ENERGY AND GREENHOUSE MANAGEMENT TOOLKIT

MODULE 2

HOW TO COMPLY WITH THE SEPP (AQM) ENERGY AND GREENHOUSE REQUIREMENTS

Victoria
The Place To Be

The *Energy and greenhouse management toolkit* is a Victorian Government initiative developed in partnership by EPA Victoria and the Sustainable Energy Authority Victoria, and funded through the Victorian Greenhouse Strategy.

EPA Victoria
EPA is a Victorian State Government statutory authority established to enable the safe clean and sustainable environment that Victorians seek. Based on a philosophy that prevention is better than cure, EPA Victoria takes an integrated approach to delivering its mission by providing environmental leadership, promoting public awareness and working with all sectors of the community. It also provides best practice guidelines and standards, together with regulation and policing where required.
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Sustainable Energy Authority Victoria
The Sustainable Energy Authority Victoria (SEAV) is a State Government statutory authority. SEAV's objective is to accelerate progress towards a sustainable energy future by bringing together the best available knowledge and expertise to develop leading-edge initiatives which provide Victorians with greater choice in how they can take action to significantly improve energy sustainability.
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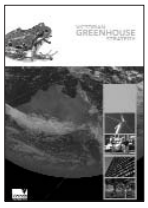

Victorian Greenhouse Strategy (VGS)
Climate change is an issue which impacts on the whole community, including individuals, business and all levels of government. If a truly sustainable solution is to be achieved, all members of the community must play their part. The VGS will facilitate the establishment of partnerships, and build capacity throughout the community for greenhouse action. The development of the VGS has benefited from extensive public consultation and is a significant first step on the long road to addressing the threat of climate change.
For further information visit www.greenhouse.vic.gov.au or call the Department of Natural Resources and Environment Customer Service Centre on 136 186.

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1. Overview

1.1 THE POLICY BACKGROUND

This module has been prepared to assist businesses and enterprises to comply with the greenhouse provisions of the State environment protection policy (Air Quality Management). The SEPP (AQM) implements a government commitment, reflected in the Victorian Greenhouse Strategy, to promote sustainable business practices by requiring greenhouse gas (GHG) and energy issues to be addressed in the EPA works approvals and licensing processes.

A Protocol for Environmental Management (PEM) on *Greenhouse gas emissions and energy efficiency in industry* has been issued as an incorporated document of the policy. The PEM specifies:

- the necessary steps to be taken by businesses subject to the EPA works approvals and licensing system to comply with SEPP (AQM) principles and provisions relating to energy efficiency and GHG emissions; and
- how EPA will assess compliance.

The greenhouse provisions apply to all EPA licence holders and works approvals applicants, not just those with direct air emissions.

This module complements the PEM by providing additional detail. The module focuses on two groups of enterprises:

- **Licence holders:** operators of **existing** premises or facilities that are licensed by EPA under the *Environment Protection Act* 1970 (the Act); and
- **Works approval applicants:** proponents or developers of **new** facilities or upgrades of existing facilities that require works approval and licensing under the act.

Figure 1 illustrates the basis of the GHG and energy management requirements specified in the SEPP (AQM) and PEM.

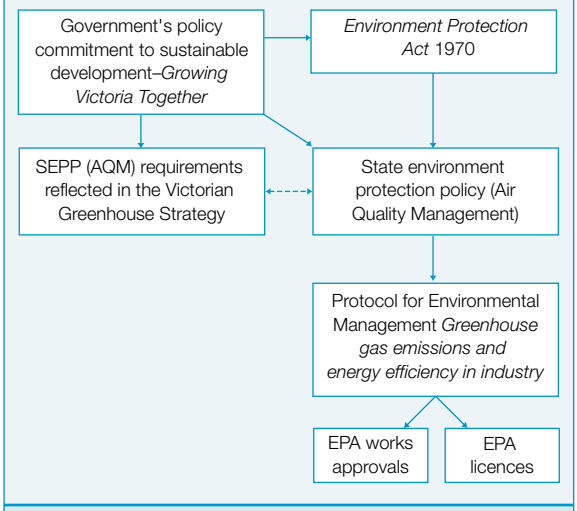

Figure 1

1.2 CONSISTENCY WITH EXISTING REGULATORY REQUIREMENTS

The works approval and licensing system is a well-established mechanism for facilitating improved environmental performance. In the past EPA has applied this system to the management of emissions, wastes and noise. It is now being applied to the management of energy and greenhouse gases.

The skills required to use this module and comply with the policy are no greater than those normally required to negotiate EPA's works approval and licensing process. There may be a need for some users to access expertise in energy management.

The requirements for greenhouse and energy management can be minimised through integration with existing environmental management programs, such as site Environment Improvement Plans (EIPs) and annual reports. EPA does not expect licence holders and applicants to duplicate systems and tools already in use at a site.

The specific skills, tools and information required for energy assessment and management can be acquired or developed in a variety of ways:

- using the guidelines, data, case studies and other material available in the Toolkit, other publications and on various websites;
- liaising with EPA, the Sustainable Energy Authority Victoria (SEAV) and other sources, or employing an energy/greenhouse consultant; and
- participating in existing greenhouse programs, such as the Australian Greenhouse Office (AGO) Greenhouse Challenge program.

These sources are discussed in later sections of this module and in *Module 7.*

1.3 THE BENEFITS OF COMPLIANCE

Improving energy efficiency can lead to significant cost savings. Some real-life examples of initiatives and savings are shown below. It should be clearly understood that EPA will not require pursuit of energy and GHG management options regardless of their costs or other implications. The technical and economic feasibility of options is a major consideration in determining whether they should be adopted. This is explained further in section 3.7.

In addition, adoption of cleaner production techniques can reduce waste disposal costs, decrease environmental risks, increase production efficiency and improve worker safety.

The Coles Supermarket Group in Victoria now saves $1 000 000 annually after the implementation of a new lighting system. The payback period is less than two years.

The Ford Motor Company of Australia Ltd is saving $22 000 per annum since upgrading their cooling system to use a Variable Speed Drive Control. The payback period is 1.2 years.

Since upgrading a number of compressed air systems, Holden Engine Operations is saving $388 000 per annum at its Port Melbourne manufacturing complex. The payback period is less than two years.

1.4 SUMMARY OF KEY STEPS FOR COMPLIANCE

Figures 2 and 3 summarise the key steps that works approval applicants and licence holders should take in complying with the policy, together with an estimate of the time necessary to complete each step. Additional detail is given in subsequent sections.

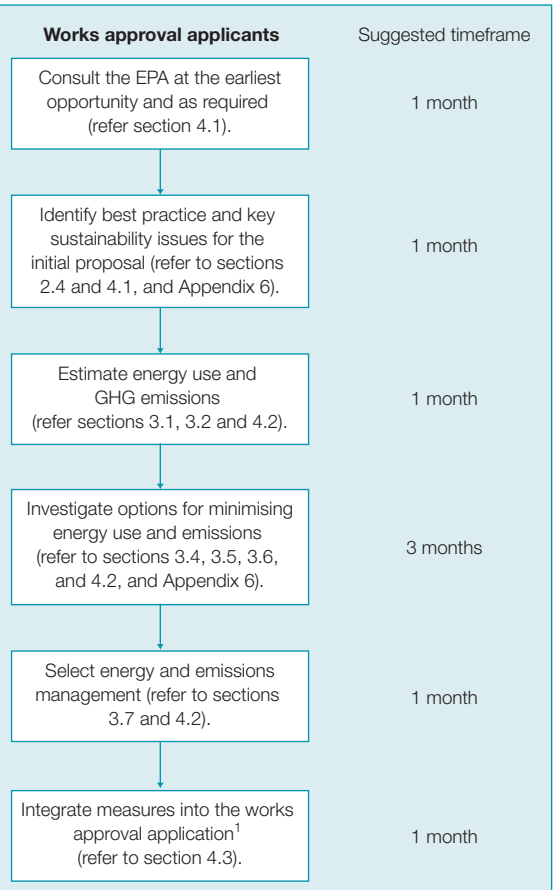

Figure 2

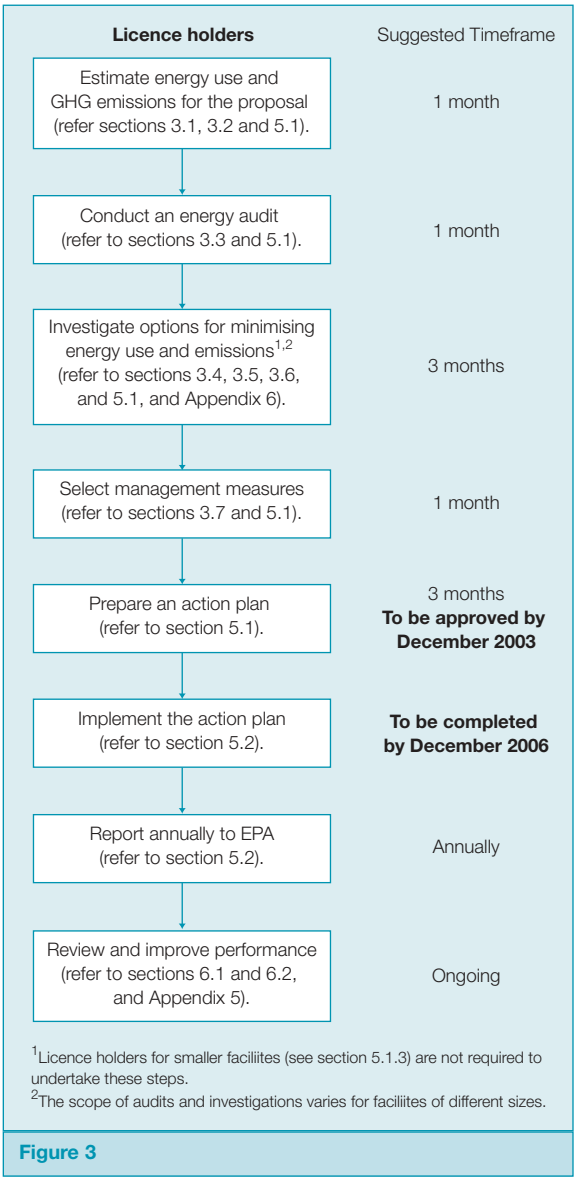

Figure 3

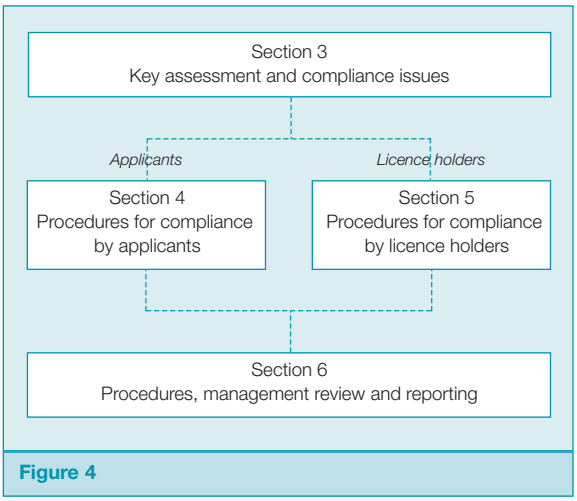

Figure 4

2. Contents of the module

The content of the subsequent sections of this module is illustrated and described in Figure 4.

