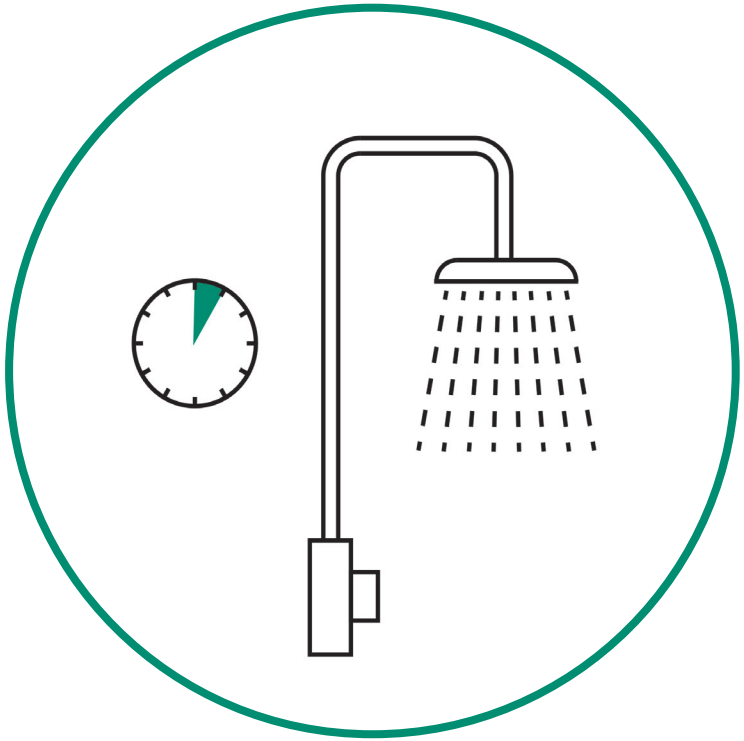
Part C

Worked examples for typical facilities



How to reduce energy costs

Key considerations for local physical activity and sports facilities

Foreword

How to reduce energy costs for local physical activity and sports facilities.

There are many challenges arising from the current economic circumstances and the needs for operators to maintain financial and environmental sustainability.

This guidance aims to give practical support on how energy efficiency measures can reduce running costs. The suite of documents describe the range of local physical activity and sports facilities and many types of energy reduction features that are available. It also provides a worksheet tool to help analyse individual situations and develop an energy reduction action plan.

Illustrations

The references, images and links to commercial products and organisations used in this guide are intended to illustrate the range of technologies that are available on the market at 2Q2022, but should not be taken as an endorsement by Sport England of the particular products or services concerned.

Document accessibility

This document has been designed for comfortable reading at A4 and on a laptop screen, but can also be printed at A3 for large print versions. The pdf is accessible and has been tested to work with text readers.

The guidance has separately downloadable parts - see page 3 summary. They have been developed to enable readers to digest and process the information easily with illustrations and tables for quick reference.

User guide

Before using this design guidance note for any specific projects, all users should refer to the User guide to understand when and how to use the guidance as well as understanding the limitations of use.

Click here for **User guide** and other
Design and cost guidance

How this document relates to other guidance

The **How to reduce energy costs** guidance documents should be read alongside related Sport England guidance and links highlighted below:

Sport England **How to reduce energy costs** documents

Part A	Introduction and overview
Part B	Facility elements and checklist
Part C	**Worked examples of typical facilities**
Part D	Frequently asked questions (FAQs)
Part E	Project worksheet

For web page — Click here

Other Sport England guidance

Environmental sustainability	Click here
Clubhouses	Click here
Club matters	Click here
Funding	Click here

Contents

1.0 Small clubhouse with changing and social area

1.1 Accommodation

The plan of a typical small clubhouse with changing room and some limited social areas is shown below. It might typically serve a football or rugby pitch and/or a floodlit MUGA or artificial pitch. There may also be a car park and amenity area with some street or amenity lighting.

Ground floor plan

A clubhouse building is likely to be used intermittently. During the playing season, training and social evenings may take place during weekday evenings and competitive matches during the weekend.

1.2 Occupation

The building is likely to be used intermittently and a typical occupation pattern during the playing season might be as shown in Table C-1. Training and social evenings may take place during weekday evenings and competitive matches during the weekend.

