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GREENHOUSE CHALLENGE PLUS



ENERGY AUDIT TOOL DOMESTIC HOT WATER

08



Australian Government
Department of the
Environment and Heritage
Australian Greenhouse Office



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Effective management of your organisation's energy usage is good business sense. It can produce both environmental and economic benefits – and importantly reduce your greenhouse gas emissions.

The Greenhouse Challenge Plus Energy Audit Tool has been developed to assist non-technical or semi-technical energy managers in small to medium organisations:

- identify actions to improve energy efficiency through the use of a simple but detailed audit checklist; and
- develop plans for implementing energy efficiency actions.

The checklist contains notes supplying the auditor with further explanation or hints on how to complete the tasks. It should be possible to complete the majority of tasks through simple observation.

The energy efficiency action plan – can also be utilised in the preparation of or alternatively form part of your organisation's annual progress report to the Greenhouse Challenge Plus programme—which details abatement actions.

The energy audit tool has been designed as a modular system. This means that you can utilise each of the volumes as stand-alone independent units or in combination with the other units.

This is *Volume 08 — Domestic hot water* of the Greenhouse Challenge Plus Energy Audit Tool, which includes the following 11 volumes:

- Volume 01** — Lighting (indoor and outdoor)
- Volume 02** — Lighting control
- Volume 03** — Chillers
- Volume 04** — Boilers and steam systems
- Volume 05** — Ventilation systems
- Volume 06** — Airconditioning systems
- Volume 07** — Office equipment
- Volume 08** — Domestic hot water
- Volume 09** — Building insulation
- Volume 10** — Infiltration (air leakage into buildings)
- Volume 11** — Compressed air

Your challenge to reduce energy consumption and greenhouse gas emissions starts now!

Need more information?

If you require additional information about the Greenhouse Challenge Plus Energy Audit Tool, contact your Industry Adviser on 02 6274-1229 or at email greenhouse@greenhouse.gov.au. Additional copies of the Greenhouse Challenge Plus Audit tool can also be downloaded from www.greenhouse.gov.au/challenge

A:

BACKGROUND INFORMATION

Domestic hot water is water available for hand washing, general kitchen use, showering and small-scale laundry activities. There is potential for substantial money and energy savings even for small businesses if domestic hot water is produced and used efficiently.

Most water heaters consume a great proportion of their energy just to keep a supply of hot water ready and waiting in the tank. The heat gradually leaks out of the tank until the heater turns on again to heat the water back up. Reducing hot water consumption and replacing an old water heater with a new, more efficient model are simple but effective changes. You can further reduce your hot water use by buying appliances with low water usage, such as front-loading (horizontal-axis) washing machines, and by installing water-conserving plumbing fixtures.

Although it is not often feasible to eliminate water heating entirely, it is possible to substantially reduce the need for water heating without making large-scale changes to installations. This section focuses on the operation, structure and use of smaller, local hot water systems in work places such as offices, shops and small factories. It highlights simple opportunities to improve the energy efficiency of the hot water supply, consequently saving on running costs.

Each question in the energy audit checklist, which follows, has a space where you can write your energy efficiency improvement ideas. You should refer to the explanatory notes when considering what can be done to improve energy efficiency. You may need to take additional notes and attach them to the checklist, or attach other relevant documentation (such as instruction sheets and site plans) in order to support your improvement ideas and completely document your audit.

Remember these are ideas, not decisions. When you have completed the energy audit checklist, select the energy efficiency improvements that are viable and enter them into the energy efficiency action plan in section C of this volume.

OPERATION AND USE

QUESTION 1: What types of hot water systems (HWS) are used? Please tick the appropriate boxes below.

- Instantaneous gas
- Gas storage
- Instantaneous electricity
- Electricity storage (mains)
- Electricity storage (gravity fed)
- Solar storage
- Solar storage (gas boosted)
- Solar storage (electric boosted) — mains or gravity fed
- Heat pump storage
- Other:

Improvement ideas and notes:.....
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→ A solar storage system is the most energy efficient HWS, followed by a gas boosted solar storage system, then an electricity boosted solar storage system, and then a five star gas storage HWS.

