-round?



At different times of day and year as energy use changes. For example:

- at lunchtime
- at night or during weekends
- when the cleaners are on duty
- beginning and end of heating season
- when clocks change



On most sites these four types of energy wastage can be commonly identified:



UNNECESSARY

- » Equipment and lights that are redundant

POORLY CONTROLLED

- » Timer and/or temperature controls wrongly set

INEFFICIENT

- » Poorly maintained boilers
- » Use of standard lamps instead of energy saving lamps

INAPPROPRIATE

- » Use of inappropriate fuel

Don't forget reducing energy is:



Good for your bottom line



Good for the environment



Improves company image



Ready for future legislation

Door Closure



Doors and windows



- » closed when heating is on:
 - reduces heat loss
 - prevents cold draughts
- » Applies also to internal doors which separate areas held at different temperatures



Insulation



An un-insulated hot water cylinder and pipes will result in large heat losses; increasing your heating bill

ACTION:

- Insulate cylinder with a hot water jacket (min. 50mm)
- Internal pipes should be insulated to 25mm, external pipes to 50mm

Ventilation



Good ventilation is essential, excessive and uncontrolled ventilation is not. Typically:

- Over half the energy spent heating a room is used to warm incoming fresh air
- Twice the volume of air in a room is heated up to the required temperature every hour
- Doubling the ventilation rate increases heating costs by 50%



General - Ventilation



Temperature controls



- 1°C increase, costs 6 - 10% extra fuel
- Define required room temperatures e.g.
 - Changing rooms 25°C
 - Toddlers groups 19°C
 - General sports 17°C
 - Circulation areas 16°C
 - Aerobics 15°C
- Check regularly



Heating



- Over heating by 1° C can increase consumption by 10%
- Overheating of 3 to 4° C is not unknown
- 18° C recommended for classrooms
- 15° C recommended for gymnasiums, corridors and circulating areas

Managing heating systems



- React to areas suffering under and over heating
- Define temperature requirements and check set points
- Define heating times and check time controls
- Check you are not heating unoccupied areas

Good housekeeping measures

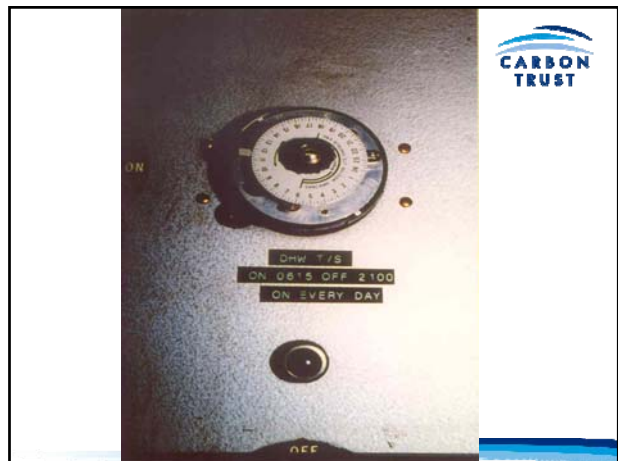


- Check representative thermostat locations
- Don't use thermostat as on/off switches
- Check filters are regularly cleaned
- Don't place obstructions in front of heaters
- Use portable electric heaters as a last resort

Time controls



- Define required operating times (heating, ventilation, external lighting..)
- Ensure time switches are correctly set
- Pay special attention to:
 - seasonal adjustments
 - re-setting after 'one off' bookings
 - holiday periods
 - British Summer Time



Optimum Start Controls

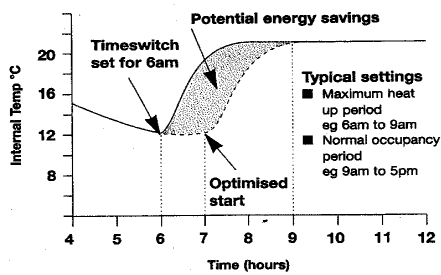


- Weather dependant timeswitches
- Reduce heat up times in mild weather
- Range of simple or sophisticated controls available
- Optimum stop facilities also available

