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Sustainability Guide

for

Energy from Waste (EfW) Projects and Proposals

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Preface

The Sustainability Guide for Energy from Waste (EfW) Projects and Proposals is an initiative of the EfW Division of the Waste Management Association of Australia (WMAA). The EfW Division has also developed a Code of Practice for the EfW Sector in Australia to support the Sustainability Guide.

These two documents form the first and second parts of the WMAA Energy from Waste Sustainability Project. Together they provide the fledgling EfW industry with a widely accepted protocol, process and strategic framework for assessing EfW projects and proposals.

The vision of the Energy from Waste Sustainability Project is for a sustainable Australia with our systems, facilities and infrastructure working to avoid and minimise waste, recover valuable resources and energy and close the loop on urban resource consumption.

The Sustainability Guide is intended to help the community, government and industry stakeholders know when it is best to conserve materials presenting as urban "wastes" in something close to their original form and when it is appropriate to convert them to energy through a variety of processes.

The Sustainability Guide recognises the crucial role played by the community in any EfW project or proposal. In effect, the community, represented by Government, or special interest groups or as individuals, act as arbiters of sustainability on behalf of current and future generations. The Sustainability Guide acknowledges that without broad community agreement to an EfW project, or a "community' licence to operate," an EfW project cannot go ahead. The document is framed to keep the community actively involved, fully informed and engaged regularly and transparently in order to facilitate an outcome that provides for sustainable resource use in the interests of current and future generations.

Although the Sustainability Guide does discuss some EfW technologies, a deliberate decision has been made to focus on outcomes rather than being prescriptive in terms of technology, process or methodology. The document presents a number of project scoping principles stakeholders can use to assess whether a project or proposal falls within the principles of ecologically sustainable development.

The Code of Practice supporting the Sustainability Guide is intended to demonstrate the EfW industry's commitment to operating within the framework of sustainable development. By signing up to the Code members of the EfW industry are publicly stating their commitment to act for the recovery of the highest resource value from secondary resource materials, ensure transparency in their decision-making processes, meet all legislative requirements and continuously improve in all the aspects of their operation over which they have control.

The Sustainability Guide and Code of Practice are living documents that derive their functionality and credibility from their inclusiveness, continual improvement and interaction with stakeholder requirements, as accommodated against a founding philosophy of sustainable resource use.

They were developed over three years from November 2000 to December 2003 and involved extensive consultation with a wide range of stakeholders (see Appendixes A, B, C and D). The Commonwealth Government provided significant sponsorship for the project through the Australian Greenhouse Office, as did a wide range of government and industry parties (see Appendix C).

Signatories to the Code and their current compliance status will be kept on the WMAA EfW Division website at http://www.wmaa.asn.au/efw/home.html

The EfW Division of the WMAA and its state-based Working Groups will regularly produce updated editions of the Sustainability Guide and Code of Practice in a culture of continuous improvement and in the face of changing circumstances and needs. Edition 2 of the Sustainability Guide is due for completion at the end of 2005.

Structure of the Sustainability Guide

Section 1 of the Sustainability Guide is intended for first-time readers only. It provides a broad overview of the issues involved and the rationale for the Sustainability Guide and Code of Practice. It also outlines how the document was developed and gives guidance on how it is to be applied.

Section 2 gives a consolidated summary of the issues and drivers as a context and rationale to many of the principles and outcomes adopted in the Sustainability Guide. Much of this material originated from early discussion groups, the deliberations of the Working Group and the matters raised during the stakeholder consultation. This section will be useful where the interpretation of related, collateral or contingent issues arise in any future project assessment.

Section 3 provides a set of project scoping principles (PSPs). These are the principles that have been developed to best address the complex issues surrounding sustainable energy recovery from urban wastes. The section will be particularly useful in the qualitative assessment of proposed or actual projects.

Section 4 is the assessment roadmap tool. This consists of a process that is recommended to analyse and evaluate the impacts of a project in the context of ESD.

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Section 1: Introduction

This section provides an overview of the main issues that relate to the complex topic of energy recovery from society's urban waste streams. It introduces the structure of the Sustainability Guide and outlines the process of its development.

(Many of the issues touched on in the introduction are explored in more detail elsewhere in the document and referenced accordingly. The section may only be of value to first-time readers of the Sustainability Guide.)

1.1 The Initial Conditions and Context

1.1.1 One unintended consequence of the rapid economic development in OECD countries is the unsustainable use and consumption of natural resources, both renewable and finite (non renewable).

1.1.2 Sustainability in this context, or ecologically sustainable development (ESD) in general, refers to the concept of managing the use of resources in a way that improves our quality of life today and allows future generations to improve their own quality of life, with an underlying focus on maintaining the ecological processes upon which life on Earth depends. Within this concept, sustainability can also be described in terms of the ability of the natural environment to sustain impact (see 2.1.5)[1].

The wastes in question

1.1.3 This Sustainability Guide focuses on the sustainable use of the resources that currently present as the **three main urban waste streams,** comprising:

i) the spent, surplus and discarded materials that originate from households that are usually managed by local government, called municipal solid waste (MSW) (see 2.2.1 i)

ii) the spent, surplus and discarded materials that originate from commercial, industrial and manufacturing operations that are usually managed by private waste contractors, called commercial and industrial (C&I) waste (see 2.2.1 ii)

iii) the discarded or waste materials that originate from the construction, engineering and building demolition sectors that are generally managed by private contractors, called construction and demolition (C&D) waste (see 2.2.1 iii).

1.1.4 In addressing society's urban waste streams from a perspective of sustainability, a number of strategies can be adopted:

i) efforts can be made to **avoid** the materials being initially produced, consumed or managed in such a way that they never present as wastes

ii) strategies can be employed to limit or **minimise** the amounts of materials that are employed in the production of goods and services and that will eventually present as wastes

[1] This application of sustainability requires the proactive implementation of the precautionary principle Appendix D ii).

iii) spent, surplus or secondary materials can be managed as by-products for future **reuse** or **recycling** in their original form or in a degraded form, or they can be **reprocessed** for some equally valid re-application of their resource potential.

One potential but irreversible reprocessing option for these materials may be to recover the energy or "calorific" value of the waste through an Energy from Waste (EfW) project.

1.1.5 This Sustainability Guide seeks to address and define those elements in the urban waste streams that are suitable for EfW projects and to present protocols for their conversion from waste to energy.

1.1.6 These potential sources of energy could be described as materials that satisfy the following two conditions:

i) they have no further practical value or market for reuse, recycling or reprocessing to recover their inherent resource value

ii) they have a net calorific value that could be recovered and would otherwise be lost through disposal to landfill.

1.1.7 In terms of ecologically sustainable resource application, the crucial issue is to know when to conserve materials in something close to their original form and when to convert them for their calorific value.

This Sustainability Guide has been developed to help determine:

i) whether the materials in question are suitable for conversion to energy

ii) whether the immediate impacts of the conversion activity are acceptable: i.e. will the benefits be optimised and the disbenefits minimised or eliminated?

1.1.8 Urban waste is an important community issue and concern. The Sustainability Guide provides a structure for the community to regain more ownership of the issues and the potential solutions.