MAKE SURE YOU: Consult maintenance or engineering personnel, look at the labels on the HWS, or review the operating manual.

QUESTION 2: Is peak or off-peak electricity supplied to your electric HWS?

- Peak Off-peak

Improvement ideas and notes:.....
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→ Off-peak electricity is cheaper but is only available for storage systems of 160 litres capacity or greater.

MAKE SURE YOU: Check with maintenance or engineering personnel, look on the HWS or review the HWS operating manual.

B:

ENERGY AUDIT CHECKLIST



QUESTION 3: When was the HWS installed?

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Improvement ideas and notes:.....
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→ A HWS older than ten years should be replaced with a more energy efficient one, see note concerning question 1.

MAKE SURE YOU: Consult maintenance or engineering personnel, the operating manual or the HWS itself.

QUESTION 4: Is there an adjustable thermostat installed on the HWS?

Yes No

Improvement ideas and notes:.....
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→ Installing an adjustable thermostat will allow the water heating temperature to be controlled easily by maintenance staff, to adjust to peak and low flow periods. Assure the hot water is heated to 60°C or more at least once a day to prevent harmful bacteria from growing.

MAKE SURE YOU: Check with maintenance or engineering personnel, the operating manual or look at the HWS.

QUESTION 5: What temperature is the thermostat set to?

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Improvement ideas and notes:.....
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→ For maximum energy efficiency and a suitable hot-water temperature, the thermostat should be set to a temperature between 60°C and 65°C.

MAKE SURE YOU: Check with maintenance or engineering personnel, or look at the thermostat on the HWS.

QUESTION 6: What outlets are connected to the hot water? Please tick the appropriate boxes below.

- Hot water taps (number:.....) (check bathroom sinks, kitchen sinks, showers, commercial kitchens, or other tenants)
- Dishwasher
- Washing machine
- Coffee machine
- Other:

Improvement ideas and notes:.....
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→ Appliances such as washing machines and dishwashers do not need connection to the hot water system and should only use cold water. In addition, only wash when there is a full load if possible.

MAKE SURE YOU: Check with maintenance or engineering personnel, or look at appliances and other connections. Obtain a plan of the premise showing the HWS, piping system, appliances connected, and other hot water outlets such as taps, showers, and sinks if possible. If a plan is not already available consider drawing one up.

QUESTION 7: What is the energy star rating on the HWS and its associated appliances? Please indicate in the table below.

Appliance	Energy star rating
HWS
Dishwasher
Washing machine
Coffee machine
Other:

Improvement ideas and notes:.....
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- Appliances with a higher energy star rating are more energy efficient.
- The star rating will be shown on the energy-rating sticker on the appliance, otherwise consult maintenance or engineering personnel, or the appliance's manual.

B: ENERGY AUDIT CHECKLIST



QUESTION 8: Is hot water used for cleaning purposes?

Yes No

If yes, indicate the specific purpose it is used for below:

- Domestic — home, residential
- Commercial — offices, restaurants, shops, gymnasium, transport terminal, hotels
- Industrial — factory, workshops, mines, quarries
- Educational — schools, TAFE, universities
- Medical — hospital, nursing home, doctor's surgery

Improvement ideas and notes:.....
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→ Use high-pressure cold water for cleaning purposes instead of hot water where possible.

QUESTION 9: Are showers provided in the building?

Yes No

If yes, please indicate the frequency of use and approximate showering times below:

Number of showers (male and female):.....

Frequency of use:

Approximate shower times:

Improvement ideas and notes:.....
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→ Showers should be shortened to 3 to 5 minutes in length to reduce the amount of hot water used. Consider placing signage near the showers to remind employees.

QUESTION 10: When is the HWS switched off? Please tick the appropriate boxes below.

- Overnight
- Holiday periods
- Long weekends
- Not at all
- Other:

Improvement ideas and notes:.....
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→ The HWS should be turned off during holidays and long weekends. This may be achieved by implementing timing mechanisms. Electric systems that have no obvious off-switch may have to be turned down instead. The pilot light of a gas storage system should be turned off.

MAKE SURE YOU: Consult maintenance personnel if needed.

