

Energy Management for Defence Infrastructure

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Benefits of Refurbishment

- Cheaper than demolition and construction
- Preserves embodied energy of the structure
- Reduces waste
- Reduces resource usage
- Usually quicker





Finding Efficiencies

- Establish the current conditions
 - Need to know what represents an improvement
 - What is the total “Carbon Footprint” ?
 - How is the building being used ?
 - What are the needs of the occupiers ?
 - Can these needs be met in a different way ? eg natural ventilation rather than air-conditioning





Finding Efficiencies

- Better use of space
- Changed working practices
- Fabric enhancements
- Insulation
- More efficient equipment
- Different technical approach
- Heat recovery, co-generation
- Improved control





Finding Efficiencies **carbon footprinting**

- Metered data
- Check/supplement with invoices
 - Energy audit
- Normalise
 - Occupation levels
 - Running hours
 - Weather





Targeting High Impact Areas

- Canteen/kitchen
- Kitchenettes
- Boardroom
- Server room
- Comms room
- Car parks
- Motors
 - Fans
 - Chillers
 - Pumps
 - Lifts
- Lighting





Technologies

- Condensing boilers
 - Radiant cooling
 - High-frequency ballasts
 - LED lighting
 - Solar PV
 - Solar water heating
 - Sun pipes
 - “Windcatchers”
 - Heat pumps
 - Waterless urinals
 - Rainwater harvesting
 - Oil to Gas
 - Biofuels/Biomass
 - Natural ventilation
 - FSC timber
 - Recycled content
 - Low VOC paints & finishes
- Small-scale wind and greywater systems are probably uneconomic





Retrofitting insulation

- Roof insulation
- Cavity walls
- Solid walls
 - Internal or external insulation
 - Façade/cladding
- Windows
 - Sealed/Openable
 - Single/Double/Triple Glazed
 - U-values





Systems

- New boilers
- Condensing boilers, High Efficiency boilers
- Choice of fuel
 - Gas – Biomass
- Combined Heat & Power ?
- Heat pumps
 - Ground-source
 - Air-source
- Heat recovery





Controls

- Full BMS
- Optimisation
- Time-clocks
- Zoning

- **But...** always check and calibrate





Retrofitting cooling

- Higher occupation densities: greater internal heat gains; Global Warming
- But the first question has to be, do we really need cooling ?
- Can we live with higher set-points ?
- Passive measures
 - Shading, solar glass, natural ventilation
- Central plant or localised





Mechanical Cooling

- “Free cooling”
- Water-cooled v Air-cooled chillers
- Choice of refrigerant
- Heat-recovery
- Heat-pumps
- Displacement ventilation
- Concentration of heat sources





Improving Lighting

Zero and low-cost options

1. Controls. Can the existing installation be made to work more efficiently ?
2. Lamps. Can existing lamps be replaced by more efficient ones ?
3. People. Can awareness change habits ?





Types of lighting control

- On/Off switch
- Time-clocks
- Presence detectors
- Daylight sensors
- Dimming (manual or automatic)

The Golden Rule

Use automatic controls to turn lights off, not to bring them on (except presence detectors)

Controls can be used in combination – eg On/Off with Daylight Sensor





Not only technology

- Refurbishment offers opportunities for education
 - Change occupancy and working practices
 - Amend set-points
 - Start point for an energy campaign

Many studies suggest that greater savings can be achieved, and at a lower cost, by improved housekeeping and a change in attitude and behaviour. Efficient equipment needs to be operated properly for maximum results.





Occupied Premises

- Buildings are all about PEOPLE
- Technology should be efficient but it's people who make it work or not.
- AWARENESS
 - Keep the message simple but vary the delivery





Handy Hints

- Ensure all occupation times are appropriate for the next 24 hours.
- Where occupiers have requested a variation in hours, confirm this is still required.
- Via BMS, day+one exception reports or manual reads, check the previous day's usage patterns.
- Regularly check that sensors are working and appear to give sensible values.
- Ensure that boiler combustion is tested regularly and the burners are clean.
- Turn off lights when not needed.
- Turn off screens when not being used.
- Turn off PCs overnight.
- Reduce heating set-points.
- Raise cooling set-points.
- Rationalise hours of operation (can all occupiers working out-of-hours be located on the same floor?)
- Implement a day-time cleaning regime





Monitoring & Targeting (M&T)

- Collecting data is pointless if you do nothing with it

MONITORING

- Collect & collate data
- Calculate consumption
- Circulate reports

- It needs to drive change

TARGETING

- Set baselines based on actual usage
- Set realistic targets
- Normalise for weather if appropriate