1.1.9 Currently, fractions of urban wastes that present as potentially sustainable sources of energy as described in 1.1.6 above are being lost to landfill disposal because:

i) there are few, if any, facilities available to recover the energy in Australia

ii) energy recovery facilities are not being developed in Australia because there are no generally accepted standards, protocols or strategic planning frameworks that could support the necessary investment decisions.

1.1.10 This Sustainability Guide provides the strategic framework needed to evaluate EfW projects and their social, environmental and economic impacts.

1.2 Energy Recovery: A Binary Decision

1.2.1 Because the EfW process is irreversible, the decision to reprocess urban wastes for the primary purpose of energy recovery has implications for sustainable resource use.

1.2.2 On the one hand, the recovery of the calorific value of the waste and its corresponding benefits may be preferable to losing the potential for energy recovery to landfill disposal.

1.2.3 On the other hand, the irreversible consumption of a resource for energy alone may not fully acknowledge the more sustainable resource use of that material, by reuse, recycling or reprocessing for the inherent material recovery and the greater embodied energy value (see 2.1.7).

1.2.4 Such resource decisions are of vital interest to the broader community as we consider our collective responsibility to future generations. This highlights the need for community consent for projects that seek to recover energy value from urban waste. In order to gain this consent it is important for the potential impacts, both positive and negative, to be properly identified and understood in order to determine the suitability of an EfW project.

1.3 The Potential Impacts of Energy Recovery from Urban Wastes

The potential benefits

1.3.1 The **benefits** of energy recovery from urban wastes can include the following:

i) a higher value resource management outcome than to lose the same materials through landfill disposal

ii) the biomass or lignocellulosic content of urban wastes can present as a renewable source of energy

iii) the hydrocarbon-based content (high calorific plastic-, textile- and fossil-fuel-based fraction) of urban wastes can present as a source of alternative or supplementary energy

iv) use of certain urban wastes for energy recovery can deliver a reduced greenhouse gas impact when compared to directly applied fossil fuels or the landfill alternative where organic material is not collected separately and diverted (see 1.3.5)

v) a reduction in volume of the solid waste that is consigned to landfill

vi) appropriate conversion of certain urban wastes for energy recovery close to the potential markets for this energy can demonstrate significant transport and transmission advantages

vii) processing urban wastes for energy recovery can demonstrate significant public health, hygiene and public amenity advantages over many alternative applications such as landfill disposal[2].

The potential disadvantages

1.3.2 Like any waste management option, inappropriate energy recovery from urban wastes can produce significant **disadvantages** such as:

i) wasted resource value from a once-off application for energy from materials that had ongoing or higher resource value applications available

ii) direct impacts of polluting emissions (including health impacts), odours, dust and noise

iii) maintaining a demand for the creation of waste, rather than avoiding waste, simply to satisfy the needs of the EfW facility.

Better information exchange is needed to promote community confidence in EfW projects

1.3.3 An objective of sustainable development is to ensure optimum benefits within a framework that eliminates or minimises the potential disadvantages.

[2] Landfill disposal itself has a range of problems including leachate and the generation of methane, a potent greenhouse gas. These impacts can be difficult to manage because of the indeterminate boundaries of landfill impact. Furthermore, landfilling the materials is unlikely to recover the highest resource value for the material so employed.

1.3.4 Some EfW projects have had a chequered history; too often realising many of the disadvantages with too few of the benefits. The lack of a commonly adopted standard or strategic planning framework has led to the current situation where the development of sustainable and well conceived projects are often prevented due to the difficulty of obtaining a licence to operate from the community. This has stemmed from poor information exchange between stakeholders and a lack of community confidence in EfW projects.

1.3.5 The potential greenhouse impacts and advantages of using fuels made from selected urban wastes include, but are not limited to:-

i) reducing demand for fossil fuel extraction to produce a given amount of energy. In particular -

a) biomass based materials (wood, plant matter, paper, cardboard etc.) can represent a renewable source of energy in that any CO_2 released can be reabsorbed at the same rate as it is released

b) hydrocarbon based materials (plastics, textiles etc.) converted to energy at the end of their useful life can represent a net advantage in terms of overall greenhouse gas release over the direct application of such materials (coal, oil, gas) to energy, in that such materials have served one or more useful purposes before being converted to energy.

ii) reducing demand for the materials conserved or reused before being presented for energy recovery such that less mining, manufacturing, transporting, treating, reprocessing or even disposal activities are necessary with the resultant energy and transport fuel savings and their related emissions.

iii) the promotion of high order material reuse where appropriate, with the resultant savings of embodied energy in certain applications.

1.4 Origins of the Sustainability Guide

A National strategic planning framework was needed

1.4.1 In November 2000 the EfW Division of the Waste Management Association of Australia (WMAA) was initiated by a group of experienced practitioners in the area of waste management and sustainable resource use. The group identified the need to develop a nationally accepted approach and strategic planning framework for EfW projects.

1.4.2 The EfW Division developed a discussion paper to conceptualise the group's ideas and launched the project to develop this Sustainability Guide and its supporting Code of Practice. The project attracted major sponsorship from the Commonwealth Government through the Australian Greenhouse Office and significant additional sponsorship and support from a wide range of government and industry parties (see Appendix C).

1.4.3 This Sustainability Guide and its supporting Code of Practice are the outcomes of this project.

1.5 Development of the Sustainability Guide and Code of Practice

1.5.1 The key steps in the development of this Sustainability Guide and Code of Practice have featured an ever-broadening involvement of stakeholders so that the final product can be adopted with confidence.

i) Following the formation of the WMAA EfW Division an initial discussion paper was prepared.

ii) Increasing membership of the EfW Division led to the preparation of a revised and refined discussion paper and to the identification of the need for a Sustainability Guide and Code of Practice.

iii) A project proposal was developed to produce the Sustainability Guide and Code of Practice. This proposal received funding from the Commonwealth Government through the Australian Greenhouse Office, the environmental agencies in most states and private sector contributors (see Appendix C).

iv) An expert Working Group was established to manage the project and maintain editorial control (see Appendix A).

v) Workshops were advertised and conducted in all state capitals and many regional centres to address the complexities of the debate and to inform the production of subsequent documents[3].

vi) The first drafts of the Sustainability Guide and Code of Practice were prepared from the workshop outputs and reviewed by the Working Group. They were then put out to a much wider Reference Group for peer review (see Appendix B).

vii) First Editions of the Sustainability Guide and Code of Practice were then developed for distribution. A structure of state-based Working Groups (including non-industry representatives) reporting to the National EfW Division was established for the regular and ongoing updating and maintenance of the documents.

1.5.2 The Sustainability Guide and Code of Practice are living documents that derive their functionality and credibility from their inclusiveness, continual improvement and interaction with stakeholder requirements, as accommodated against a founding philosophy of sustainable resource use and the agreed principles outlined in Section 3.

[3] See http://www.wmaa.asn.au/efw/Final%20Summary.pdf for more information

1.6 The Purpose of the Sustainability Guide and Code of Practice

Why do we need an EfW sustainability guide and code of practice?