Section 3 discusses the key assessment and compliance issues that are addressed in this module, including:

- estimating energy consumption and emissions;
- conducting energy audits;
- defining and adopting best practice;
- conducting an integrated assessment;
- assessing options for financial feasibility;
- prioritising and selecting measures for compliance; and
- using existing procedures, systems and standards.

The PEM specifies different requirements for applicants and licence holders. Separate procedures are presented in sections 4 and 5 respectively.

Section 4 describes the procedures that a proponent or developer should follow in project planning and the works approval process.

Section 5 presents two-stage procedures for licence holders comprising:

- development of an action plan for managing energy and GHGs; and
- implementation of the action plan.

Action plans for all existing licence holders must obtain EPA approval by December 2003 and be implemented by December 2006.

Section 6 outlines approaches to managing an enterprise's ongoing obligations under the PEM, including requirements for periodic review of performance and regular reporting to EPA.

Appendix 1 and Appendix 2 are worked examples of compliance documentation procedures. Appendix 3 lists abbreviations used throughout this module. Appendix 4 contains definitions of key terms used. The objectives and key requirements of the PEM are summarised in Appendix 5, and a description of the works approval and licensing system is provided in Appendix 6. Appendix 7 explains the policy goal of business sustainability, and provides guidance on the development of sustainable proposals. Appendix 8 discusses the policy requirement of continuous improvement in environmental performance.

3. Key assessment and compliance issues

This section provides an overview of key assessment and compliance issues under the SEPP (AQM) and PEM and indicates where additional assistance can be found.

3.1 SELECTING A BOUNDARY

In order to estimate energy consumption and emissions, a 'boundary' for the proposal, facility or operation needs to be selected. This is not so much a physical boundary as a means of deciding what activities or emission sources to include in the estimation.

The boundary must always encompass:

A. Emissions (including non-energy related emissions) and direct energy use at the site that is the subject of the works approval application or licence; and

B. Emissions associated with off-site generation of electricity consumed at the site.

It may also be appropriate to include other emissions associated with 'upstream' or 'downstream' activities in the business chain or product lifecycle. For example, there may be two options to achieve a desired result at the site. The first option may not be as efficient as the second but the second option may require a product to be transported to another site. The energy use and carbon dioxide emissions due to the first option may be compared with those for the second option plus its transport component to indicate which option has the lowest overall energy use and emissions. In this case, the boundary would be the subject site plus the transport required to move the product to the second site and may be used to help justify one option over the other.

As a general rule, if a project or development decision (e.g. a choice from a range of development options or processes) may affect the type or amount of energy used or off-site emissions that are generated, then the relevant facilities or activities should be included in the boundary. If there is uncertainty about whether to include particular off-site energy and emissions, this should be discussed with EPA.

Businesses are encouraged to consider the boundary within the broader context of enhancing business sustainability (see Appendix 7). The boundary in this case would go beyond the facility or activity to consider where feasible:

- the 'upstream' impacts associated with the production, distribution and handling of resources, materials and other inputs; and
- the 'downstream' impacts of the marketing, distribution, handling and use of products, and the disposal of wastes and products at the end of their useful lives.

Module 3 provides reference to tools that assist in the measurement of business sustainability and ecological impact.

3.2 ESTIMATING ENERGY CONSUMPTION AND EMISSIONS

Both applicants and licence holders must estimate energy consumption (in gigajoules) and GHG emissions (expressed as 'carbon dioxide equivalent'). The unit 'carbon dioxide equivalent' (CO_2-e) refers to the amount of carbon dioxide that has an equivalent greenhouse potential—this provides a means of comparing the warming effects of different amounts of different greenhouse gases.

A variety of methodologies are available for undertaking these estimates.

For more information on emission methodologies and conversion factors refer to *Module 3*, Appendix 3, sourced from the AGO publication *Greenhouse Challenge: Factors and methods workbook*. The full version of this booklet is available from the AGO at www.greenhouse.gov.au/challenge/html/member-tools/member_tools.html

For emissions estimation methodologies and conversion factors for greenhouse gas emissions generated from landfills and wastewater treatment facilities, refer to the *Environmental guidelines for reducing greenhouse gas emissions from landfills and wastewater treatment facilities*, (publication 722) and the *Greenhouse emission model for effluent streams* (Excel-based calculator) available on the EPA website www.epa.vic.gov.au or by calling (03) 9695 2722.

The application of these and other methods is discussed in more detail in *Module 3*. Whatever method is chosen, it is important to document the approach used and the assumptions made in producing the estimates.

Estimating energy consumption and GHG emissions may require data relating to:

- electricity consumption;
- natural gas or LPG consumption (stationary or non-transport use);
- the generation and distribution of public electricity supplies;
- the combustion of other fuels;
- the production and distribution of coal, gas and petroleum products;
- industrial processes, including the use of refrigerants and solvents;

- the operation of landfills and wastewater treatment facilities; and/or
- other sources.

3.3 CONDUCTING ENERGY AUDITS

Licence holders at energy and greenhouse-intensive facilities must conduct an energy audit. The audit will determine whether overall energy use is excessive and will establish benchmarks for monitoring and future investigations. Energy audits are not required for smaller facilities (see section 4.2.3), but may be undertaken voluntarily to identify potential areas of energy cost reduction.

The recommendations of an energy audit are best implemented through an energy management system, which can be integrated into existing environmental management programs. Energy management systems are discussed in more detail in *Module 4*.

3.4 DEFINING AND ADOPTING BEST PRACTICE

The policy requires licence holders and applicants to adopt **best practice** in developing actions, plans and proposals for minimising energy use and GHG emissions. Best practice means adopting the best combination of **eco-efficient** (see definition in Appendix 4) techniques, methods, processes or technology used in an industry sector or activity that demonstrably minimises the environmental impact of a generator of emissions in that industry sector. It will always involve following the requirements of the PEM.

Guidance on the identification of best practice and relevant case studies is included in *Module 5.* Additionally, there is extensive information on best practice in energy efficiency and the management of greenhouse gas emissions available from sources discussed in *Module 5* and *Module 7.*

3.5 CONDUCTING AN INTEGRATED ASSESSMENT

The Act requires an integrated approach to environmental management. This means that the full range of environmental issues, as well as economic and social factors, should be considered in assessing development options for new proposals or improving the environmental performance of existing facilities.

Energy and greenhouse reduction options should be assessed to ensure they will not cause unacceptable impacts in other areas. For example, a proposal to reduce energy consumption may increase water usage. In this case a balanced assessment of the overall impact should be undertaken.

In many cases an integrated approach can offer benefits which enhance the long-term sustainability of a business, and these benefits often provide the driving force behind improvements in environmental performance and resource management.

The pursuit of best practice and improved performance in accordance with the policy should therefore be undertaken as part of an overall, integrated assessment of energy, other resources, environmental, technical, economic and social factors. These factors collectively determine the 'sustainability' of a project or operation (see Appendix 7).

3.6 ASSESSING OPTIONS FOR FINANCIAL FEASIBILITY

Options for managing energy use and GHGs should be assessed for financial feasibility as part of the development of proposals and action plans. Detailed guidance on the assessment of financial feasibility is provided in *Module 6*.

The primary criterion for these assessments is the investment's **payback period**. This should be calculated to take into account savings in energy bills, operational costs and improved productivity. A general benchmark of three years payback time is used for **energy-related emissions**. That is, EPA will expect the implementation of any proposal or identified option with a payback period of less than three years. For **non-energy related emissions,** EPA will consider financial feasibility on a case-by-case basis.

Some companies may be more familiar with alternative methods for assessing project financial feasibility, such as Internal Rate of Return (IRR) or Net Present Value (NPV). It is expected that these will be converted to payback period for the purposes of demonstrating compliance with the policy, using the current bank bill rate. There may be some flexibility to use an alternative assessment method if a company is able to provide sufficient justification. A payback period of three years will typically correspond to an IRR of 31% (assumes project lifetime of ten years).

For assets having an expected life span of more than ten years, a payback period exceeding three years may still deliver a favourable return on investment. In these cases EPA will expect a detailed cost analysis of the project over its life to be undertaken and for the results to be expressed in IRR and NPV. Decisions on which actions should be carried out will be negotiated on a case-by-case basis by the enterprise and EPA.

Some case studies are summarised in section 1.3, and detailed case studies can be found in *Module 5*.

3.7 PRIORITISING AND SELECTING MEASURES FOR COMPLIANCE

Options for minimising or managing energy and GHG emissions must be assessed, compared and prioritised for inclusion in a proposal (for works approval) or action plan (for an existing facility).

The criteria for comparing and prioritising options should include:

- the relative size or significance of potential energy savings or emissions reductions;
- the cost-effectiveness of options (energy savings or emission reductions per dollar invested);
- the payback time for implementation (see section 3.6);
- expected performance against best practice benchmarks (see section 3.4);
- expected performance against sustainability criteria (see Appendix 7); and
- the acceptability of any impacts on other segments of the environment or natural resources (see section 3.5).

Other criteria may be appropriate for particular applications.

While proposals and action plans should seek to maximise positive outcomes, it is important that investigations focus primarily on areas where the most benefit can be gained. Assessment of options to reduce very small energy uses or small sources of emissions may suffer from the principle of diminishing returns (i.e. the effort involved in developing and implementing measures may not be justified by the benefits that can be realised). Any decision not to assess such options should be documented and justified.