HWS Generation



Optimum Start

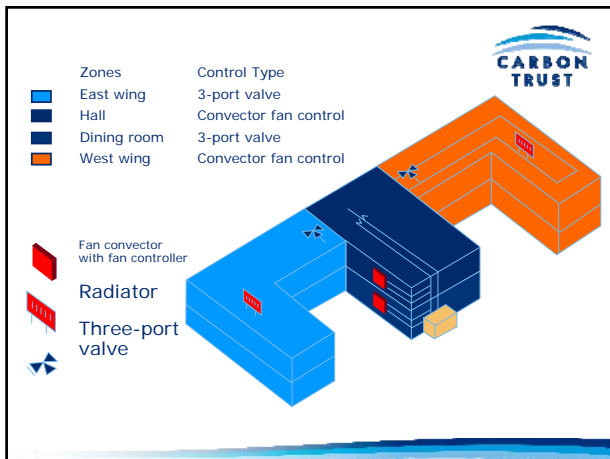


Optimum Start control

Domestic hot water



- Energy efficiency vs. health & safety
 - control of Legionella
 - risk of scalding
- Varying temperature requirements:
 - Pre-swim shower 2°C above pool temp
 - Post-swim shower 40°C supply
 - Storage 60°C
- Check regularly



Swimming pools



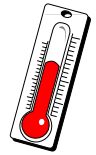
- Swimming pools are energy intensive due to evaporation from the pool's surface:
 - water heating to counter cooling effect
 - high ventilation rates to prevent condensation (fresh air needs heating)
- Limiting evaporation is essential



Pool water temperature



- 1°C increase, costs 5% extra fuel
- Define required temperatures, e.g.
 - elderly/disabled/infirm 30°C
 - leisure pools 29°C
 - teaching pools 29°C
 - conventional pools 28°C
 - diving pools 28°C
 - competition/fitness pools 27°C
- Check regularly



Control of evaporation



- Keep air temperature within 1°C of pool water temperature
- Maintain pool hall relative humidity (RH) at 55-65%
- Use pool covers
 - 90% saving overnight
 - 25% saving overall



Air vs. water temperature



- Air temp more than 1°C **above** water:
 - risk of condensation
 - uncomfortable for spectators
 - water feels cold
- Air temp more than 1°C **below** water:
 - air feels cold
 - increased evaporation heat loss
- Optimum is air within 1°C of water



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Pool hall ventilation



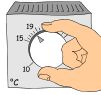
- To avoid condensation/structural damage
- Accounts for 50% of pool energy use
 - heating of incoming fresh air
 - electrical power to fan motors
- Complex controls (understand and check)
 - relative humidity (%RH)
 - amount of fresh air
 - dampers or fan speed
 - heat recovery



Controls



- Daily measurement of temperatures and humidities (in pools)
- Weekly checks on times and hours run
- Annual calibration checks on:
 - temperature sensors
 - humidity sensors
 - pressure sensors
 - time controls
 - boiler sequencers



Variable ventilation (medium cost)



- Amount of fresh air required depends on moisture load (i.e. pool activity)
- Use automatic humidity controls to vary fresh air rates using either:
 - motorised dampers
 - variable speed drives
- Particularly effective when combined with pool covers



Back-washing

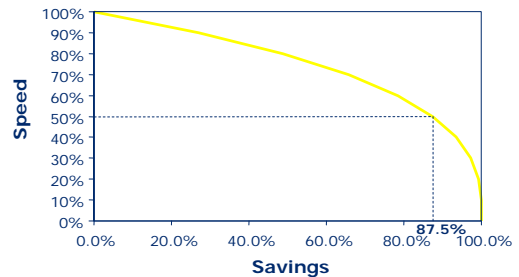


- Back-washing consumes energy and water but is essential to maintain circulation rates and hygiene
- Optimise back-washing frequency
 - manufacturer's recommendations
 - pressure drop up by 30kPa (4 psi)
 - at least once per week

Reduce The Speed



The power used by a motor varies with the cube of the speed



Advanced controls (low cost)