STRUCTURE

QUESTION 11: Are there multiple hot water systems (HWS) in the building?

- Yes No

If yes, how many and where?

Improvement ideas and notes:.....
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→ A centralised hot water generation unit may be more energy efficient than a number of smaller units that are located close together, as maintenance costs will be reduced. However, a number of smaller hot water generation units located right near their places of consumption will generally be more energy-efficient when places of consumption are spread apart. See also question 12.

MAKE SURE YOU: Consult maintenance or engineering personnel, or check the site map established in question 6. If the locations of the HWS are not already included, mark them on the map.

B:

ENERGY AUDIT CHECKLIST



QUESTION 12: Is the HWS located as close as practicable to the major points of use, minimising the length of necessary pipework?

Yes No

Improvement ideas and notes:.....
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- The distance between the HWS and the points of use should be minimised to avoid large heat losses from extensive pipe systems. This will also result in water-savings, as less water, which may have cooled down in the pipes, will be flushed down the drain when a user requires hot water. Reducing the diameter of the hot water piping will additionally reduce cold and hot water consumption. Therefore, if the HWS and various points of use are located far apart, consider the installation of a number of smaller hot water units closer to the points of use.
- Note the locations of the points of use on the site map established in question 6.

QUESTION 13: Are the pipes, tank and fittings of the HWS well insulated?

Yes No

If yes, indicate the insulation material and thickness below:

Insulation material:

Insulation thickness:

% of piping not insulated

Improvement ideas and notes:.....
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- Pipes between the tank and taps should be insulated with material of at least 10mm thickness. This is especially important for the first two metres of piping extending from the tank, as this is where most heat is lost. Closed cell rubber insulation is recommended, as it is waterproof. In addition, electric hot water tanks and their fittings should be insulated with a hot water cylinder wrap.

MAKE SURE YOU: Consult maintenance or engineering personnel, the operating manual or the installer of the HWS.

QUESTION 14: Are there any hot water saving features installed in the building?

Yes No

If yes, specify which feature(s) below:

- AAA rated shower heads
- Hose trigger nozzles
- Automatic tap off
- Spring-loaded taps
- Twin flush toilets
- Other:

Improvement ideas and notes:.....
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→ The installation of water saving features such as AAA rated showerheads, aerators on taps, or in-tap flow regulators is recommended where appropriate, to minimise the use of water and energy. AAA rated showerheads are not suitable for use with instantaneous electric HWS and old instantaneous gas HWS. AAA rated showerheads are suitable for use in electric gravity fed HWS only if the flow rate of the current showerhead is greater than 9 litres per minute.

MAKE SURE YOU: Consult maintenance or engineering personnel.

QUESTION 15: Are separate hot and cold taps or single lever taps used in the building? Please tick the appropriate box below.

- Separate hot and cold taps
- Single lever mixing taps
- Mixture of types
- Other:

Improvement ideas and notes:.....
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→ Users should be reminded to ensure single lever taps are resting on the cold water side after use. Left on the warm or hot setting, single lever taps provide next users with hot water when they may not need it, causing unnecessary use of hot water. Therefore, the installation of separate hot and cold water taps may be beneficial.

→ Nevertheless, where warm rather than hot water is required regularly, single lever taps may be the more appropriate choice. In this case, ensure the tap has obvious positions for cold, warm and hot.

MAKE SURE YOU: Check all bathrooms, kitchens and other relevant outlets.

B: ENERGY AUDIT CHECKLIST



MAINTENANCE

QUESTION 16: Is the HWS maintained and serviced according to the manufacturer's instructions?

Yes No

Improvement ideas and notes:.....
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→ The HWS should be maintained and serviced according to manufacturers' instructions to ensure it is working efficiently.

MAKE SURE YOU: Consult the operating manual and the maintenance or engineering personnel.

QUESTION 17: How often is the HWS, including pipes and taps, checked for leaks or drips? Please tick the appropriate box below.

- Once per day
- Once per week
- Once per month
- Not checked
- Other:

Improvement ideas and notes:.....
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→ Regular inspections of the HWS including pipes and taps should be undertaken to ensure that leaks and drips are repaired as quickly as possible and do not go unnoticed.