To ensure consistency and equity, all enterprises must undertake a thorough assessment that is appropriate to their circumstances. It is recognised that the outcomes will vary on a case-by-case basis. EPA should be involved in deliberations regarding the relative merits of different options, especially where case-by-case determinations (e.g. for payback period) are required.

In summary, the PEM seeks the implementation of cost-effective approaches, measures and solutions that will not be technically or economically burdensome. If a sufficiently thorough and rigorous assessment of options is undertaken, the best measures for implementation should 'recommend themselves'.

3.8 USING EXISTING PROCEDURES, SYSTEMS AND STANDARDS

Users of this module are not expected to 're-invent the wheel'. A great deal of work has already been done and a wide range of methods developed to assist businesses and enterprises to manage their energy use and GHG emissions.

In some cases energy saving and GHG reduction policies and measures may have already been adopted by licence holders and applicants through other programs such as the Greenhouse Challenge and Energy Efficiency Best Practice programs. Assessments and actions taken under these programs will be taken into account in determining compliance with policy requirements.

Similarly, actions taken to comply with SEPP (AQM) and the PEM are best integrated into current site management systems, particularly those produced under EPA requirements or guidance. Energy and greenhouse action plans can be incorporated into existing site EIPs. Existing management systems, such as those established in accordance with ISO 9001 or ISO 14001, may also be used as a foundation for compliance.

Duplication of assessment and reporting requirements can, and should, be minimised. For example, the reporting requirements of the PEM can be integrated with facility reporting of annual energy consumption for the National Pollutant Inventory.

4. Procedures for compliance by applicants

This section describes the compliance procedures to be followed by applicants for works approval in their project planning and application process. These procedures are illustrated in the flowchart in Figure 5.

It is anticipated that the process outlined in this section will typically take the better part of one year (see Figures 2 and 3 in section 1.4). Applicants should make sure sufficient time is allocated and that energy and greenhouse management is considered in the early period of project development.

Where a works approval application is for new works at a licensed site, the applicant may need to undertake activities described in both this section and section 5.

Applicants seeking EPA approval for a research, development and demonstration (RD&D) proposal under section 19D of the Act are not required to comply with the PEM requirements. However, RD&D applicants should consider GHG emissions and energy efficiency in the application and should fully assess the project's greenhouse impacts and energy consumption in the trial outcome report.

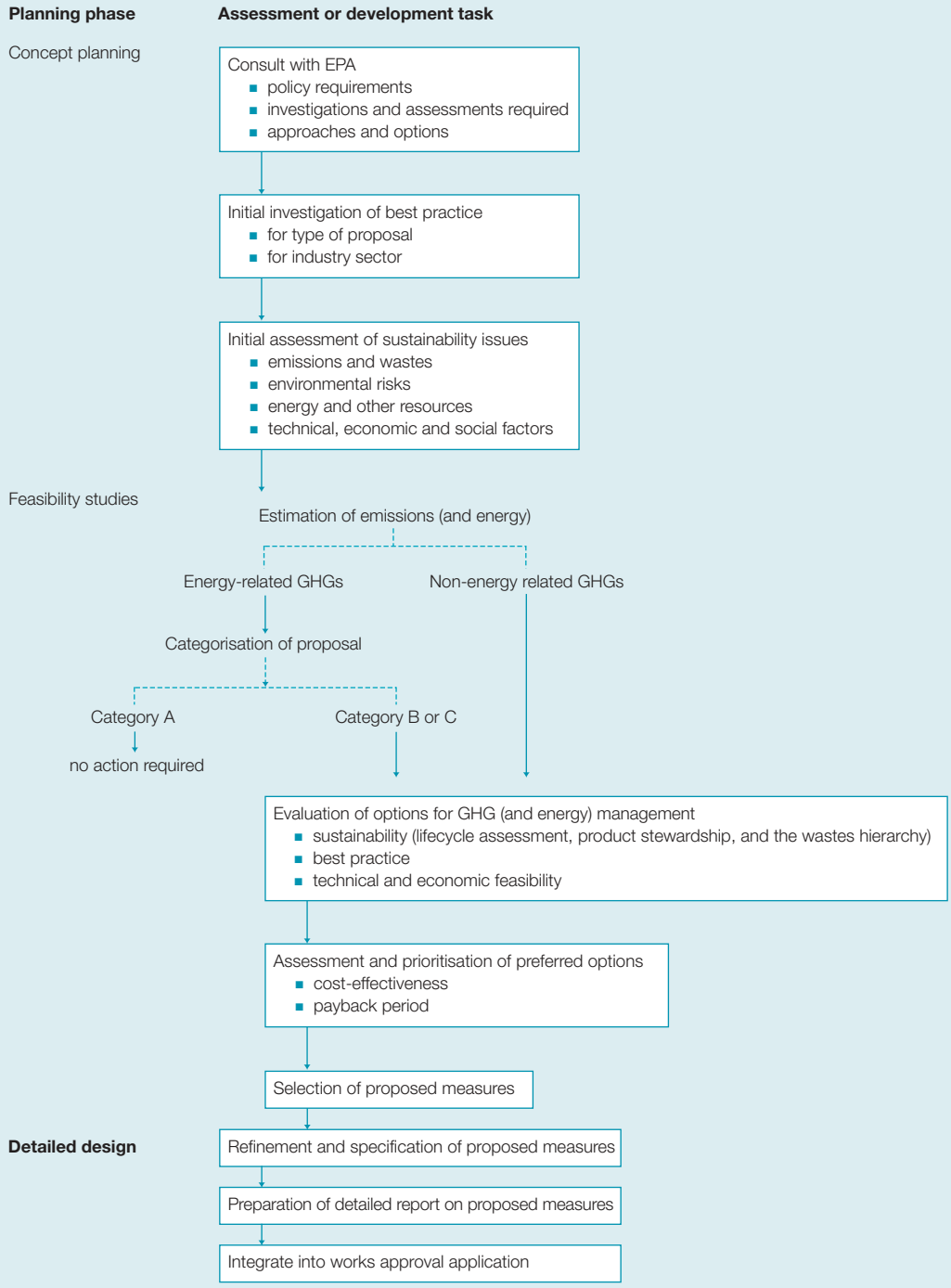

Figure 5: Procedures for compliance by works approval applicants

4.1 PROCEDURES AT THE CONCEPTUAL PLANNING STAGE

The initial concept or outline for a new project is usually developed from a conceptual planning process, pre-feasibility study or similar exercise. At this stage the project concept is likely to include a range of **options** for the siting, design or operation of the project, each having different environmental implications. These implications should be fully explored and documented.

Proponents intending to engage an environmental consultant or auditor to assist with their project planning and works approval application are advised to appoint early so that high quality environmental guidance is obtained at the conceptual planning stage.

The proponent should undertake the following tasks in parallel with the development and refinement of the initial project concept.

4.1.1 Consult with EPA

EPA should be consulted as early as possible for confirmation of energy and GHG emission management requirements. Discussions with EPA may be needed at several points in the project planning process to progressively interpret and refine these requirements.

A submission is more likely to be accepted first time around if advice provided during EPA consultations is acted upon when preparing the submission. Early consultation with EPA may therefore save significant time and effort.

4.1.2 Initial investigation of best practice

The proponent should **establish an understanding of best practice** in environmental and resource management specific to the **type of project** and the **relevant industry or sector**. For GHG and energy management, guidance on the assessment and implementation of best practice is provided in *Module 5.*

The proponent may wish to consult industry bodies, energy consultants and other local and overseas sources to develop an appreciation of the latest available practices and technologies. Any conclusions drawn from these investigations should be verified with EPA as part of the ongoing consultation process.

More detailed assessment of best practice is required at the subsequent feasibility study stage.

4.1.3 Initial assessment of sustainability issues

The proponent should **conduct an initial assessment of sustainability issues** (in general) and GHG and energy issues (in particular) for the proposal. Appendix 5 provides an explanation of business sustainability requirements and guidance on the development of sustainable proposals.

Broad options for minimising energy consumption and GHG emissions should be generated and evaluated, as part of a wider initial assessment of options for minimising emissions, wastes, risks and resource consumption. EPA should be consulted about the findings of these investigations.

More detailed assessment of sustainability issues is required at the subsequent feasibility study stage.

4.1.4 Refine the project concept

The previous tasks may lead to some refinement or redefinition of the initial project concept. This should provide a useful foundation for the adoption of best practice and more sustainable solutions in the detailed planning work that will follow.

4.2 PROCEDURES AT THE FEASIBILITY STUDY STAGE

The feasibility studies for a project normally involve a more detailed analysis of financial, technical and logistical aspects, including a comparative assessment of development options and a progressive refinement of the project design. Decisions during this phase of project planning should enable the proponent to:

- estimate the likely energy requirements (and associated GHG emissions) associated with the proposal;
- where applicable, estimate the likely non-energy related GHG emissions;
- investigate and assess options for managing energy and GHG emissions; and
- develop specific measures for energy and GHG management to be incorporated in the project concept and, subsequently, the works approval application.

4.2.1 Define the project boundary

The first task in developing energy and emissions estimates is **to define the effective 'boundary' of the project** for the purpose of estimating energy consumption and emissions. Section 3.2 provides guidance on this task.

The key assumptions made in defining this boundary should be discussed with EPA, and documented in the works approval application.

4.2.2 Estimate energy and emissions

When the project boundary is finalised, annual energy consumption and corresponding GHG emissions should be estimated for each energy type or source. Non-energy related emissions should be calculated separately. (A list of the main types of GHGs is provided in Appendix 4.)

In estimating the likely energy consumption of a new facility, a variety of standard techniques may be used including:

- summing estimates based on specific items of equipment (calculated through output ratings, load profiles, energy demand, estimated hours of operation); or
- 'global' estimates derived by modifying or scaling existing data on energy consumption in similar plants or facilities elsewhere.

Energy and emission estimation is introduced in section 3.2 and discussed in detail in *Module 3*.

Table 1				
Criteria		**Category**	**Typical annual energy bills in category**	
			Electricity	*Gas*
Energy consumption **or** GHG emissions	< 500 GJ/yr < 100 t CO_2-e/yr	A	< $10 000	< $3000
Energy consumption **or** GHG emissions	500–7000 GJ/yr 100–1400 t CO_2-e/yr	B	> $10 000	> $3000
Energy consumption **and** GHG emissions	> 7000 GJ/yr > 1400 t CO_2-e/yr	C	> $100 000	> $42 000

4.2.3 Categorise the proposal

Proposals are to be categorised based on projected energy consumption and energy-related GHG emissions are shown in Table 1. GHG emissions unrelated to energy consumption do not need to be used in categorising proposals.