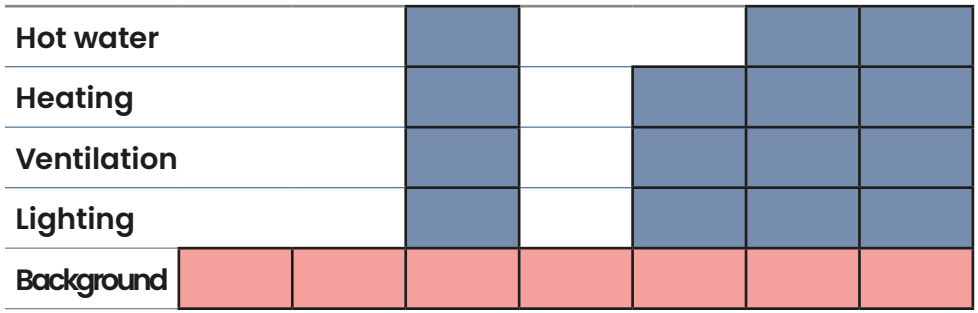
Table C-1 Example clubhouse weekly pattern of use

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Morning							
Afternoon						Match	Match
Evening			Training		Social		

1.3 Energy use

A resultant energy use profile might typically be as shown below.

Table C-2 Example clubhouse weekly energy use profile (indicative)



Key:

= Background energy profile

= Daily peak loads during occupation

Notes:

Occupied energy use: increased energy consumption (for user comfort/ safety) when building is occupied:

- Space heating;
- Ventilation;
- Water heating (additional demand);
- General lighting;
- Sports floodlighting.

Unoccupied energy use: base energy consumption (with eco settings) when building is unoccupied:

- Space heating;
- Ventilation;
- Water heating (reserve for sanitary/ showers/ catering);
- Security lighting;
- Computer/ catering appliances etc.

1.4 Monitoring energy use

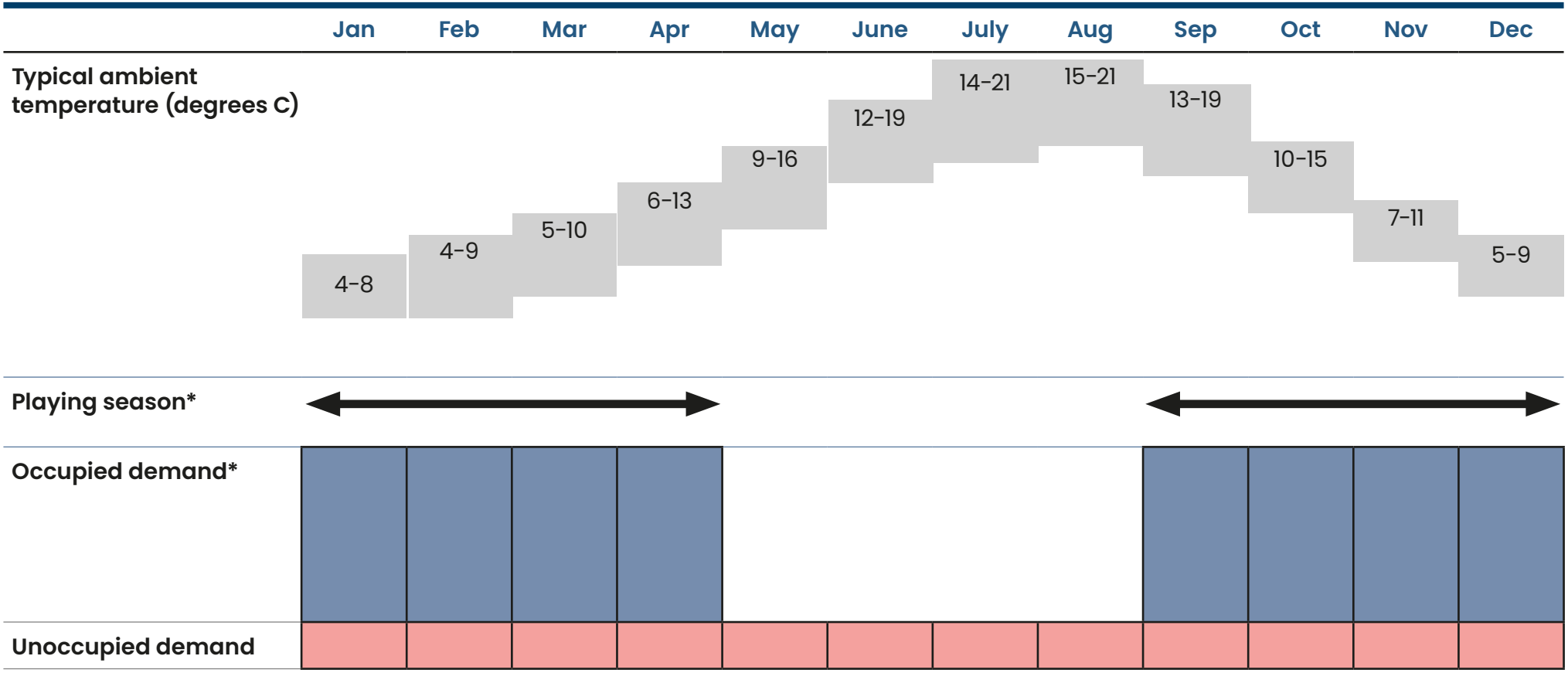
A smart meter should be used to give a **baseline** of actual use and **monitor the impact** of any changes that are considered. It is sensible to look at usage records for a number of years to get a sense of general trends.