1.6.1 The Sustainability Guide has been produced to provide a widely accepted protocol, process and strategic framework that will:

i) help potential EfW projects to be conceived, scoped and structured to optimise the potential of sustainable energy recovery from the appropriate fractions of urban waste, whilst ensuring that the potential environmental, social, health and economic impacts are rigorously evaluated in a transparent and publicly accountable manner

ii) provide a common reference for the evaluation of potential projects and for projects that are evaluated positively

iii) provide a pathway toward the granting of a "licence to operate" from the community and assistance for regulators in granting project approvals

iv) provide an integrated and structured reference for the ongoing assessment and monitoring of a project or facility that does acquire a "community licence to operate".

1.6.2 Whilst the Sustainability Guide has been developed to inform and facilitate the scoping and initiation of sustainable EfW projects, the companion Code of Practice has been produced to evidence stakeholders' long-term and ongoing commitment to the principles and philosophies of the Sustainability Guide. This enshrines a platform of continuous improvement for all stakeholders directly involved in a potential project.

1.6.3 It is hoped that the Sustainability Guide will assist sustainable EfW projects to emerge that gain consent, approval and the confidence of all stakeholders.

1.6.4 The Sustainability Guide in no way seeks to provide guarantees or assurances of success during a formal consent or approval process. However, it can help both applicants and consent authorities understand the complex issues surrounding EfW projects.

1.6.5 Since a formal application may well require the expenditure of considerable time and money, some project profiling and screening techniques have been provided that are designed to limit expenses for projects and proposals that appear to be unsustainable rather than attempting to justify them.

1.7 Key Stakeholder Groups

Wide consultation improves an EfW project's chances of success

1.7.1 There is a wide range of individual stakeholder and special interest groups with whom consultation is an important factor in gaining acceptance and approval for a development. These groups can be loosely categorised as community, government and industry and encompass the following stakeholders:

i) community

a) neighbouring residents, workers, businesses and sensitive landuses such as schools, community centres and aged care facilities

b) the electorate (local, state, federal)

c) environmental NGOs

d) special interest groups

ii) government

a) local government

b) state governments and their individual agencies

c) federal government and its individual agencies

iii) industry

a) project developers and proponents

b) waste generators, suppliers and collectors

c) technology developers and vendors

d) energy wholesalers and retailers

e) energy consumers

f) specialist consultants and advisors

g) ancillary suppliers.

1.8 Applicability to Individual Stakeholder Requirements

The Sustainability Guide helps the community, government and industry decide which projects are acceptable

1.8.1 The Sustainability Guide and Code of Practice have been developed for both the general community and the specialist stakeholder groups involved to promote informed decision-making processes and sustainable resource use.

i) **Community groups** can use the Sustainability Guide to become better informed about the issues related to EfW and to understand the complexities and inter-relationships between the various issues and outcomes. In the face of specific proposals, community groups can use the Sustainability Guide to evaluate, critique and, if appropriate, approve certain projects or initiatives, confident that the documents have been developed in an informed, impartial and inclusive manner.

ii) **Government** politicians and their bureaucracies can use the Sustainability Guide for evaluating and approving projects, drafting consent conditions and developing public policy and strategy. For example, it will assist local government to make waste management decisions where alternative technologies are being considered.

iii) **Industry** can apply the principles, philosophies and project assessment framework in the Sustainability Guide for scoping and developing projects that are more likely to receive a community licence to operate and the regulatory consents and approvals that are required.

1.8.2 The Sustainability Guide and Code of Practice are designed to be beneficially adopted by community representatives, government and project proponents in equal measure.

1.9 Editorial Focus and Sustainability Guide Formats

1.9.1 The issues of resolving the interests of both current and future generations within the field of sustainable resource use and the appropriate role for energy recovery from selected urban wastes have generated different opinions and defined some individual objectives. In the first editions of the Sustainability Guide and Code of Practice certain issues have been agreed and/or acknowledged, including:

i) the community's involvement in and acceptance of EfW projects is essential. The core focus during the development of the Sustainability Guide and Code of Practice was to facilitate not only a greater level of understanding of the issues by all stakeholders, but to provide a transparent and practical framework for appropriate and sustainable EfW projects to achieve the broad community licence to operate. However, it must be recognised that the framework itself may be limited and should not exclude consideration of other sustainability issues raised by stakeholders

ii) whilst this project was developed under the supportive umbrella of the WMAA and its principles and constitution, it has also been a public policy development activity for the broadest possible adoption. A wide range of stakeholders have been actively involved in the project to this point including those listed in Appendixes A, B and C and all those who attended the consultative workshops[4]. This active involvement provides the credibility for widespread application of the outcomes

iii) the WMAA will have an important role in providing a structured forum for ongoing input, review and comment through the Working Groups in each state and feeding into the National EfW Division. The EfW Division of the WMAA will regularly produce updated editions of the Sustainability Guide and Code of Practice in a culture of continuous improvement in the face of changing circumstances and needs

iv) the Sustainability Guide will be published in the following forms to accommodate different requirements:

a) the Complete Sustainability Guide with all sections as the background reference document

b) a Concise Sustainability Guide with little background and context and more emphasis on the project scoping principles (PSPs) and the assessment tool

c) a Condensed Sustainability Guide with only core principles and a graphic of the assessment process.

1.9.2 All documents will be developed and issued by the National EfW Division of WMAA.

1.9.3 The Sustainability Guide and Code of Practice will be updated every few years or more frequently if events require it.

1.9.4 The EfW Division of the WMAA is the peak national body, with Working Groups in most states of Australia. These Working Groups will submit editorial suggestions or factual modifications to the national body for assessment in the regular updating and review process.

[4] See http://www.wmaa.asn.au/efw/Final%20Summary.pdf for more information.

Section 2: Background and Context

This section gives more detail and background to the issues and drivers that must be addressed and resolved in the evaluation of sustainable energy from waste (EfW) projects. It is designed as a reference guide for the evaluation and assessment of related, collateral or contingent issues or projects.

2.1 Ecologically Sustainable Development (ESD) as the Primary Determinant

2.1.1 The management of urban wastes is an issue that goes to the heart of the social, environmental and commercial debate over the impact modern civilisation is having on the biosphere and its natural systems.

Establishing the benchmark

2.1.2 The framework adopted by the Working Group for the assessment and prioritisation of options is derived from Australia's National Strategy for Ecologically Sustainable Development (see Appendix D).

2.1.3 The definition of ecologically sustainable development (ESD)[5] adopted in this strategy is:

A pattern of development that improves the total quality of life both now and in the future, in a way that maintains the ecological processes on which life depends.

2.1.4 The overarching concept adopted in the Sustainability Guide is as follows:

Society's resources are to be managed in a way that improves our quality of life today without compromising the ability of future generations to improve their own quality of life.

What is sustainability?

2.1.5 This concept of sustainability accepts that all human and natural activity has an impact, but advocates that the biosphere must be capable of sustaining or absorbing these impacts[1]. Human activity that causes impacts which natural systems cannot repair is unsustainable. This unsustainability can be assessed by intensity and rate.

The Sustainability Guide looks to avoiding, minimising, reusing, recycling and reprocessing waste before considering the potential of EfW projects kicks in.

2.1.6 The Sustainability Guide has been developed to support and complement higher order strategies of avoidance, minimisation, reuse, recycling and reprocessing (facilitated through source separation) for inherent material recovery. It seeks to promote these outcomes before the step is taken to recover the calorific value through EfW projects (see 1.1.6).