MAKE SURE YOU: Consult maintenance or engineering personnel or maintenance or inspection schedules.

QUESTION 18: In what time frame are repairs undertaken? Please tick the appropriate box below.

- Within 24 hours
- Within a week
- Within a month
- Greater than a month

Improvement ideas and notes:.....
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→ Repairs to any part of the HWS should be undertaken as soon as possible to avoid the unnecessary loss of hot water and associated energy use.

MAKE SURE YOU: Consult maintenance or engineering personnel, or asset or defect management system.

PURCHASING

QUESTION 19: Are energy star ratings or other energy saving tools taken into account when purchasing equipment associated with hot water supply?

- Yes No

Improvement ideas and notes:.....
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- A HWS with a high energy star rating should be considered for purchase as it is the most energy efficient system and will result in long-term savings.
- Changes to issues like multiple HWS (see question 11), pipe length and diameter (see question 12), and installations (see questions 14 and 15) may only become viable when renovations or new buildings are being planned. Available options should be carefully reviewed, especially regarding solar hot water systems. These may be a major investment, but lead to significant savings and therefore pay back in just a couple of years.

MAKE SURE YOU: Consult purchasing procedures, policies or guidelines.

C: ENERGY EFFICIENCY ACTION PLAN

Note: As an alternative to using this action plan, you can also enter your energy efficiency actions as objectives and targets in an environmental management system, as a work order in your maintenance management system, or in another process that ensures nominated personnel complete the actions.

GOALS AND METHODS FOR ENERGY EFFICIENCY

Your energy efficiency goals

Example: "Reduce the energy use for lighting by 10% compared to last year's consumption." Be specific where possible taking into account technical, financial and operational inputs. Goals should be measurable where practicable.

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Your preferred energy efficiency options

Chosen from 'Improvement ideas and notes' in section B.

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Target completion date

Person responsible

Goal(s):.....

ACTION STEPS TO BE TAKEN *Specific steps needed to implement the preferred energy efficiency actions stated under 'goals and methods'.*

No.	Action	Person responsible	Due date	Date completed	Initials

COMPLETION *To be signed by person nominated under 'goals and methods'.*

Signature.....

Print Name

Title Completion Date.....

Please photocopy this form if additional action steps are required. Complete the page numbering and action numbering on all forms.

Page..... of.....

D: RESOURCES

National Energy Efficiency

A comprehensive guide to the latest Commonwealth, State and Territory regulations, standards and guides on energy efficient appliances
www.energyrating.gov.au

A SELECTION OF OTHER USEFUL LINKS

1. Home Greenhouse Audit Manual — Section 4: Identifying Key Areas for Greenhouse Savings in Energy.

Department of the Environment and Heritage, Australian Greenhouse Office.
<http://www.greenhouse.gov.au/coolcommunities/audit/section4.html>

2. Energy Smart Allies Directory.

Directory of suppliers of energy services and products including information regarding water saving features and types and installation of hot water systems (HWS) and their components.
www.energysmartallies.com/esa/middlesub.asp

3. Energy Smart Toolbox Component 2: Energy Saving Manual, Section 10.1.

NSW Department of Energy, Utilities & Sustainability,
WA Sustainable Energy Development Office.
Information about the types of HWS available and their energy efficiencies:
www.energysmart.com.au/sedatoolbox/esm101.asp

4. Sustainable energy info: Your home: Hot water.

Sustainable Energy Authority of Victoria (SEAV).
Provides information about different types and installation of HWS, energy rating labels, energy options, types of solar HWS, and tips for saving energy and water.
www.sustainable-energy.vic.gov.au/seinfo/your-home/hot%20water/index.asp

5. Energy efficiency and renewable energy for your home or small business — Water Heating.

US Department of Energy.
<http://www.eere.energy.gov/consumerinfo/factsheets.html#waterheat>

6. Energy Smart Housing Manual Chapter 9: Services Lighting & Appliances.

Sustainable Energy Authority of Victoria (SEAV).
Pages 93 to 97 of the manual provide information about the types of hot water systems available and how to select a suitable, energy efficient hot water system.
http://www.sea.vic.gov.au/buildings/housing_manual.asp#chapter9

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