A proposal falls within Category A if **either** its estimated energy consumption **or** energy-related GHG emissions fall below the relevant threshold. Consequently, a proposal projecting 400 GJ/yr and 120 t CO_2-e/yr would be in Category A rather than B.

There are different requirements for addressing energy consumption and energy-related GHG emissions depending on a proposal's category. This is discussed in the following section.

4.2.4 Develop energy and emissions management measures

Table 2 summarises the requirements of different categories of proposal in relation to developing measures to manage energy and energy-related emissions.

Table 2	
Proposal category	**Requirement**
Category A	No requirement
Category B	Develop measures for managing energy and energy-related GHG emissions
Category C	Develop measures for managing energy and energy-related GHG emissions

Proponents of **Category B and C** proposals are required to **assess options and develop measures** for managing energy use and energy-related GHG's. There is no such formal requirement for **Category A** proposals, but these works are recommended to all proponents in the interests of maximising the benefits of sustainability and energy efficiency for the environment and proponents.

The process for assessing options and developing measures should include the following steps:

- assess options for sustainability, feasibility and policy compliance;
- select preferred options for further evaluation;
- define best practice for these preferred options;
- assess the cost-effectiveness and payback period of best practice options (see section 3.6);
- prioritise preferred options on the basis of these assessments (see section 3.7); and
- select measures for inclusion in the project proposal.

Detailed assessments of sustainability and best practice are to be conducted at this time, focussing on specific products, processes, activities, materials or items of equipment. This contrasts with the initial assessments undertaken at the conceptual planning stage (see section 4.1), which are concerned with the proposal as a whole in the context of the industry type or sector. Advice on undertaking a detailed assessment of sustainability is given in Appendix 7.

Proponents may wish to draw upon relevant investigations, commitments and actions they have taken under other greenhouse and energy management programs, such as the AGO Greenhouse Challenge program. For example, the proposal may relate to the modification or expansion of a facility for which energy reduction measures have already been identified or implemented. These prior actions should be discussed with EPA to allow confirmation of the extent of any additional investigations or assessments required for the works approval application.

4.2.5 Develop measures for managing other emissions

All proposals involving the generation of non-energy related GHG emissions must develop measures for managing and minimising these emissions using a similar process to that described above. Options should be assessed and compared for sustainability, feasibility, and policy compliance. Best practice should be identified and options should be ranked and selected based on cost-effectiveness.

4.2.6 Document the process

The proponent should ensure that the investigation process and outcomes are documented for subsequent inclusion in a works approval application.

4.3 PROCEDURES AT THE DETAILED DESIGN STAGE

Once the key development decisions have been made, the proponent will be able to undertake detailed design and costing of the proposal, including facility layout and selection of plant and equipment. The works approval application should be prepared during this phase of the project.

4.3.1 Refine measures

As detailed design and procurement decisions are made and more specific information becomes available, the proponent should refine measures and update documentation as appropriate.

4.3.2 Prepare works approval application

When all necessary information is available, documentation on GHG emission and energy management measures should be incorporated into a works approval application. This must clearly demonstrate compliance with the policy and must specify any understandings reached with EPA about actions taken under other greenhouse programs.

Suggested outline of works approval application sections on GHG emission and energy management

1. Estimation of energy consumption and related emissions
2. Estimation of non-energy related emissions
3. Categorisation of the proposal
4. Commitments and actions taken through other greenhouse programs (where applicable)
5. Assessment of options and development of measures
   - generation and evaluation of options
   - definition of best practice for preferred options
   - assessment and prioritisation of preferred options
   - selection of measures for implementation
   - description of proposed measures and their effectiveness
6. Demonstration of compliance with PEM and policy requirements

If an auditor has been engaged to assess whether the application complies with EPA requirements, the auditor will need to advise on the adequacy of the above investigations and the report.

5. Procedures for compliance by licence holders

This section outlines the procedures that licence holders should follow to comply with the PEM and policy requirements. These procedures are illustrated in Figure 6.

Licence holders are required to take action in two stages:

- develop an action plan to manage energy and GHG emissions; and
- implement the action plan.

It is anticipated that the time required for the first stage may be typically around one year (including approval time). Approval is required by December 2003. The time taken for the second stage will vary widely depending on the actions to be undertaken. Implementation is required to be complete by December 2006.

5.1 PROCEDURES FOR DEVELOPING THE ACTION PLAN

5.1.1 Define the operation boundary

The first task in developing an action plan is **to define the effective 'boundary' of the operation** for the purpose of estimating energy consumption and emissions. Section 3.2 provides guidance on this task.

The key assumptions made in defining this boundary should be discussed with EPA, and documented in the report to EPA (see clause 5.1.7).

5.1.2 Estimate energy and emissions

When the operation boundary is finalised, annual energy consumption and corresponding GHG emissions should be estimated for each energy type or source. Non-energy related emissions should be calculated separately. (A list of GHGs is provided in Appendix 4.)

Actual data and records should be used as a basis for these calculations (e.g. power bills, fuel and material usage records).

Energy and emission estimation is introduced in section 3.2 and discussed in detail in *Module 3.*

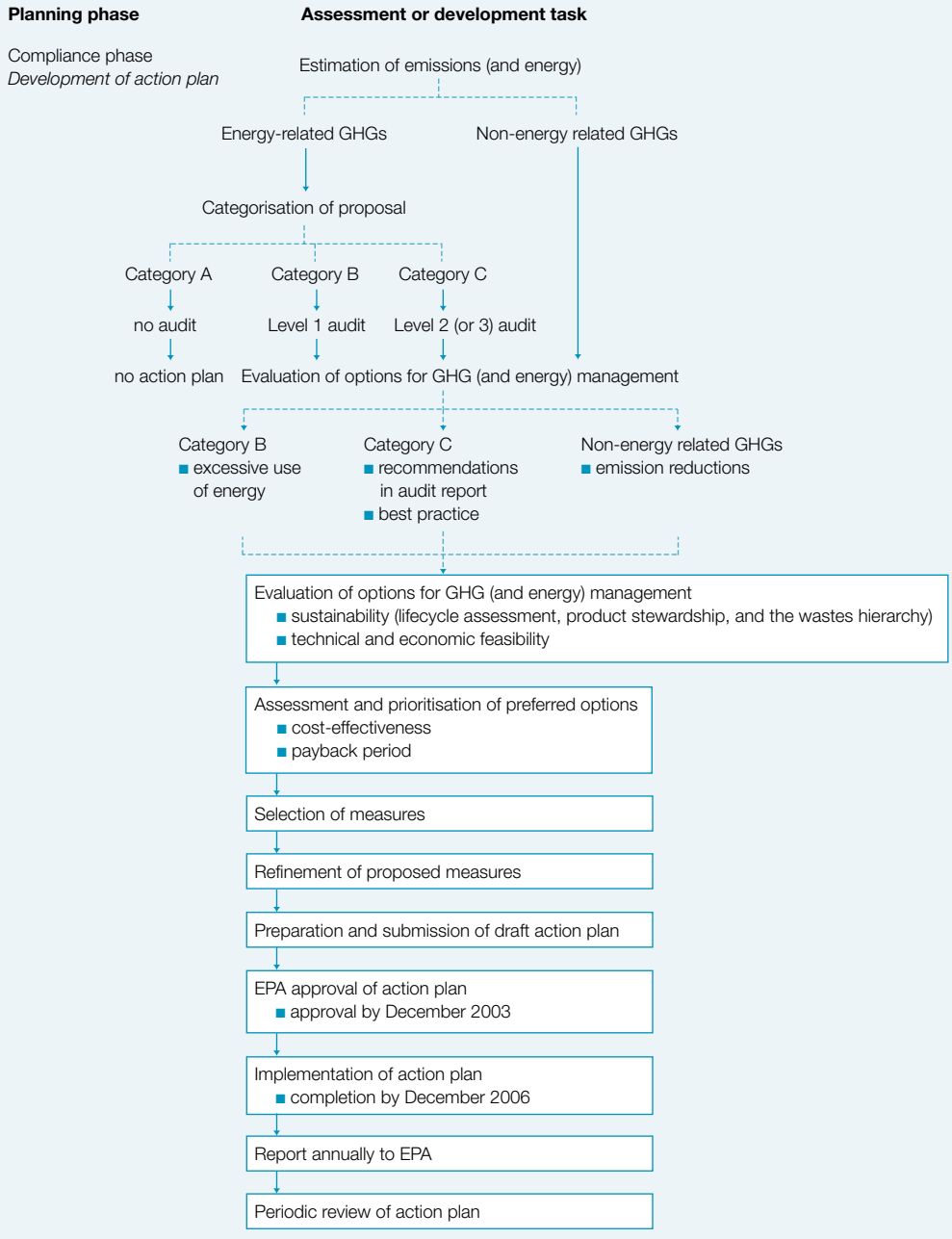

Figure 6: Procedures for compliance by licence holders

Table 3

Criteria		Category	Typical energy bills in category	
			Electricity	*Gas*
Energy consumption **or** GHG emissions	< 500 GJ/yr < 100 t CO_2-e/yr	A	< $10 000	< $3000
Energy consumption **or** GHG emissions	> 500 GJ/yr, < 7000 GJ/yr > 100 t CO_2-e/yr, < 1400 t CO_2-e/yr	B	$10 000 to $100 000	$3000 to $42 000
Energy consumption **and** GHG emissions	> 7000 GJ/yr > 1400 t CO_2-e/yr	C	> $100 000	> $42 000

Table 4

Facility category	Energy audit* requirement	Action plan requirement
Category A	No requirement	No requirement
Category B	Level 1 audit	Prepare and implement plan if energy consumption is excessive
Category C	Level 2 audit (minimum)	Prepare and implement plan

* as defined in Australian Standard AS/NZS 3598:2000 Energy Audits.

5.1.3 Categorise the facility or premises

Operations are to be categorised based on projected energy consumption and energy-related GHG emissions as shown in Table 3. GHG emissions unrelated to energy consumption do not need to be used in categorising proposals.