[1] This application of sustainability requires the proactive implementation of the precautionary principle Appendix D ii).
[5] Note that the terms "ecologically sustainable development" and "sustainable development" are used interchangeably.

2.1.7 The destruction of finite resources for energy recovery alone can have lasting impacts on future resource availability and is not encouraged by this Sustainability Guide. The impacts of this are exacerbated when these materials still have the practical ability to furnish other higher value societal needs in substantially their current form or slightly degraded form.

Embodied energy needs to be considered

2.1.8 The importance of embodied energy needs to be considered at this point.

i) The embodied energy in an item or material is the energy expended to create the item or material and the energy that will need to be expended again if the material is to be replaced. This energy value is seldom reflected in the single calorific value that would be recovered by a traditional thermal energy recovery process (see 2.5.1 iv). For example, a textile made with a standard plastic will represent only a basic calorific value in a traditional thermal EfW process. However, this outcome will not reflect the energy expended to form the basic polymers or compounds from the original hydrocarbon source, nor will the energy expended in designing, manufacturing, marketing and distributing the product be recovered or recognised by the simple EfW end-of-life fate.

ii) The overarching interests of sustainable resource use place considerable importance on measuring and conserving embodied energy values. This is reflected in the preference given in the Sustainability Guide to higher order outcomes such as reuse, recycling and reprocessing for inherent resource value recovery (see 2.1.6).

iii) The balancing factor for the retention of embodied energy recovery is the effort, energy or resources required to actually reuse, recycle or reprocess the particular item that is presenting in an urban waste stream.

2.1.9 The principles of ESD have been adopted as a primary determinant for issues and options during the development of the Sustainability Guide since they establish a framework to balance social, environmental and commercial issues with the needs of both current and future generations.

2.1.10 These issues discussed in 2.1.1-2.1.9 above have been addressed in the preparation of PSP1 (see3.1).

2.2 The Nature of the Waste Considered

The Sustainability Guide deals with the residuals of three urban waste streams

2.2.1 The urban waste streams that are the focus of the Sustainability Guide originate from the following three main sources:

i) **municipal solid waste (MSW)** — the material generated by individual households and some small businesses. It represents the post-consumer spent and surplus materials that have traditionally been disposed of or discarded

ii) **commercial and industrial (C&I) waste** — the spent, surplus or unwanted materials that arise in the course of the primary productive activity. For the purposes of the Sustainability Guide this waste stream does **not** include by-products that also emanate from these productive enterprises. These will be applied as process inputs into some other activity since it is assumed that they will be channelled to some higher order application before presenting as a potential fuel

iii) **construction and demolition (C&D) waste** — the products of building demolition or alterations and the spent or surplus materials generated by building and engineering activity.

2.2.2 By their nature, the materials from these three waste streams present as **mixed** or **heterogeneous**. This is a direct product of the circumstances of their discard and will greatly affect how the materials might later be used if they are not to be simply discarded for landfill disposal.

2.2.3 Where the materials can be presented in **defined** or **homogeneous** streams, their ability to be reused or recycled is much enhanced, as is the case with kerbside recycling of domestic containers and paper, source-separated garden waste or source-separated wood, metals, glass and plastics from C&I or C&D waste.

2.2.4 The focus of this Sustainability Guide is the flow of **residual urban wastes** after higher order options have been thoroughly explored or those materials that, although homogeneous in nature, can be most sustainably used for energy recovery.

2.2.5 The Sustainability Guide has been developed as an assessment tool for urban wastes presenting for appropriate energy recovery as an option of last resort for materials that otherwise would be disposed to landfill.

2.3 Broad Characteristics of Residual Urban Wastes

The viability of an EfW project depends on the properties of the materials, their location and the energy recovery pathway or infrastructure

2.3.1 Although the materials in residual urban wastes are by definition indeterminate, in aggregate they demonstrate some broad characteristics. Generally these wastes will contain:

i) a moist organic fraction — this material comes from food residuals, soiled paper and garden organics and is predominantly lignocellulosic biomass in origin (renewable)

ii) a biologically slow or inactive high calorific fraction — this material consists of plastics, textiles, footwear and some wood, cardboard and paper and is predominantly hydrocarbon material of crude oil origin with some carry-over of lignocellulosic material

iii) metals — this consists of ferrous (iron and steel) and non ferrous (aluminium, copper and lead) materials. Metals can be extracted from the original waste material

iv) an inert fraction — this includes materials such as ceramics, dirt, grit, broken glass and rubble. These materials can be readily separated from the original waste material.

2.3.2 It is anticipated that a level of cross-contamination will occur between the four fractions identified.

2.3.3 Carry-over cross-contamination is addressed by the principles and protocols contained in the Sustainability Guide.

2.3.4 The location or geography of a potential source of urban waste is an important characteristic in assessing the potential for an appropriate energy recovery pathway. Issues of transport for aggregation to create viable volumes and the transmission of any electricity to be generated are both characteristics to be evaluated in determining the ultimate viability and sustainability of the EfW project.

2.3.5 The Sustainability Guide focuses on three urban waste streams: municipal solid waste (MSW), commercial and industrial (C&I) waste and construction and demolition (C&D) waste.

2.4 Community Perceptions of Energy Recovery Projects

2.4.1 Incinerating urban wastes as an alternative to landfill disposal has been practised widely for many years around the world, and still is. Increasingly incineration operations are retrofitting energy recovery capabilities and flue gas treatment systems to their facilities or replacing old plants with new facilities that seek to optimise the energy recovery in the form of heat or power as a valuable by-product of the primary operation. For ease of description we term these facilities "waste to energy" or "WtE."

2.4.2 Modern WtE facilities are one possible approach to the sustainable energy recovery from urban waste streams, especially in the light of recent technology improvements and the effort that is being directed to engineering out their potential negative impacts. However, the limits to these technological solutions must be recognised and considered in a transparent manner.

The Sustainability Guide promotes EfW when all other resource recovery options have been exhausted, not WtE as a by-product of incineration

2.4.3 The current community perceptions of this form of energy recovery from urban wastes could be coloured by past events and impacts. The business profile for these facilities tends to feature the following:

i) the core business is based on the disposal of the community's wastes. Energy recovery is an option or by-product of the core activity

ii) the efficiency and cost-effectiveness of the facility is closely dependent on waste volume and constant levels of throughput which have a tendency to require a large and dedicated catchment to provide supply for such a significant investment

iii) the wastes provided as feed to the facility are by definition indeterminate and of no fixed or certain origin or quality, even though they tend to demonstrate certain broad generic characteristics (see 2.2.2, 2.3.1). This lack of consistency could reflect a commensurate lack of control of the emission and ash quality from the facility and even certain operational impacts. Whilst many of these issues can now be managed by improved technology and engineering, these controls come at a cost.