Consider the potential saving from a reduction in the temperature settings and/or switching off equipment and appliances when not needed. Typical energy profiles should be established by looking at the records of a smart meter or, if not installed, by taking regular readings from a traditional meter. A typical pattern for a day during the playing season and across the year is shown in Tables C-2 and C-3.

These tables indicate that even when the building is unoccupied, there is likely to be a residual background energy load as a result of equipment and appliances that are left running continuously. For example, hot water systems, refrigerators, security systems and lighting. The level of this residual background energy load can be deduced from the data recorded from the smart meter. It could also be tested by simply switching individual items of equipment or appliances on and off and taking readings from the smart meter.

In contrast, there will be energy peaks that are related to the times that the building is occupied. The high peaks are likely to be when sports floodlighting is in use on a MUGA or artificial pitch, or when the heating system is heating water for players to shower after matches. Again, the levels of these peaks can be deduced from the smart meter data and should be understood before any energy reduction measures are considered.

Table C-3 Example clubhouse weekly pattern of energy use per month



Key:

= Background energy profile

= Daily peak loads during occupation

Note:

*The profiles will vary depending on the type and use of each specific facility.

1.5 Checklist for review

Options on saving energy where the following are likely the highest loads.

Table C-4 Checklist for small clubhouse with changing and social area

Item	Actions
Space heating	If electric panel heaters are providing the heating, consider other options: • Gas boilers with radiators; • Heat pumps with radiators.
	For boilers or heat pumps, ensure: • A time clock control is included; • The clock matches the expected occupancy and use of the building (e.g. Wednesday, Friday, Saturday and Sunday); • The controls are set back to just 10°C when the building is not used.
	Radiators should have a thermostatic control valve (TRV) to allow temperature to be adjusted within each space — normal setting should be around 3-4.
	Smart controls such as Hive can be easily installed and more easily used. The user interface is much more intuitive.
	Programmable TRVs can be bought and installed, the temperature required within each space can be set. These work best when used in conjunction with a smart thermostat. E.g., if the building only uses one or two rooms, for example the club / committee room and not the changing rooms, programmable TRVs can be used to raise the temperature to say 19°C in the committee room, but leave the remaining spaces at 10°C. • Tado smart heating products; • Hive smart heating products.
	Consider adding insulation to walls and roof, or replacing windows to reduce heat loss.
	Heating with a gas boiler may cost up to **£5.28 for an 8-hour day** during winter.

Item	Actions
Domestic hot water	Understand the cost of generating hot water. A shower used 50 times a year for 10 minutes each time will cost: • **£10.16/ annum** for gas (instantaneous); • **£48.51/ annum** for electric (instantaneous); Prices based at 2Q2022 (**4.4p/kWh** gas or **21p/kWh** electricity).
	Is hot water generated in a cylinder?: • If so, ensure time clocks reflect the use pattern; • Smart controls, as described above can also control hot water cylinders; • Maybe consider replacing with point of use or instantaneous gas hot water generators: It's important to ensure the fuel used has enough capacity, instantaneous loads have a higher peak, though use less energy overall.
	If showers are electric point of use or combi boiler / instantaneous: • Consider taking shorter showers; • Turn the temperature down as low as is comfortable; • Consider cost benefit of gas over electric showers.
Internal lighting	Ensure all light fittings are LED lights.
	LED fittings will use around half the amount of energy of traditional fluorescent fittings.
	Automatic lighting controls can: • Switch lights on and off as people enter and leave rooms; • Dim the lights down if significant amounts of daylight are within the space.
	Consider smart lighting systems, as they: • Are easy to install and can be controlled via apps and or voice activated by Alexa type devices; • Can be combined with occupancy detectors to switch on and off when people enter and leave rooms; • Be dimmed down easily to lower levels and reduce energy used.
	Lighting a club building with LEDs may be **£1.40 for an 8-hour day,** or **2 or 3 times** as much if LEDs are not used.