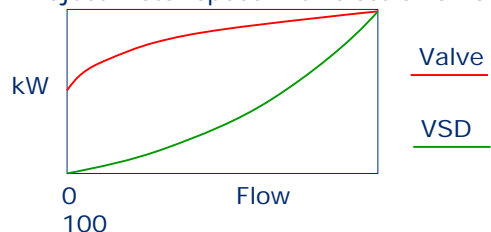
- Heating optimisers (vary start/stop times in line with prevailing weather)
- Thermostatic radiator valves (provide local control where variable heat gains)
- Automatic occupancy sensing control of lighting (movement, sound etc.)
- Daylight control of lighting (photocells - for well glazed areas, external etc.)



Variable Speed Drives (medium cost)



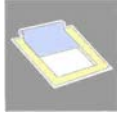
- Flow control using valves or dampers wastes energy
- Adjust motor speed with electronic VSD



Pool covers



- Reduce heat and evaporation losses from the pool surface
- Savings typically 10 -30% of total energy use when combined with auto humidity control of ventilation
- Payback 1.5 - 3 years
- Automatic operation available



Making the savings - Lighting

Heat recovery



- Recover heat from swimming pool ventilation exhaust streams and use to preheat incoming fresh air
- Can reduce heating requirements by 30%
- Options:
 - run around coils
 - plate heat exchangers
 - rotary heat exchangers
- Some constraints on retrofit



Good housekeeping lighting



- Only use lights when daylight is inadequate
- Keep roof lights, windows and light fittings clean
- Label light switches
- Motivate users to switch off lights
- It is a myth that it is cheaper to leave fluorescent lights on

Combined Heat and Power (CHP)



- On-site power generation (gas engine)
- Waste heat recovered to hot water
- Heat to power ratio approx.. 2:1
- Needs year round heat demand (i.e. pool water heating)
- Can sell any surplus power



Lighting Industry Federation (1994) Lamp Guide



- "The energy taken during starting (a fluorescent) is a small fraction of the energy taken during one minute's operation"
- Manufacturers lifetime estimates are based on switching a fluorescent on upto 8 times a day. If this is not exceeded the lifetime remains at 100%

Unnecessary Lighting



Assessment Lighting Performance (simple)



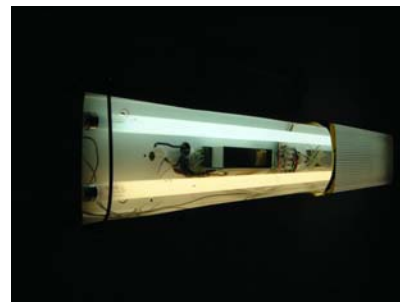
- kW circuit power
- Lighting performance kW/m² floor area
- Compare performances (similar lux)

Best Practice

Classroom 500lux – 12W/m²

IT Room 350 lux – 8W/m²

Fluorescent Lamp Colour (Warm/Cold)



Reduce Light Levels



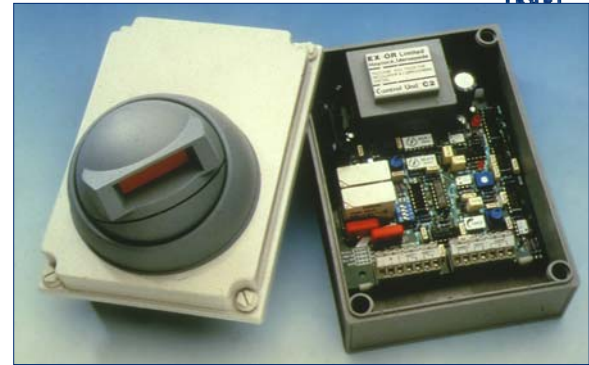
Maintenance Diffusers



Lighting control



- Switching arrangements
- Centralised time control
- Time delay/key switches
- Occupancy sensing
- Photocell control



Light switching management



Lighting Demonstration



Making the Savings Equipment

Standby energy consumption

Equipment type	Average power consumption while in use (watts)	Standby energy consumption (watts)
PC (processor only)	40	20-30
PC monitors	80	10-15
Inkjet printer	40-80	20-30
Laser printer	90-130	20-30
Fax machine	30-40	10
Photocopiers	120-1000	30-250
Copy printers	160-200	35-50