2.4.4 The term "energy from waste" or "EfW" used in this Sustainability Guide is a simple terminology intended to promote projects and facilities that demonstrate a markedly different business profile from the WtE facilities outlined above. The business profile for EfW projects tends to feature the following:

i) the core business is the efficient recovery of energy from those fractions of the urban waste stream that have been identified as having no higher resource value other than energy recovery

ii) EfW provides the systems, facilities and infrastructure to recover energy efficiently without creating an incentive to generate waste or disrupt the flow of waste materials to their highest net resource value

iii) the immediate environmental consequences of EfW must demonstrate assured levels of control and management of impacts such as noise, pollutants, air and ash quality, as well as odour and traffic (see 3.5). **Given the indeterminate nature of the original urban wastes, if fuel preparation is not to be the primary strategy for controlling environmental impacts, the project would need to demonstrate post-conversion engineering and technological solutions that give the same or higher levels of confidence.**

2.4.5 Whilst WtE and EfW facilities may deliver substantially similar results and outcomes most of the time, it is perception and confidence issues that so concern the community.

2.4.6 Once urban wastes have been determined to have no higher resource value than energy recovery[6] the circumstances of their availability should inform the selection of the most appropriate conversion pathway.

[6] Note that the Sustainability Guide does not preclude the use of monofill as a long-term storage option. This would simply become one of the technology options to assess when considering highest resource value.

2.5 Energy Recovery Systems and Technologies

2.5.1 Detail on each technology is provided in Appendix H.

*Generic approaches for **unsorted** urban wastes*

Generic systems and technologies to recover energy from non-source separated or unsorted urban wastes include:

i) **conventional landfill with methane recovery** — the biogas that is recovered from landfill can be converted to heat, steam or electricity. The conventional landfilling of unsorted urban wastes generates methane or "biogas" through anaerobic degradation. Biogas is a significant, potentially explosive pollutant and greenhouse gas with a global warming potential 21 times that of carbon dioxide. Its recovery or extraction from traditional landfills is as much a pollution protection and safety measure as an energy recovery objective. However, even with today's best landfill practices, there are potential inefficiencies in biogas recovery including incomplete gas capture and greenhouse gas emission[7]

ii) **landfill designed to optimise biogas recovery** — the recovered biogas that is recovered from landfill can be converted to heat, steam or electricity. The landfill design and filling process can be done to optimise

   a) the anaerobic, biogas generating activity

   b) the systematic recovery of the biogas. Less gas is likely to escape to atmosphere over time, minimising the risk of a significant greenhouse emission impact from the biogas[5]

iii) **in-vessel anaerobic digestion (AD)** — the recovered biogas can be converted to heat, steam or electricity. Rather than rely on the relatively indeterminate boundary limits of a landfill, the same anaerobic digestion can be better controlled in a dedicated vessel or container. This allows the process to be conducted "wet" in a fully aqueous (added water) environment or "dry" using the inherent moisture in the material itself (perhaps 55% moisture). In either case, gas control can be absolute and gas generation rates optimised. The digestate will present for future treatment, beneficiation or processing to produce secondary products if required[4]

iv) **mass burn** — the heat evolved can be used directly or converted to steam or electricity. This approach can use a range of hearth configurations but the similar conditions of intense thermal oxidation aim to achieve complete "burn out" of the organic molecules to achieve complete mineralisation of the urban wastes which will present as heat evolved, ash and resultant gases. The gases that result must then be cleaned up or controlled before emission to the locally prevailing limits or standards. The ash must be similarly managed for reuse, recycling or disposal in accordance with local circumstances.

[7] In the three generic systems and technologies set out in i, ii and iii above it is only the organic biomass fraction of the urban wastes that is altered or converted by the process. The metals and inert materials remain substantially unchanged. A biologically stable organic fraction will result from the digestion for future processing, application or disposal. The primary outcomes of these systems or technologies are volume reduction, biochemical stabilisation and some calorific energy recovery.

v) **advanced thermal processes** — these include pyrolysis, gasification and plasma arc (see Annexure H for more detail).

In general these advanced thermal processes and technologies are unsuitable for **unsorted** or **non pre-treated** urban wastes (see 2.5.2 iii below).

*Generic approaches for **selected** urban wastes*

2.5.2 Generic systems and technologies to recover energy from selected or source-separated fractions of urban waste are set out below.

By definition, the following systems or technologies require and assume that the preferred fraction has been selected from the mixed and indeterminate urban waste feedstocks and pre-treated, screened or selected:

i) **in-vessel anaerobic digestion (AD)** — as for 2.5.1 iii above. However, where the moist organic fraction referred to in 2.3.1 iii above is processed without the other fractions of urban waste, a greater level of gas generation efficiency is possible. In this case the digestate is much more likely to be reprocessed into secondary products rather than directed for conventional disposal as a stabilised material

ii) **process engineered fuel (PEF)** — this approach to systematic energy recovery from mixed urban wastes usually focuses on the high calorific fraction (see 2.3.1 ii), but may also include carry-over components from the moist organic fraction (see 2.3.1 i). These materials most typically are processed at a specialised facility by sorting, screening, blending, drying and particle size control to produce quality-assured **alternative** or **supplementary fuels** for use by existing or dedicated conversion facilities (see 2.5.3). A feature of these facilities is the production of a supplementary or alternative fuel product that has defined, specified and assured qualities and characteristics. This allows the converter to establish their own product, process and emission quality criteria, with confidence that the fuel will have known and acceptable impacts.

This generic approach presents the maximum quantity of available high calorific fraction (HCF) for conversion to energy and retains the primary control of environmental impacts in the fuel preparation process rather than relying solely on gas clean-up and complex ash management techniques.

Another feature of the approach is that high calorific materials can be received and processed into fuel products as they are needed. Their future conversion can then occur as required to meet secondary market demand. Where existing facilities such as kilns and power stations act as the converter the capital cost of dedicated conversion facilities is avoided.

Process engineered fuel facilities play a convenient and cost-effective first point of receival role for waste collection vehicles similar to that currently played by transfer stations.

The alternative and supplementary fuel products that result can be forwarded to the dedicated conversion facilities as value-added products rather than as negatively valued wastes

iii) **advanced thermal processes** — these include:

a) **gasification** — thermal conversion of feedstock to a combustible gas in an oxygen-reduced atmosphere. The gas may be used as a fuel or chemical feedstock after clean-up

b) **pyrolysis** — the application of an external heat source in the absence of oxygen to produce reduced gas, oil and char products for immediate or future use

c) **plasma arc** — the application of an extreme heat source to convert the fuels into hot ionised gas for synthesis into the desired products.

These are sophisticated processes that can deliver significant advantages in terms of efficiency and control of process and product quality. They are invariably sensitive to feedstock quality and consistency and therefore most likely to be used for converting PEFs.

2.5.3 Secondary conversion facilities for selected or pre-prepared fuel products can present in many forms:

i) **existing facilities** — a range of industrial or power generation facilities currently exist that have been established on traditional fossil fuels (coal, oil, gas) and can be adapted to accept a proportion of alternative or supplementary fuels prepared from urban wastes.

Similarly, these PEFs can be "manufactured" to meet the precise requirements of existing industrial applications to ensure there is no detriment to the primary product quality or emission profile of the existing facilities (see 2.5.2 ii).

The potential facilities include:

a) cement and lime kilns
b) brick or masonry works
c) metal smelting and reduction plants
d) thermal power generation plants
e) miscellaneous facilities that generate industrial heat and steam.

As alternative fuels, the PEFs are manufactured to completely replace the existing fuel source.