A proposal falls within Category A if **either** its estimated energy consumption **or** energy-related GHG emissions fall below 500 GJ/yr or 100 t CO_2-e/yr. Similarly, proposals not in Category A are allocated to Category B if either energy or energy-related emissions fall below 7000 GJ/yr or 1400 t CO_2-e/yr. Consequently, a proposal projecting 400 GJ/yr and 120 t CO_2-e/yr would be in Category A rather than B, and a proposal with 6000 GJ/yr and 1500 t CO_2-e/yr would similarly be allocated to Category B. A proposal falls into Category C only if the estimates exceed both 7000 GJ/yr and 1400 t CO_2-e/yr thresholds.

Depending on a proposal's category, there are different requirements for energy and GHG emission management. These are summarised in Table 4 and discussed in the following sections.

5.1.4 Conduct an energy audit

Energy audits must be conducted in compliance with the Australian Standard AS/NZS 3598:2000. This describes three levels of energy audit as follows.

- **Level 1 audit**—provides an overview of energy consumption for the previous 24 months. It indicates whether energy use is excessive and provides benchmark data that can be used to determine if additional auditing is required.
- **Level 2 audit**—investigates energy consumption in more detail by conducting an energy use survey. This estimates energy consumption for various energy types and sources (typically to an accuracy of ± 20%). This level of audit also identifies areas for potential energy savings and analyses and prioritises options for reducing energy consumption or increasing energy efficiency. Recommendations and an implementation plan are developed from these options. Costs and potential savings are identified.
- **Level 3 audit**—includes all of the components of a Level 2 audit but usually analyses energy usage to higher levels of time resolution and accuracy (± 10%). A Level 3 audit can target individual processes or items of plant or equipment. It includes an investment analysis for its recommended implementation plan and proposes changes to energy policies and programs. Increased cost savings are likely to result from a Level 3 audit.

Category A facilities are generally smaller premises and are not required to undertake an audit. However, a Level 1 audit is recommended since this may lead to efficiency savings and establish useful benchmarks for any future investigations.

Category B facilities must undertake a Level 1 audit.

Category C facilities can choose to undertake either a Level 2 or Level 3 audit.

Some enterprises may have undertaken energy audits previously, perhaps as part of commitments under other greenhouse and energy management programs such as the AGO Greenhouse Challenge program. Licence holders that have undertaken energy audits consistent with the standard subsequent to 1 January 1999 and that have implemented recommendations of that audit can use this to demonstrate compliance.

Audits and actions undertaken prior to this date may also be used to demonstrate compliance—EPA will consider this on a case-by-case basis taking into account:

- the audit date, level and findings;
- the actions taken since the audit;
- the degree to which industry best practice is carried out at the facility; and
- any other matters that EPA considers relevant.

In each case, the audit findings and subsequent actions must be documented and submitted to EPA in accordance with the guidance given in subsequent sections.

5.1.5 Develop energy and emissions management measures

Category A facilities are not formally required to prepare an action plan but are advised to address any identified excessive energy use so potential energy cost savings can be realised.

Category B facilities must take the following steps:

1. identify and analyse the causes of excessive energy use;
2. generate options for eliminating or minimising this excessive use;
3. assess these options for sustainability, feasibility, and policy compliance;
4. select preferred options for further evaluation;
5. assess preferred options for cost-effectiveness and payback period (see section 3.6);
6. prioritise preferred options on the basis of these assessments (see section 3.7); and
7. select measures and document in an action plan.

Category C facilities must take the following steps:

1. research current best practice in the management of energy and GHG emissions within the industry sector, including benchmarks for key processes and activities;
2. compare current processes, equipment, operations and activities with industry best practice in energy and GHG emission management;
3. generate options for upgrading the facility or premises to achieve best practice;
4. evaluate the recommendations of the energy audit;
5. generate options for reducing energy consumption and resulting GHG emissions;
6. assess the above options for sustainability, feasibility, and policy compliance;
7. select preferred options for further evaluation;
8. assess preferred options for cost-effectiveness and payback period (see section 3.6);
9. prioritise preferred options on the basis of these assessments (see section 3.7); and
10. select measures and document in an action plan.

Adopted measures should be integrated into existing development plans and management programs, especially any environmental improvement plan that has been developed for EPA compliance purposes or resolution of an existing environmental problem.

Licence holders may wish to draw upon relevant investigations, commitments and actions they have taken under other greenhouse and energy management programs, such as the AGO Greenhouse Challenge program. These prior actions should be discussed with EPA to allow confirmation of the extent of any additional investigations or assessments required for the works approval application.

5.1.6 Develop measures for managing other emissions

All licence holders that generate other GHG emissions are also required to investigate options and develop measures for reducing these emissions irrespective of their size. The assessment should include the following steps:

1. generate options for avoiding or minimising emissions;
2. assess these options for sustainability, feasibility and policy compliance;
3. select preferred options for further evaluation;
4. assess preferred options for cost-effectiveness and payback period (see section 3.6);
5. prioritise preferred options on the basis of these assessments (see section 3.7); and
6. select measures and document in an action plan.

Where appropriate, lifecycle assessment, product stewardship and the wastes hierarchy should be applied in the generation and assessment of options.

As with the energy-related improvement measures, the selected measures should be integrated with a licence holder's development plans, existing programs and environmental improvement plan, where applicable. Any proposed reliance on action taken under other programs should be discussed with EPA.

5.1.7 Prepare and submit a report to EPA

Licence holders who are required to develop measures for managing energy and GHG emissions must obtain EPA approval for their action plan. The plan should be submitted within an energy and greenhouse gas management report that documents all stages of the work undertaken towards developing the plan.

Action plans for all existing licence holders need to be approved by December 2003. Draft reports should therefore be submitted several months before this deadline to allow time for EPA review and for making any amendments to the plan that EPA may require. However, EPA hopes to be able to approve many action plans well in advance of this date, and therefore invites early submission of these draft plans.

A recommended format for the energy and greenhouse gas management report is shown below. There will be some differences between the reports from Category B and Category C facilities—the former should focus mainly on excessive energy use whereas the latter should address best practice and should respond to all of the outcomes of the more rigorous Level 2 (or Level 3) audit.

Suggested outline of the report on GHG and energy management

1. Estimation of energy consumption and related emissions
2. Estimation of non-energy related emissions
3. Categorisation of the facility
4. Report on the energy audit
5. Commitments and actions taken through other greenhouse programs (where applicable)
6. Assessment of options and development of measures
   - ☐ analysis of audit findings on excessive energy use (Category B)
   - ☐ evaluation of audit findings and recommendations (Category C)
   - ☐ comparison of current operations with best practice in the industry (Category C)
   - ☐ generation and evaluation of improvement options
   - ☐ definition of best practice for preferred options (Category C)
   - ☐ assessment and prioritisation of preferred options
   - ☐ selection of measures for implementation
   - ☐ description of proposed measures and program for implementation

5.2 PROCEDURES FOR THE IMPLEMENTATION PHASE

5.2.1 Implement the action plan

Licence holders are required to complete implementation of the action plan by December 2006. This deadline provides considerable flexibility for licence holders to program implementation to maximise convenience, efficiency and cost-effectiveness.

A later date for completion may be negotiated with EPA if this would enable measures to be implemented in association with a planned major upgrade or redevelopment of a plant or facility.

5.2.2 Report to EPA

Enterprises that have an approved action plan are required to report to EPA annually, describing:

- current estimates of energy consumption and GHG emissions;

- measures taken over the previous year to reduce energy use and GHG emissions (in accordance with the approved action plan); and
- measures proposed for the forthcoming year, including any proposed changes or additions to the action plan.

Most licence holders are already required to submit an annual report to EPA on other matters. It is expected that energy and GHG management issues will be integrated into this report. This means that the first energy and GHG management report may need to be submitted less than 12 months from approval of the action plan.

Module 4 provides guidance on reporting procedures as part of an energy management system. An example of the annual reporting procedure is given in Appendix 2.

6. Procedures for management, review and reporting

This section provides preliminary guidance on policy expectations relating to management of energy and GHG emissions, periodic review of progress and reporting procedures. These expectations apply to licence holders as well as to successful works approval applicants, where these enterprises were required by policy to develop energy management measures.

6.1 MANAGEMENT SYSTEMS

Wherever possible, energy and greenhouse management systems should be incorporated into existing site systems such as **environment improvement plans** or management programs developed in accordance with ISO 9001 and ISO 14001.

Advice particular to energy management systems is given in *Module 4*. An energy management system should incorporate:

- energy conservation strategies;
- energy efficiency strategies;
- a responsibility matrix for implementation of strategies;
- a reporting system to monitor and track energy consumption such as the *Energy Smart Tracker* software;
- a system for maintaining records; and
- reporting requirements.

6.2 REVIEW PROCEDURES

Periodic review is required of energy use and GHG emissions and their management. The purposes of the review are to:

- enhance business sustainability (see Appendix 7); and
- pursue continuous improvement (see Appendix 8).

In this context, continuous improvement involves an examination of current best practice, an investigation of further options and the development of new measures for energy efficiency and GHG management.

Reviews should broadly follow the approach outlined in section 5 and should be fully documented. A review should be seen as an opportunity to improve the performance and efficiency of a facility or operation. Appendix 8 discusses improvement opportunities that may arise during the course of normal operations.

6.3 REPORTING PROCEDURES

Wherever possible, energy and greenhouse management reporting should be incorporated into existing reporting systems such as annual reports to EPA or internal annual reports.

It is important that adequate documentation is produced to show compliance with policy requirements. Energy audit reporting requirements are detailed in AS/NZS 3598:2000. Outlines of relevant reports and action plans are provided in sections 4.3.2 and 5.1.7 of this module.

6.4 OTHER ACTIONS

In addition to the requirements discussed in this module, licence holders may wish to consider additional actions to reduce GHG emissions. These may include:

- management of the impacts of transport operations and other third party activities **not initially included** in the 'boundary' for energy and emissions estimation (see section 3.2);
- public environmental reporting to gain public recognition for efforts made;
- the use of energy alternatives such as 'green' power sources associated with low or zero GHG emissions; or
- offsetting GHG emissions through the development of carbon sinks (e.g. by tree planting).

Appendix 1 Example using Module 2 for a works approval application

A manufacturing company used 585 000 kWh/yr of electricity, 35 755 GJ/yr of gas and emitted 250 kg/yr of nitrous oxide at its factory. To increase production the company submitted a Works Approval application to modify factory plant in such a way that electricity use would fall to 520 000 kWh/yr, gas consumption would rise to 45 650 GJ/yr and nitrous oxide emissions reduce to 150 kg/yr. The company had upgraded the steam plant during the year, reducing energy use by 5800 GJ compared with the previous year.