Cont/d...

Item	Actions
External floodlighting	Ensure all light fittings are LED lights.
	LED fittings may use around a third of the energy that traditional metal halide or SON fittings might use.
	LED fittings will last considerably longer than metal halide or SON fittings, thus they have a much better lifecycle cost.
	Ensure lights are only ever on when needed. LED fittings don't have the same warm-up time of the more traditional fittings, so should be used accordingly.
	Typically, the cost of lighting a MUGA could be around **£10/hour** for traditional SON high pressure sodium or metal halide systems compared to **£3/hour** for LEDs.
Consider installing solar / photovoltaic (PV) panels	Panels installed on the roof can generate electricity to use directly, reducing the electricity supplied by the energy supplier.
	Panels generate more when the weather is warm and sunny.
	Most cost effective when: • The building has electric showers, heating or uses significant amount of electricity for equipment; • The building is used during daylight hours; • The building is used during the week, rather than just at weekends.
	Installations can include batteries to store electricity when it's not used as it's generated, though this can add significant cost.
	Each panel (2 m^2) can generate around **£160** of electricity (at 2Q2022 prices): • Any unused electricity can't be used, without a battery.
	Typical cost for panels is around **£400–600/m^2** (depending on the amount and the installation of batteries).

2.0 Village hall

2.1 Accommodation

Many local facilites will have activity spaces such as fitness rooms and activity studios. A typical village hall layout (GIFA = 387 m^2) is shown below.

A village hall building is likely to have a greater range of use than a clubhouse and be used more consistently. A range of physical activity sessions and social events may take place across the week.

Ground floor plan

Key

1. Hall
2. Hall storage
3. Male toilets
4. Female toilets
5. Accessible toilet
6. Meeting room
7. Cleaner's store
8. Plant
9. Community room
10. Foyer
11. Kitchen
12. Store

2.2 Occupation

Compared to the previous example (see section 1.2), the building may have a greater range of use and a typical occupation weekly pattern is shown in Table C-5. The range of physical activity sessions and social events across the week may include keep fit, dance, martial arts, yoga, short mat bowls and table tennis etc., and the community sessions may range from coffee mornings, meetings of various interest groups and private bookings.

The energy loads associated with catering could be significant, with appliances such as a fridge, deep freezer, oven and tea earn.

Table C-5 Example weekly pattern of use (intermittent)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Morning	Keep fit	Community	Yoga		Community		Community
Afternoon	Dance group			Short mat bowls			
Evening		Badminton	Martial arts		Table tennis	Community	

2.3 Energy use

The resultant energy use profile is likely to be more evenly spread across the week.

Typically, a village hall may not have dedicated changing rooms and showers, with users arriving in suitable clothing for the specific activity concerned. The energy load for heating hot water for showers is likely to be low. On the other hand, the energy loads associated with space heating, ventilation and catering could be more significant with the use of appliances such as a fridge, deep freezer, oven and tea earn.

2.4 Monitoring energy use

See previous section 1.4 for the value of using a smart meter to give a baseline of actual use and monitor the impact of any changes that are considered.

2.5 Checklist for review

Options on saving energy where the following are likely the highest loads. If smart meters are not installed, refer to Part A Section 3.3.

Table C-6 Checklist for a village hall

Item	Actions
Building uses	Identify the high energy uses of the building.
	Activity room: • Space heating will be high; • Lighting could also be high in this area; • The space could also have mechanical ventilation.
	Kitchen area: • Catering equipment maybe both gas and electric could have significant loads.
	Other areas: • Heating throughout the space will be significant; • Lighting throughout will be significant.

Cont/d...

Item	Actions
Space heating	Heating is natural gas - ensure the boiler / system have a time clock: • Ensure the time clock is only set to heat on days when building is in use i.e. Monday and Wednesday to Sunday; • Make sure the heating is set to heat at the times the building is in use, Monday and Wednesday all day, Thursday afternoon to evening, Friday afternoon and Saturday and Sunday morning until late afternoon. Allow at least an hour before the building is occupied to get the space up to temperature; • Outside of these times, heating can be set to frost protection, between 5°C and 10°C.
	Check each radiator has a standard thermostatic radiator valve (TRV) fitted. Each has a number between 1-6. To achieve around 20°C, the radiator should be set to number 3.
	Consider smart controls and smart TRVs – best to contact a local heating engineer who is accredited to install and they will advise the suitability.
	The advantage of smart controls is at times when only a part of the building is used, all other rooms can be held at 10°C by the smart TRVs.
	Minimise heating as much as possible: • Based on 150W/m^2 heating; • Approximate cost of heating the whole building for **8 hours = £10.24** – based on the coldest week of the year, in summer cost could be **zero.**

Cont/d...