As supplementary fuels, the PEFs are manufactured and supplied to co-fire with the existing fuel source in the desired or practical proportion

ii) **special purpose facilities** — in this scenario PEFs might be produced to a specification to exactly suit a new special purpose conversion facility such as:

a) an advanced thermal process (see 2.5.2 iii)

b) a dedicated power generation facility with a wide range of hearth configurations

iii) **embedded facilities** — these are usually smaller but very localised energy recovery facilities, even to the scale of the single facility converting its own waste material. An example of this is a sawmill converting offcuts and sawdust to produce heat, steam and/or power for its own use, perhaps with an excess to export from time-to-time or perhaps converting bagasse on-site to provide heat and power for sugar distillation. These facilities are increasingly adopting cogeneration techniques for optimum efficiency and cost-effectiveness.

The main features of embedded facilities with regard to the conversion of urban wastes are:

a) they are usually small-scale, for example up to 10 MW
b) they are localised and generally centred on one plant or industry for base demand
c) they are located to minimise transport and transmission costs
d) they often feature cogeneration for local heat and steam use, with excess power exported.

2.6 Interaction with the Community

A focus for the Sustainability Guide and Code of Practice is to facilitate the granting of a broad-based community licence to operate for appropriate and sustainable EfW projects. This involves providing information and facilitating active involvement so that the community can exercise its ultimate responsibility through an informed, transparent and accountable process or framework.

2.6.1 Whilst the term "community" includes every party potentially involved in evaluating a particular project or issue, the main stakeholders have been defined as community, government and industry (see 1.7.1). As such, government represents the statutory authorities that are charged with interpreting the community will and common good. Community in this instance seeks to reflect:

i) neighbouring residents, workers, businesses and sensitive landuses such as schools, community centres and aged care facilities

ii) the electorate (local, state, federal)

iii) environmental NGOs

iv) special interest groups.

By this definition the community is a powerful force that could organise and act to influence government and industry on significant issues.

2.6.2 Given the benchmark of sustainability as the primary determinant of appropriate projects and the requirement for a broad-based community licence to operate as a basic necessity for an appropriate project to proceed, the community has a crucial role to play (see 2.1, 1.10.2 i).

2.6.3 The community role is to interpret the sustainability issues on behalf of current and future generations. This requires active interaction between the stakeholders to assist them to carry out their tasks and responsibilities.

2.6.4 The community needs to be actively involved, fully informed and engaged regularly and transparently in order to make its decision responsibly. The Sustainability Guide provides a structure or framework to facilitate this outcome.

2.6.5 To facilitate this interaction between the stakeholders the Sustainability Guide outlines a process and framework for:

i) **providing information** — the information provided must be topical, of an appropriate quality and readily accessible. It needs to cover the following topics as a minimum:

a) the issues and context

b) the details of the specific proposal

c) the outcomes, impacts and benefits

d) the determining factors

e) the process for project assessment and determination

ii) **stimulating involvement** — the rights of and necessity for the community to be intimately involved in the decision-making process is matched by a responsibility to undertake the task thoroughly. Action and involvement are essential for this to occur and can be stimulated if required by:

a) an iterative and interactive approach that matches involvement, information and interaction as suits the status of the proposal

b) an “early and often” approach that encourages active involvement whenever new information or material advances on a proposal occur

c) a consultative approach that provides transparent and accountable feedback mechanisms

iii) **maintaining a transparent and accountable process** — for all the stakeholder groups to be able to act and interact with confidence and goodwill, the process must be fair and transparent and the parties must be accountable for their actions and the decisions they make on behalf of their respective constituencies. The adoption of a transparent and accountable process is the best insurance that projects will be thoroughly evaluated and critiqued and the final decision to approve, amend or reject a proposal delivered in an environment that can be substantiated.

2.7 Issues to be Evaluated and Assessed for a Successful Project

As outlined in this section and reinforced during the extensive consultation and workshop process[8], a number of key issues emerge that must be addressed and resolved for a project or proposal to:

i) receive a widely endorsed licence to operate from the community

ii) optimise the sustainability of the project or proposal.

2.7.1 Best Use of the Available Resources

The evaluation of best resource use goes to the heart of the sustainability issue. This issue is of paramount importance because of the irreversibility or binary nature of the decision to recover the calorific value of the materials concerned (see 1.2). If it can be shown that potentially available urban wastes can be directed for higher value reuse, recycling or reprocessing in substantially their current form, then it is immediately apparent that EfW is not the correct action. In those circumstances all other issues of efficiency, environmental and social impact and economic consequence will not require assessment or evaluation.

2.7.2 Assessment of Consequences, Impacts and Commitment

Once potentially available fractions have been identified as being suitable for appropriate conversion to energy, then the circumstances of their arising and presentation can inform the most effective conversion pathway. This can be decided after considering:

i) the net efficiency of their conversion. Inefficient conversion results in wasted resource value (see PSP2 and Section 3 for a description of the PSPs)

ii) whether there is adequate control of the environmental impacts that will occur. In all circumstances this is a critical factor in receiving consent to operate. It will be demonstrated by control of the fuel preparation and conversion processes (see PSP3)

iii) adequate assessment, evaluation and control of the social consequences of a potential project. These issues are of significant consequence to neighbours, the electorate and traditional or special purpose NGOs (see PSP4)

iv) the importance of demonstrating the ability to deliver on the long-term commitments made at the time of initial consent. This amounts to a proven ability to make good on commitments and control measures over the life of a project — perhaps 20–30 years — and not just at the consent and approval stages (see PSP5)

v) the potential commercial impacts on higher order reuse, recycling or reprocessing options. Before the project is operational, it is crucial to document that no higher resource value programs will be negatively impacted (see PSP6).

Throughout the evaluation process for i-v above there is a need to ensure that the full suite of environmental externalities has been systematically evaluated and included in any final assessment or decision.

[8] See http://www.wmaa.asn.au/efw/Final%20Summary.pdf for more information.

2.7.3 Throughout the project evaluation phase the community needs to be consulted proactively and the actions and decisions of all stakeholders continually monitored and reviewed in a fully transparent and accountable framework. The Sustainability Guide has been designed to provide this framework.

Section 3: Project Scoping Principles for EfW Projects

This section summarises and resolves the outcomes of the national consultative workshops and the issues reviewed in the two previous sections. It presents a series of key project scoping principles (PSPs) that can be used to assess the sustainability of any energy from waste (EfW) project or proposal. The PSPs are fundamental to the use of this Sustainability Guide.

3.1 Introduction to the PSPs

Project scoping principles or PSPs take the guesswork out of assessing the sustainability of an EfW project

3.1.1 The following PSPs have been developed from the national consultative workshops to provide a recognisable structure for assessing the sustainability of an EfW project. The PSPs aim to:

i) help potential EfW projects be conceived, scoped and structured to optimise the potential of sustainable energy recovery from the appropriate fractions of urban waste whilst minimising or eliminating the potential disadvantages (see 1.3)

ii) provide a common reference for the evaluation of potential projects as they seek to "justify their demand" or acquire their basic "licence to operate" from the community and its duly authorised consent and approval authorities

iii) provide an integrated and structured reference for the ongoing assessment and monitoring of a project or facility that does acquire a community licence to operate.