DEFINITION OF PROJECT BOUNDARY (REFER TO SECTION 4.2.1)

The company defined the boundary within which its calculation of energy use and GHG emission will apply. It may be the boundary of the site or, if associated activities occur away from the factory site, the boundary may be extended to include them. In this case the company selected the factory site as the boundary.

ESTIMATION OF ENERGY USE AND GHG EMISSIONS (REFER TO SECTION 4.2.2)

The company determined its proposed energy consumption and GHG emissions within the project boundary. This is summarised in Table 1.1. (It would also be helpful if a similar estimation of energy use and GHG emissions for the existing plant were provided.)

Had a similar estimate of the situation prior to plant modification been prepared, the company would have been able to advise EPA that the expected overall increase in energy use and GHG emissions is 9625 GJ/yr and 401 t CO_2-e/yr.

A similar process may have been repeated for several variations of plant design to refine the concept before finalising it and preparing the works approval application.

CATEGORISING THE PROPOSAL (REFER TO SECTIONS 4.2.3 AND 4.2.4)

As energy use exceeds 7000 GJ/yr and total GHG emission was above 1400 t CO_2-e/yr, the company was a Category C GHG emitter and so needed to develop measures to manage energy use and energy-related GHG emissions.

Table 1.1: Total expected energy use and GHG emissions after modifying plant at the site

Energy consumption		
Electricity	$\frac{520\,000 \text{ kWh/yr} \times 3.6 \text{ MJ/kWh}}{1000 \text{ MJ/GJ}}$	= 1 836 GJ/yr
Gas		= 45 650 GJ/yr
Total energy consumption within the boundary		= 47 486 GJ/yr
Energy-related emissions		
Electricity	520 000 kWh/yr x 1.467 kg CO_2-e/kWh	= 762 840 kg CO_2-e/yr
Gas	45 650 GJ x 58.9 kg CO_2-e/GJ	= 2 688 785 kg CO_2-e/yr
Total energy-related emissions within the boundary		= 3 451 625 kg CO_2-e/yr
		= 3 451.625 t CO_2-e/yr
Non-energy related emissions		
Nitrous oxide	150 kg/yr x 310 kg CO_2-e/kg nitrous oxide	= 46 500 kg CO_2-e/yr
Grand total CO_2 emissions within the boundary		**= 3 498 125 kg CO_2-e/yr** **= 3 498.125 t CO_2-e/yr**

COMMITMENTS AND ACTIONS TAKEN THROUGH OTHER PROGRAMS

The company would mention any other actions taken during the last 12 months to reduce energy use and GHG emissions.

Report statement

The steam plant was upgraded six months ago by installing a new boiler that has also reduced energy use by 5800 GJ/yr and cut GHG emissions by 5800 GJ/yr x 58.9 kg CO_2-e/GJ = 341 620 kg CO_2-e/yr or 341.62 t CO_2-e/yr.

DEVELOPMENT OF ENERGY AND EMISSIONS MANAGEMENT MEASURES (REFER TO SECTION 4.2.4)

The company would locate potential areas of energy saving and GHG emissions reductions. This would be done as part of a wider investigation of options to enhance the project's sustainability and in this example included: tuning boiler burners, fitting electronic refrigerant expansion valves to the chiller, lighting system modifications and eliminating compressed air leaks. These potential items would be evaluated over their expected life to determine their actual energy and GHG emission savings, costs, technical impacts, health and safety issues and whether they meet best practice standards. In this case, after evaluating them, the company decides to implement the items listed above.

DEVELOPMENT OF MEASURES FOR MANAGING OTHER EMISSIONS (REFER TO SECTION 4.2.5)

Options to reduce the non-energy related GHG emissions would be evaluated in a similar manner to that used for the energy related options; and in this case the company decides that work will be undertaken during the coming year to further reduce nitrous oxide emissions.

SUGGESTED OUTLINE OF THE REPORT (REFER TO SECTION 4.3.2)

The report may take the following format.

Project boundary

We have assumed the factory site as the project boundary.

Estimation of energy use and greenhouse gas emissions

Total expected energy use and GHG emissions after modifying plant at the site are given in Table 1.2.

Table 1.2: Total expected energy use and GHG emissions after modifying plant at the site

Energy consumption	
Electricity	= 1 836 GJ/yr
Gas	= 45 650 GJ/yr
Total energy consumption within the boundary	= 47 486 GJ/yr
Energy-related emissions	
Electricity	= 762 840 kg CO_2-e/yr
Gas	= 2 688 785 kg CO_2-e/yr
Total energy-related emissions within the boundary	= 3 451 625 kg CO_2-e/yr = 3 452 t CO_2-e/yr
Non-energy related emissions	
Nitrous oxide	= 46 500 kg CO_2-e/yr
Grand total CO_2 emissions within the boundary	**= 3 498 125 kg CO_2-e/yr** **= 3 498 t CO_2-e/yr**

Table 1.3

Action	Estimated energy saving	Estimated GHG emission saving (t CO_2-e/yr)	Completion date (month/yr)
Energy-related emissions			
Tune boiler burners	220 GJ/yr	12.95	04/03
Fit electronic refrigerant expansion valve to chiller	12 500 kWh/yr	18.4	06/03
Dimmer system to office lights	3 500 kWh/yr	5.1	03/03
Repair compressed air leaks	22 000 kWh/yr	32.3	05/03
Non-energy related emissions			
Reduce nitrous oxide emissions from 150 to 50 kg/yr	n/a	31.0	07/03

Project categorisation

As energy use will exceed 7000 GJ/yr and total GHG emission will be more than 1400 t CO_2-e/yr, our company will be a Category C GHG emitter.

Commitments and actions taken through other programs

The steam plant was upgraded six months ago by installing a new boiler that has also reduced energy use by 5800 GJ/yr and cut GHG emissions by 5800 GJ/yr x 58.9 kg CO_2-e/GJ = 341 620 kg CO_2-e/yr or 341.62 t CO_2-e/yr.

Assessment of options and development of measures

We have assessed several options to reduce energy and GHG emissions and have decided to tune the boiler burners, fit electronic refrigerant expansion valves to the chiller, install new lighting controls and eliminate compressed air leaks.

Proposed measures and their effectiveness

The estimated effectiveness of the above measures is listed in Table 1.3.

Appropriate calculations, manufacturers' data, preliminary design details, laboratory test results and other information were attached to the works approval application supporting statements about existing and proposed design concepts and plant, and about energy use and GHG emissions.

Appendix 2 Example of licence holder energy and greenhouse report to EPA

The following example indicates the greenhouse and energy management information a licensed company will need to incorporate into:

- its report to EPA by December 2003 (this could be part of an updated Environment Improvement Plan or submitted with or as part of a stand-alone document); and
- its annual report to EPA from 2004 onwards.

Steps the company may need to follow to prepare the information are also discussed.

Example: A licensed company treating waste at site A uses 265 000 kWh/yr of electricity and 1500 GJ/yr of gas and emits 150 kg/yr of methane. Treated waste is taken by a truck using 1480 l/yr of distillate to an organisation at site B.

INITIAL ENERGY AND GREENHOUSE EMISSION REPORT IN 2003 (REFER TO SECTION 5.2.2)

The company is required to report to EPA by December 2003 on:

- current estimates of energy consumption and GHG emissions;
- measures taken over the previous year to reduce energy use and GHG emissions; and
- measures proposed for the forthcoming year to reduce energy use and GHG emissions.

The report will therefore need to include a section similar to that given below.

Project boundary (refer to section 5.1.1)

In this case the project boundary is defined as the energy used and GHG emissions associated with the treatment plant at site a plus that due to transport of treated waste to site B.

Estimation of energy use and emissions (refer to section 5.1.2)

This section of the report should give estimates of current energy use and energy-related greenhouse gas emissions plus any non-energy related greenhouse emissions from within the project boundary. For this case the data is given in Table 2.1.

Facility categorisation (refer to section 5.1.3)

This section gives a simple statement about the category in which the company currently belongs.

This is a Category B company because energy consumed lies between 500 and 7000 GJ/yr and the carbon dioxide equivalent of GHG emitted is between 100 and 1400 t CO_2-e/yr.

Energy audit (refer to section 5.1.4)

Had the site used under 500 GJ/yr of energy or emitted less than 100 t CO_2-e/yr of GHG (Category A), no formal energy audit or action plan would be necessary. Since this is a Category B company, a minimum of a Level 1 energy audit is required. Had energy use been more than 7000 GJ/yr or more than 1400 t CO_2-e/yr, a Level 2 (minimum) energy audit would have been required.

The company needs to explain what it arranged regarding the Level 1 energy audit. This should also list the findings from the audit report, including its recommendations.

Report statement

XYZ Energy Auditors were employed in June 2003 to undertake a Level 1 audit. Their findings were:

- gas consumption is higher than expected
- electricity use in the treatment plant is considered excessive
- initiatives recommended to reduce energy consumption and GHG emissions were:
  - Purchase of a new, more fuel efficient truck
  - Tune boiler burners to reduce gas consumption
  - Fit a dimmer system to office lights
  - Repair compressed air leaks
  - Eliminate methane emissions

Other actions taken

This section of the report advises the EPA of any actions taken as a result of the company's participation in other greenhouse and energy management programs such as the AGO Greenhouse Challenge program or other activities.

Report statement

Lighting timer controls were fitted last year following work with SEAV. Compared with the previous year it is estimated that they have saved:

35 000 kWh/yr (126 GJ/yr) and reduced GHG emissions by:

35 000 kwh x 1.467 kg CO_2-e/kWh = 51 345 kg CO_2-e/yr = 51.3 t CO_2-e/yr

Assessment of options and development of measures (refer to sections 5.1.5 and 5.1.6)

This section of the report to EPA should summarise results of investigations into recommendations made in the audit report and into any other ideas considered for reducing energy use and GHG emissions.

Report statement

Items recommended in the energy audit have been assessed for possible inclusion in the Environmental Improvement Plan (EIP) with the following results.