Item	Actions
Internal and building mounted external lighting	Review each space and check if lights are LED or fluorescent fittings. LED fittings will typically use half the electrical energy that fluorescent fittings do.
	Review the lighting controls in each space. If all the controls are manual, it's worth considering having automatic controls installed, as follows: • All internal spaces, could have occupancy sensors to switch lights on and off automatically. This can be wired into the existing quite easily, though would need to be done by a qualified electrician; • Building mounted external lighting (if any) could have a photocell added to hold any external lighting off when it was still light.
	As a minimum, encourage people to switch off lights when not in use: • Based on 8W/m^2 for lighting; • Approximate cost of lighting internal space for **8 hours = £5.20** (based on LED).
External floodlighting	Review the type of light fitting, if not LED type fittings, then consideration should be given to replacing with LED.
	LED lights could reduce the cost of running floodlights by **60%+** and will need to be replaced much less frequently.
	Depending on the size of area, lighting could cost **£10/hour** (based on SON/metal halide): • LED cost for same size could be around **£3/hour**.

Cont/d...

Item	Actions
Mechanical ventilation	Ensure that any ventilation systems have as a minimum a timeclock, to ensure they are not operating at times when the building is not occupied.
	Consider controlling small ventilation systems, such as toilet areas by the use of infrared sensors, to switch ventilation on, only when the space is occupied.
	The main activity area may have supply and extract ventilation. Investigate if the system incorporates heat recovery, transferring heat from the air which is extracted, to the cold air coming into the space. If not, this should be considered, though it will have a significant capitol cost, savings in running costs will also be significant.
Consider installing solar / photovoltaic (PV) panels	Panels installed on the roof can generate electricity to use directly, reducing the electricity supplied by the energy supplier.
	Panels generate more when the weather is warm and sunny.
	Most cost effective when: • The building has electric showers, heating or uses significant amount of electricity for equipment; • The building is used during daylight hours; • The building is used during the week, rather than just at weekends.
	Installations can include batteries to store electricity when it's not used as it's generated, though this can add significant cost.
	Each panel (2 m^2) can generate around **£160** of electricity (at current prices: • Any unused electricity can't be used, without a battery.
	Typical cost for panels is around **£400 - £600/m^2** (depending on the amount and the installation of batteries).

3.0 General comments

From the indicative calculations undertaken above, it is likely that the highest energy use could be external lighting for floodlighting to a MUGA or artificial grass pitch. The illuminance levels and the times that the lighting is switched on, before and after use, should be considered and the case for changing to LED in order to reduce running and maintenance costs. It is recommended that a specialist lighting contractor is contacted to review the system and advise on energy costs. See Sport England Guidance Note available at:

https://www.sportengland.org/guidance-and-support/facilities-and-planning/design-and-cost-guidance/artificial-lighting

Heating is also likely to be a high cost and an area where a percentage costs reductions could be made by adjusting the temperature and time settings. This would be related to the level of insulation in the building itself and the extent that heat energy is lost though the fabric. However, adding insulation can be problematic and specialist advice should be taken on what would be the most appropriate technique for the particular building. See Sport England Guidance Note available at:

https://www.sportengland.org/guidance-and-support/facilities-and-planning/design-and-cost-guidance/clubhouses

Key recommendations:

1. **Ensure that boilers have a time clock control and operates only for times when the building is in use;**
2. **Ensure each space has adjustable temperature control (TRV) so spaces are kept at the coolest possible temperature that is acceptable to users (this may be an iterative process that comes out of consultation);**
3. **Consider smart controls, including smart TRVs, which could allow certain areas to be heated and others not, and be adjusted by phone apps and web.**

Note: The above calculations are approximations and should be treated as giving an indicative view. It is essential that each building is considered in its own right and that information from a smart or manual metering system is factored in. The cost benefits of potential steps to reduce energy should be considered and the impact carefully monitored and shared with users.

Where smart meters are not installed, manual meter reading and logging the meter readings on a weekly basis (as a minimum) are recommended.

Document accessibility

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Contributors

Sport England, Abacus Cost Management Ltd (Design Services), Desco, and Robin Wilson Consulting.

Acknowledgements

Sport England wishes to thank all individuals and organisations referenced or credited within this document.

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001 – Initial publication: October 2022

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