3.1.2 The process of profiling a project and assessing sustainability has the following features, which are also shown graphically in Figure 3-1:

i) **satisfaction of PSP1** — if it cannot be demonstrated that conversion to recover the calorific value of the materials in question is the most sustainable use of the materials, no further project assessment needs to be undertaken. Whilst this initial assessment may be undertaken by any stakeholder, it is most appropriate if undertaken by the current owner or generator of the waste

ii) **assessment of optimum conversion pathway** — for the materials or resources presenting for recovery of calorific value an iterative framework is proposed that includes evaluation against PSP2–6 within a process that advocates:

a) proactive consultation with the community (see 2.6.3)

b) continuous monitoring of the likely impacts of a proposal and the incorporation of environmental and social externalities at each stage.

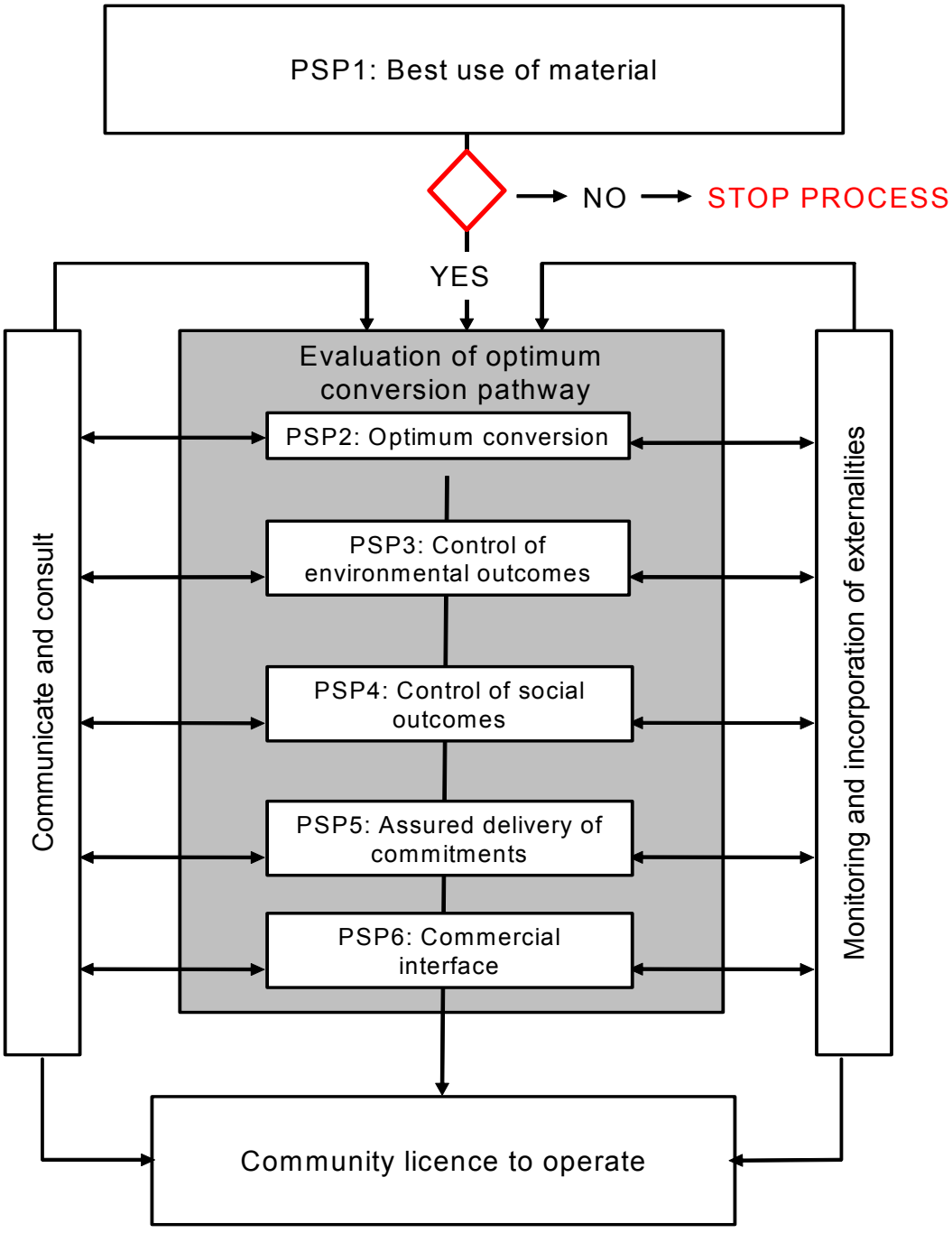
The PSPs are designed to streamline the assessment process

The Sustainability Guide proposes that the current waste owner, generator or project developer be responsible for demonstrating the optimum conversion pathway

iii) **application for formal consents and approvals** — this stage should be greatly simplified for both applicant and consent authority through the demonstration of a general licence to operate from the community.

3.1.3 The proactive and conscientious application of the project profiling and assessment process shown in Figure 3-1 can reduce the potential for misunderstandings between stakeholders and avoid potential delays due to objections since these may not be raised if the PSPs are used. The process also identifies projects at an early stage which do not demonstrate sustainable resource use. This avoids the considerable time and expense that would be incurred by both applicants and consent authorities if a formal consent or approval process were to be undertaken (see 1.5). In this case the community would be justified in withholding a licence to operate.

Figure 3-1: Assessment Roadmap of Project Scoping Principles



3.2 Profiling EfW Projects and Proposals

The following PSPs and the corresponding assessment process outlined in Figure 3-1 above allows the potential of an actual EfW project to be profiled to provide a qualitative and widely recognised assessment. If this is positive, it can provide a firm basis for a more quantitative assessment as part of any future formal consent, approval and licensing procedure.

3.2.1 The profiling process is based on assessing a project or proposal against the six PSPs that have been identified as accurately representing the issues of ESD and community interest.

3.2.2 The commercial assessment that might occur after a project has achieved a positive assessment against these sustainability criteria is assumed to be an independent process for a project proponent[9].

3.2.3 Each of the following PSPs is addressed as follows:

i) PSP title

ii) PSP statement of purpose or objective

iii) explanatory notes to assist assessment

iv) some suggested compliance criteria or approaches

v) qualitative assessment matrix.

3.2.4 The qualitative assessment matrix provides a framework for comparative evaluation. It is designed to give the stakeholders confidence that the quantitative assessments that will be required during the formal consent or approval processes are appropriate.

[9] However, a project that demonstrated a positive sustainability assessment and therefore an important role in delivering a sustainable resource outcome for the community's urban wastes but failed a standard commercial viability assessment by the project proponent might be a candidate for public support or subsidy as a tangible internalisation of certain ESD externalities.

3.3 PSP1: Best Use of the Available Materials

This assessment is best done by the waste owner or generator

3.3.1 The purpose or objective of PSP1 is:

to demonstrate that the application of the urban wastes being considered for conversion for their calorific value represents the most sustainable application of the resources.

3.3.2 Explanatory Notes to Assist Assessment

It is proposed that the following assessment is to be completed for the urban wastes under consideration by their owner or generator. This approach is aimed at both facilitating the acquisition of data and information that will most accurately describe the circumstances of their arising and presentation in their current form, and most directly informing the development of alternative strategies should they emerge as possible or beneficial. An audit and assessment of the materials in question should allow the following profile to be systematically addressed:

i) did the particular urban wastes need to be generated in the first place and is the primary activity or product design justified or could the activity have been altered or amended to avoid generating the waste?