- Several models of new truck with better fuel economy were checked. They would use between 0.39 and 0.41 l/km, saving about 300 l/yr of distillate and reducing GHG emissions by about 20%. This would save 11.6 GJ/yr of energy and 0.9 t CO_2-e/yr. Due to new vehicle costs this option will not proceed now but better fuel economy will be sought when the current vehicle is replaced in two years.
- The remaining items were found to have payback periods less than three years and will be implemented. They are listed in the following EIP.

The EIP should list all actions to be implemented, the expected energy savings and reductions in GHG emissions and the proposed completion date for the action (Table 2.2).

Environment Improvement Plan for 2003

Calculations, manufacturers' data, preliminary design details, test results and other information used in deciding whether or not to implement the various

Table 2.1: Current energy use and GHG emissions within the project boundary

Energy consumption		
Electricity use (from invoices)	$\frac{265\,000 \text{ kWh/yr} \times 3.6 \text{ MJ/kWh}}{1000 \text{ MJ/GJ}}$	= 954 GJ/yr
Gas use (from invoices)		= 1 500 GJ/yr
Distillate used (from invoices)	1 480 l/yr x 0.0386 GJ/l	= 57 GJ/yr
Total energy consumption within the boundary		= 2 511 GJ/yr
Energy-related emissions		
Electricity	265 000 kWh/yr x 1.467 kg CO_2-e/kWh	= 388 755 kg CO_2-e/yr
Gas	1500 GJ x 58.9 kg CO_2-e/GJ	= 88 350 kg CO_2-e/yr
Distillate	57 GJ/yr x 78.9 kg CO_2-e/GJ	= 4 497.3 kg CO_2-e/yr
Total energy related emissions within the boundary		= 481 602.3 kg CO_2-e/yr = 481.6 t CO_2-e/yr
Non-energy related emissions		
Methane	150 kg/yr x 21 kg CO_2-e/kg methane	= 3 150 kg/yr
Grand total CO_2 emissions within the boundary		**= 484 752.3 kg CO_2-e/yr = 484 t CO_2-e/yr**

Table 2.2: Environment Improvement Plan for 2003

Action	Estimated energy saving	Estimated GHG emission saving (t CO_2-e/yr)	Completion date (month/yr)
Energy-related emissions			
Tune boiler burners	105 GJ/yr	6.2	3/04
Fit dimmer system to office lights	3 500 kWh/yr	5.1	5/03
Repair compressed air leaks	26 000 kWh/yr	38.2	6/03
Non-energy related emissions			
Eliminate methane emissions	150 kg CH_4	3.2	7/03

items considered for inclusion in the EIP, or which supports other statements in the various sections of the report to the EPA should be attached as an appendix.

Annual reports to EPA from 2004

In 2004 and subsequent years the company would present its annual report to the EPA and it will need to incorporate a section about energy use and GHG emissions. This section of the report will need to include:

- definition of the project boundary in case it has changed;
- estimate of energy use and GHG emissions at that time. This should reflect the effects of implementing items on the EIP along with any other actions such as increased or reduced production that may have altered energy use or GHG emissions compared with the previous year.

This reflects the following:

- compressed air leaks have been eliminated and a dimmer system has been installed to control the office lighting system, saving almost 30 000 kWh/yr and 44 t CO_2-e/yr;
- gas burners on the boiler have been tuned saving about 110 GJ/yr of gas and 6.4 t CO_2-e/yr;
- methane leaks have been reduced by about 40 kg/yr, saving almost 1 t CO_2-e/yr.

The total energy use and GHG emissions are still between 500 GJ/yr and 7000 GJ/yr and the GHG emissions are still between 100 t CO_2-e/yr and 1400 t CO_2-e/yr. Therefore, the company must prepare a new EIP for the coming year. This will not show actions completed the previous year but will include items from the previous EIP that are still to be actioned and their current status, plus any new items considered during the year and approved for implementation. These could be other recommendations from the energy audit or suggestions from other sources.

Environment Improvement Plan for 2004-05

In subsequent years the company would take a similar approach when preparing the energy and greenhouse emission information for incorporation in their annual report to EPA.

Table 2.3: Current energy use and GHG emissions within the project boundary

Energy consumption		
Electricity use (from invoices)	$\frac{235\,050 \text{ kWh/yr} \times 3.6 \text{ MJ/kWh}}{1000 \text{ MJ/GJ}}$	= 846 GJ/yr
Gas use (from invoices)		= 1 390 GJ/yr
Distillate used (from invoices)	1 510 l/yr x 0.0386 GJ/l	= 58 GJ/yr
Total energy consumption within the boundary		= 2 294 GJ/yr
Energy-related emissions		
Electricity	235 050 kWh/yr x 1.467 kg CO_2/kWh	= 388 755 kg CO_2-e/yr
Gas	1 500 GJ x 58.9 kg CO_2-e/GJ	= 88 350 kg CO_2-e/yr
Distillate	57 GJ/yr x 78.9 kg CO_2-e/GJ	= 4 497.3 kg CO_2-e/yr
Total energy-related emissions within the boundary		= 437 665 kg CO_2-e/yr = 437.66 t CO_2-e/yr
Non-energy related emissions		
Methane	110 kg/yr x 21 kg CO_2-e/kg methane	= 2 310 kg CO_2-e/yr
Grand total CO_2 emissions within the boundary		**= 439 975 kg CO_2-e/yr = 439.97 t CO_2-e/yr**

Table 2.4: Environment Improvement Plan for 2003–04

Action	Estimated energy saving	Estimated GHG emission saving (t CO_2-e/yr)	Completion date (month/yr)
Energy-related emissions			
Install new condensate return	100 GJ/yr	5.9	3/05
Convert mercury vapour lamps to metal halide	35 000 kWh/yr	51	5/04
Fit high efficiency motor to air compressor	2 500 kWh/yr	3.7	6/04
Non-energy related emissions			
Eliminate methane emissions	110 kg CH_4	2.3	8/04

Appendix 3
Abbreviations

CO_2-e	carbon dioxide equivalent
EIP	Environment Improvement Plan
EPA	Environment Protection Authority
GHG	greenhouse gas
GJ	gigajoule
IRR	Internal Rate of Return
LPG	liquid petroleum gas
MJ	megajoule
NPV	Net Present Value
PEM	Protocol for Environmental Management *Greenhouse gas emissions and energy efficiency in industry*
RD&D	research, development and demonstration
SEAV	Sustainable Energy Authority Victoria
SEPP (AQM)	State environment protection policy (Air Quality Management)

Appendix 4 Definitions

Action plan means an action plan prepared in accordance with the requirements of the PEM and this module, which incorporates measures for the management of energy and greenhouse gas emissions.

Applicant refers to a business or enterprise that applies to EPA for a licence; accredited licence; licence amendment; works approval; or research, development and demonstration approval in accordance with the *Environment Protection Act* 1970.

Audit means an energy audit undertaken in accordance with the australian and new zealand standard AS/NZS 3598:2000 Energy Audits.

Best practice means the best combination of eco-efficient techniques, methods, processes or technology used in an industry sector or activity that demonstrably minimises the environmental impact of a generator of emissions in that industry sector.

Eco-efficiency means producing more goods with less energy and fewer natural resources, resulting in less waste and pollution.

Environment Improvement Plan is a document to guide a company's environmental program and a commitment, in some cases public, to improve environmental performance. It should provide a timetable to address areas of concern, and outline the means by which environmental objectives and targets are to be achieved to improve the environmental performance of the site. It should be negotiated with EPA, and in some cases, the local community and other stakeholders.

Greenhouse gas means:

- carbon dioxide
- methane
- nitrous oxide
- hydrofluorocarbons
- perfluorocarbons or
- sulfur hexafluoride.

Level 1 audit means a Level 1 audit as described in the Australian and New Zealand Standard AS/NZS 3598:2000 Energy Audits.

Level 2 audit means a Level 2 audit as described in the Australian and New Zealand Standard AS/NZS 3598:2000 Energy Audits.

Level 3 audit means a Level 3 audit as described in the Australian and New Zealand Standard AS/NZS 3598:2000 Energy Audits.

Licence means a licence that may be issued under section 20 of the *Environment Protection Act* 1970.

Protocol for Environmental Management means the Protocol for Environmental Management entitled *Greenhouse gas emissions and energy efficiency in industry*.

The policy means the State environment protection policy (Air Quality Management).

Works approval means an approval that may be issued under section 19B of the *Environment Protection Act* 1970.

Appendix 5 The Protocol for Environmental Management

A Protocol for Environmental Management (PEM) on *Greenhouse gas emissions and energy efficiency in industry* has been issued as an incorporated document of the policy. The PEM applies to licence holders and applicants for works approvals and licences.

Incorporated documents have the same legal standing as statutory policies. EPA will base its assessment of works approval applications and action plans and its statutory decisions on the provisions of the policy and the PEM.

The objectives of the PEM are to promote the long-term business sustainability of applicants and licence holders by:

- requiring the incorporation of greenhouse gas and energy considerations in the development plans and management programs of these enterprises; and
- ensuring that cost-effective measures for managing energy consumption and GHG emissions are developed and implemented by these enterprises.

Business sustainability is discussed in Appendix 7.

The key requirements of the PEM include:

- the integration of GHG and energy considerations with other assessments in the preparation of works approval applications;
- the development by applicants of sustainable proposals that incorporate best practice in energy efficiency and GHG management;
- different levels of requirements (e.g. for energy audits) and case-by-case assessments of compliance for enterprises of different types and sizes, in recognition of differences in their capacity and constraints;
- the submission by existing licence holders of action plans for enhanced GHG and energy management, and EPA approval of these plans by December 2003;
- implementation of approved action plans by December 2006; and
- continuous improvement in energy efficiency and GHG management by all licence holders.

The meaning and application of continuous improvement is discussed in Appendix 8.

The PEM and its supporting materials provide:

- methodologies for estimating energy consumption and GHG emissions;
- guidance and checklists on possible approaches and options for reducing energy consumption and GHG emissions; and
- recognition of relevant actions already taken through the involvement of enterprises in other programs (e.g. the AGO Greenhouse Challenge program).

Licence holders and applicants should consult EPA if they are unsure of their obligations or responsibilities in complying with the PEM.

Appendix 6 The works approval and licensing system

The works approval and licensing provisions of the Act acknowledge that the discharge of wastes into the environment is a privilege, and not a right. EPA is responsible under the Act, on behalf of the people of Victoria, for regulating the exercise of this privilege by those who build and operate facilities that may have environmental impacts.