ACTION:

- Adjust setups to ensure equipment enters standby mode when not in use
- Emphasis should still be placed on switching equipment off completely

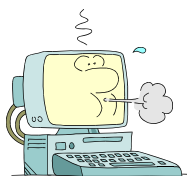
Good housekeeping - small power

- Photocopiers
- Drink Dispensers
- IT Equipment
- Catering Equipment
- Services - pumps, fans, immersion heaters



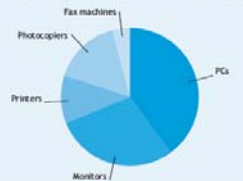
Fact...
A typical floor mounted, hot drinks vending machine switched off overnight (14 hours) and at weekends, would save 1 tonne of CO₂ emissions a year.

Where does the power go?



As the chart below demonstrates, around two-thirds of the energy consumed by office equipment is attributed to computers (PCs and monitors) as there are more of these in offices than any other piece of equipment. However, all office equipment is a potential source of energy waste.

Energy use of business equipment in the typical office



Based on 10 PCs with monitors, plus 1 photocopier, fax machine and 1 laser printer, all with average consumption and no standby enabled.

Air-conditioned areas

- Reduce air-conditioning loads by:
 - using blinds to reduce direct sunlight
 - keeping doors and windows closed to prevent warm draughts
 - switching off all unnecessary lighting and electrical equipment





Water Consumption



Water Loss/Leakage

What is annual cost of water loss

Dripping Tap?



School Water Consumption

- Typically 15% utility costs
- Charges increasing annually

Water supply and sewerage disposal costs typically £2/m³



Water Saving

- Pressure restrictors
- Push-button taps/showers
- Spray taps/aeration showers
- Urinal flush controls
- WC Dams
- Rainwater recovery



Water Meter Reading

- Infrequent by supply authority
- Leaks common - hidden
- Difficulty meter access

- Non-Return sewers-leakage

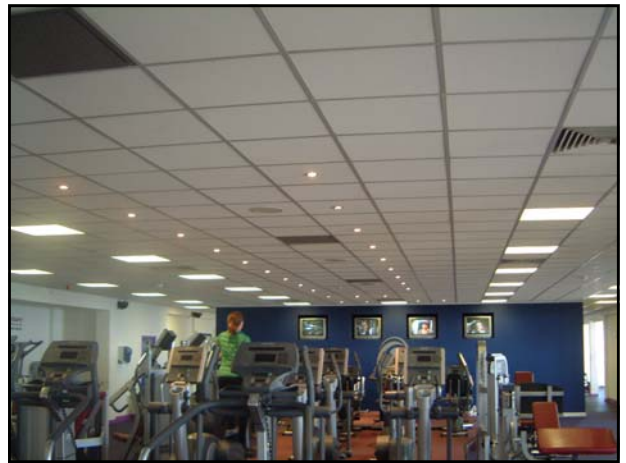


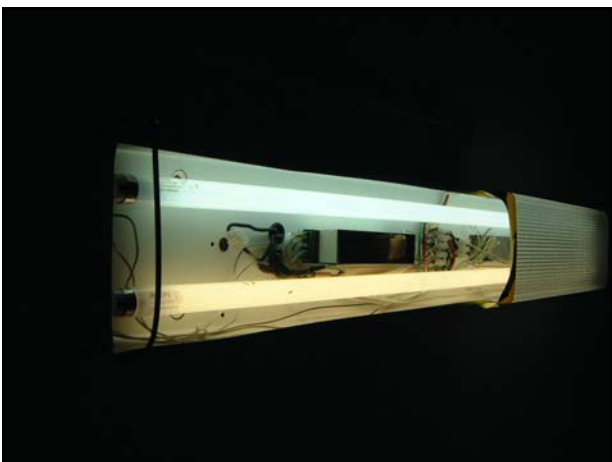




Photographic Survey Opportunities









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