Because it is not practical for EPA to license every facility or activity which has a potential impact, only those listed in the *Environment Protection (Scheduled Premises and Exemption) Regulations* 1996 require works approval and licensing. These 'scheduled premises' are, generally speaking, the larger sources of wastes or those with significant potential impacts.

The aim of works approval and licensing is to ensure that these sources:

- satisfy requirements for business sustainability;
- do not cause pollution or pose unacceptable risks to the environment;
- do not adversely affect environmental quality (locally, regionally or globally); and
- do not threaten beneficial uses of the environment.

A works approval is essentially an **approval to construct**, and must be obtained prior to commencing construction work on a development site. Works approval is required for:

- works that would establish **new** premises or facilities of a type which is scheduled;
- works at **existing** premises that would result in them **becoming scheduled** (e.g. by exceeding a threshold for size or level of activity in the regulations); and
- works at **existing scheduled premises** that would **alter the type or increase the amount** of wastes discharged.

Proposals that may require works approval should be discussed with EPA as early as possible in project planning. These early discussions can confirm whether approval is required, enable a proponent to clarify the requirements that a proposal must meet, and identify the assessments and other information that will be required with an application.

A works approval application should be **a proposal, a justification and an assessment**. In particular, it should describe the assessment of development options and address issues of best practice and sustainability for a proposal. It should also explain the rationale behind the selection of processes, equipment and material inputs for a proposal, and demonstrate compliance with relevant policies.

Information on **business sustainability** and guidance on the development of sustainable proposals are provided in Appendix 7.

A licence is a **permit to operate** a facility or premises, once works have been constructed in accordance with a works approval. EPA will inspect completed works for compliance with the works approval before it issues a licence to operate. The licence usually contains detailed requirements for the management and operation of the facility.

The key steps in the works approval and licensing process are illustrated below. EPA has a statutory period of four months from the acceptance of an application to make a determination. Further information and guidance about the process can be obtained from EPA.

The works approval and licensing process

1. Development and assessment of the proposal
2. Preparation of the application
3. Review of the application by EPA
   if application is accepted, go to 6
   if rejected, go to 4
4. Submission of additional information
5. Review of additional information by EPA
   if application is accepted, go to 6
   if rejected, go to 4
6. Public notification and referral of the application
7. Comments and objections
   if public objections received, go to 8
   if no objections, go to 9
8. EPA conference on objections (at discretion of EPA)
9. Assessment of the application by EPA
10. Determination of the application by EPA (issue of approval and draft licence, or refusal to issue approval)
11. Public notification of the determination
    if second or third party appeals received, go to 12
    if no appeals, go to 14
12. Determination of appeal(s) by vcat
13. Confirmation or amendment of the works approval
14. Construction in accordance with the approval
15. EPA inspection of completed works
    if works comply, go to 16
    if works do not comply, go to 14
16. Issue of the licence by EPA

Appendix 7
Business sustainability

This Appendix discusses the concept of business sustainability and its application in the works approval and licensing process.

ENHANCING BUSINESS SUSTAINABILITY

The State environment protection policy (Air Quality Management) requires all emission generators (including works approval applicants and licence holders) to:

- adopt an **integrated and sustainable approach** to environmental management;
- exercise an appropriate level of **product stewardship**;
- apply the **wastes hierarchy** to avoid or minimise wastes;
- employ **best practice** in environmental and resource management; and
- pursue **continuous improvement** (see Appendix 8).

In particular, EPA expects that the material in a development proposal, a works approval application, an action plan or an Environmental Improvement Plan will demonstrate that these issues have been properly investigated.

Policy requirements for the management of greenhouse gases and energy efficiency should be considered within the broader context of **enhancing business sustainability**. This concept of business sustainability encompasses:

- the integration of environmental, economic and social considerations;
- lifecycle assessment and product stewardship (i.e. managing the impacts of a product or service throughout its lifecycle);
- cleaner production and waste minimisation (through application of the wastes hierarchy); and
- the efficient use of energy, materials and other resources.

Sustainability should be pursued as a 'triple bottom line' outcome, so that the best overall outcomes in environmental, economic and social terms are obtained. A sustainable proposal will lead to a level of performance and a management approach that increase the prospects for a business to survive and prosper. In particular, it will seek to minimise waste generation, environmental risk, energy consumption and resource intensity, and to constructively involve local communities and other stakeholders, so that the long-term acceptability and viability of the enterprise is enhanced.

Sustainability is also concerned with assessing potential impacts and maximising efficiency throughout the lifecycle of a product, process or activity. Opportunities to avoid or minimise impacts may be lost if assessments focus only on process outputs or the end use of a product.

DEVELOPING A SUSTAINABLE PROPOSAL

The benefits of sustainability should be the main driver in project planning and the ongoing management and development (continuous improvement) of a facility. EPA's regulatory processes therefore play two roles. Firstly, they treat compliance with policy objectives and criteria as the **necessary minimum** level of performance that is acceptable. Secondly, they provide a **framework** within which the benefits of sustainability can be recognised and realised by proponents. These potential benefits therefore provide the **incentive** for proponents to go **beyond compliance**.

It is in the interests of a proponent or licence holder (and the environment and local communities) to investigate sustainability issues such as cleaner production and energy efficiency. All feasible options for enhancing sustainability should be investigated. This may not lead to the adoption of every promising option identified, but it is expected that obviously beneficial options will 'recommend themselves' to a proponent for consideration and implementation.

In developing a sustainable proposal or enhancing the sustainability of existing operations, **lifecycle assessment and product stewardship** should be employed, wherever practicable. The lifecycle of each product, service or activity associated with an enterprise should be evaluated. Each stage of the lifecycle that a proponent or facility operator can reasonably be expected to manage or influence should be assessed for sustainability. These stages may include, for example:

- the design or formulation of products;
- the selection of processes, equipment and materials;
- the supply of energy, materials and other inputs;
- production, processing, treatment and other operational activities;
- plant or equipment maintenance;
- the transport, storage and handling of materials, products and wastes;
- the marketing, sale and use of products; and
- the discharge and disposal of wastes.

Options for avoiding or minimising wastes, reducing environmental risks and maximising resource utilisation efficiency should be evaluated for each stage that is assessed. Where feasible, options should be evaluated for managing:

- the impacts of the facility or activity itself;
- the 'upstream' impacts associated with the production, distribution and handling of resources, materials and other inputs; and
- the 'downstream' impacts of the marketing, distribution, handling and use of products, and the disposal of wastes and products at the end of their useful lives.

The wastes hierarchy (Figure 7.1) should be applied systematically to each of these options. Avoidance should be pursued as the first option, followed by options for reuse, recycling and so on.

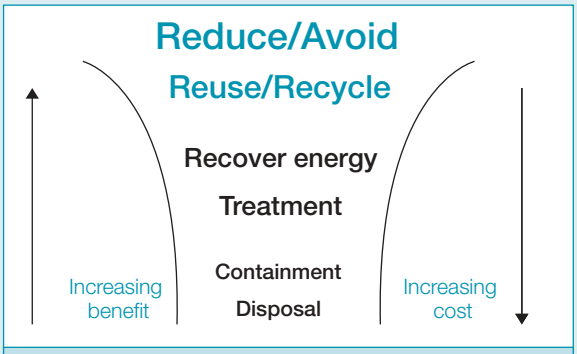

Figure 7.1: The wastes hierachy

In summary, the development of a sustainable proposal will usually involve the following steps:

- **lifecycle assessment**: identifying the stages of the lifecycle of a product, process or activity that may have environmental or resource implications;
- **product stewardship**: determining the stages that a proponent or facility operator can manage or influence;
- **assessment of options**: for each of these stages, generating and evaluating options for avoiding or minimising wastes, energy consumption and environmental risks;
- **prioritisation of options**: comparing and rating options according to their environmental performance, resource utilisation efficiency, technical feasibility, cost-effectiveness, community/social acceptability and other relevant factors; and
- **selection of measures**: selection and development of preferred options for implementation.

Appendix 8
Continuous improvement

Continuous improvement (CI) is an important principle of environmental management in the policy. CI moves away from the notion that it is sufficient for an enterprise to comply with minimum requirements, such as emission standards and design criteria. A more proactive approach is now required, in which improved performance continues to be pursued after basic policy requirements have been met, and the latest 'best practice' is investigated whenever significant new development is envisaged.

CI does not require improvements to be made every day, week or month. It is more about **identifying and exploiting opportunities** for improvement that may arise from time-to-time in a business or enterprise.

CI requires an opportunistic outlook and an ongoing awareness of the possibilities for environmental improvement, particularly when operations or business plans are being reviewed. Opportunities may occur when corporate planning is undertaken, budgets are being prepared, new investment is being planned, equipment is to be replaced or upgraded, or new products are under development. An opportunistic approach is increasingly being recognised as a key to enhancing business competitiveness and long-term sustainability.

The **works approval process** provides an important opportunity to consider improvement options, especially where the application concerns the modification or redevelopment of existing facilities. **Upgrading of a plant or facility** to resolve an existing environmental problem provides another type of opportunity. There may also be opportunities in the resolution of non-environmental issues, where the solution to the primary problem (e.g. a problem with product quality or production efficiency) may offer the possibility of improved environmental performance at the same time. **Annual or periodic performance reviews** (e.g. those associated with an environmental management system under ISO 14001) should include an assessment of improvement options.

For example, a major plant upgrade may be required to significantly increase the energy efficiency of a facility. This may not be feasible when the action plan is developed because of the costs involved in replacing equipment that, in other respects, is still entirely functional and serviceable. If, however, the remaining lifespan of the equipment is only three years, then the costs of upgrading for energy efficiency may be more easily borne as part of the project which replaces the equipment at the end of that period.

Alternatively, new technologies or changes to the economic environment of the business may make the upgrade more feasible at a future date.

The focus and vigilance required for CI can be facilitated by:

- the development and regular review of a comprehensive Environmental Improvement Plan (such as those required in many EPA licences);
- a strong corporate environmental policy and increased environmental awareness throughout an enterprise (environmental management systems developed under ISO 14001 encourage these kinds of developments);
- operating manuals and procedures which have well-documented, up-to-date approaches to environmental management (e.g. procedures for managing processes and wastes, and measures for preventing spills and accidents); and
- effective training programs, which are regularly updated to reflect best practice in the industry.

Guidance on approaches and options for improving an enterprise's performance in GHG and energy management is provided in *Module 4.*

Notes

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