Responses to this very fundamental initial question could have considerable impact on many of the future values and assessment criteria, especially where a point source or specific activity can be identified. For materials such as mixed residual MSW the assessment may be more subjective and could include:

a) justification of demand for the generic product or service

b) attention to sustainability and resource use issues at the point of design or product initiation to achieve the optimum post-consumer fate for the product or service

c) the clean production disciplines

ii) if the production of the wastes was unavoidable and justified, could the volume, toxicity or heterogeneity have been reduced at or before the point of generation?

iii) once a particular urban waste is confirmed and identified, could all or any fraction of the materials have been beneficially directed for some form of reuse, perhaps as a supplement to the original raw materials or related to the original purpose or function?

iv) could all or any of the materials presenting in the confirmed and identified urban waste stream be beneficially directed for recycling into substantially the same originating material (for example, paper-to-paper, glass-to-glass, plastic-polymer-to-plastic-polymer, metal-to-metal)?

v) having reviewed the possibilities in i–iv above, could all or some of the materials in the urban waste be beneficially reprocessed into some other raw material stream or product?

Responses to ii–v above will be much assisted if the research for i above has been thorough and systematic and properly addressed under the headings of clean production and post-consumer planning.

If questions i–v above are answered in the negative, then the calorific value potential needs to be assessed, evaluated and considered before determining the materials' fate of last resort such as the need for stabilisation or treatment to make them suitable for landfill. The following issues and all future decisions will be materially affected by the circumstances of their arising and the rate of availability of the urban wastes in question:

a) geography — where the materials initially arise will materially influence all issues of critical mass, transport and aggregation

b) rate of arising — the materials may arise sporadically, regularly or seasonally or in variable or reliable rates of presentation

c) reliability of presentation — the materials may present as short-, medium- or long-term opportunities

d) quality and content — the auditable quality characteristics of the materials will inform the selection of future processes.

These issues will be vital determinants of the options, scale or viability in the assessment of PSPs 2–6 below.

The consideration of existing or potential markets for resource streams and their availability or saturation must also be included in the assessment in PSP1. However, it should be noted that EfW projects will not prevent other markets for recoverable resource streams developing.

3.3.3 Some Suggested Compliance Criteria or Approaches

The assessment and evaluation of performance against these criteria may never be an exact science, but the ultimate granting or declining of a community licence to operate may never be able to be objectively determined either. The task is to demonstrate that the key issues and criteria have been systematically and conscientiously addressed and that practical, commonsense, fair and equitable conclusions can and have been drawn.

There are emerging assessment tools that might be adopted in whole or in part to provide greater levels of assurance and certainly in certain circumstances. These include:

- life cycle assessment (LCA)
- materials flux analysis (MFA)
- environmental accounting
- risk assessment
- general research and best practice benchmarking.

However, the adoption of these tools will still require value judgements and artificial boundary or process parameter determinations. As such, they need to be used with careful consideration of their effects on the more intuitive and subjective opinions of the general community.

This Sustainability Guide suggests that the current waste generator be responsible for the structured responses to these criteria, since they are best placed to influence the outcomes. This is especially valid in an EPR context[10].

3.3.4 Qualitative Assessment Matrix

Because of the importance of granting a community licence to operate, the responses to these criteria must be sufficiently well developed and communicated to allow reasonable assessment.

Table 3-1: PSP1 Qualitative Assessment Matrix

Issue		Assessment		
		Yes or not applicable (N/A)	No	Provisional
i)	Is there justification for the generic product or service that generated the urban wastes in question?			
ii)	Has sustainable resource management been adequately addressed at the point of product initiation or design?			
iii)	Have the clean production disciplines been conscientiously observed and implemented up to the point of consumption?			
iv)	Has resource value been optimised throughout the supply chain to create the opportunity for optimal reuse, recycling and reprocessing?			
v)	Are the resultant wastes unavoidable?			

- *A **yes** or **N/A** response to each question should facilitate a simple response to the next stage (see Table 3-2).*
- *Any **no** response would suggest a review of the circumstances that drew that response since if they are left unaltered these issues are likely to feature prominently in any future consent or approval process.*
- *Any **provisional** responses may also draw attention during a formal consent or approval process but may be offset by positive responses to all other criteria.*

[10] Assessment at this fundamental and initial stage highlights the important link between design intent at the product initiation stage with the range and serviceability of systematically available options for both the by-products from the production process and the post-consumer fate of the products or packaging themselves.

The urban wastes that are the subject of this Sustainability Guide arise as by-products of the productive processes as well as post-consumer discards. The interface between designing products and services sustainably and sensitively for a secondary resource or post-consumer fate that cannot be provided is as wasteful as providing secondary resource recovery services that are sub-optimised by inconsiderately designed products or packaging (eg. making a "recyclable" soap container that although made of cardboard, has a metal spout, a plastic handle and non-recyclable coating). The concepts of extended producer responsibility (EPR) and/or product stewardship (PS) have a direct and causal relationship with the (usually government) role of waste management planning or secondary resource recovery, reaggregation and systematic value recovery.

The provision of EfW options and facilities should be seen as providing for the recovery of the most sustainable inherent energy values from materials that were specifically designed or made available for such a fate.

Table 3-2: PSP1 Evaluation Matrix

Issue	Assessment		
	Yes	No	Provisional
In light of the quality of the information provided and the above responses, on balance has the case been sustained that the materials in question have no higher resource value than to be converted for their calorific value?			

- *A **yes** response would suggest that a move to PSPs 2–6 was appropriate.*
- *A **no** response would indicate that a move to PSPs 2–6 was unlikely to be worthwhile.*
- *A **provisional** response would indicate that a move to PSPs 2–6 might be appropriate, especially if very positive results could be expected from future assessments. However, a systematic review of the suitability of the apparently available materials for conversion to energy might be more rewarding.*

3.4 PSP2: Selection of the Optimum Conversion Pathway

3.4.1 The purpose or objective of PSP2 is:

to demonstrate that the selected process and pathway for the conversion of the urban wastes for their calorific value are the optimum ones for the available materials.

3.4.2 Explanatory Notes to Assist Assessment

i) A sub-optimal or inefficient conversion process and pathway represents wasted resource value. Wasted resource value represents unsustainability and is to be avoided on both environmental and economic grounds.

ii) The concept of the conversion pathway reflects the geography of the initial arising of the wastes in question and requires consideration of the costs and impacts of any future transport or aggregation to attain critical mass or access to a suitable conversion process (see 3.3.2 a). Where conversion to electric power is being considered, future power transmission issues have an impact on the final determination of the optimum result.

iii) Urban wastes usually present as a mixture of different materials which individually have quite different conversion characteristics such as different flash points, ash content and optimum combustion and burn-out properties. There will even be differing moisture levels and inert contaminants within each of the constituent materials. In these circumstances the selection of the conversion process will need to reflect these complexities.

iv) Optimal conversion efficiency may be best demonstrated where both heat and power recovery are achieved (cogeneration). Conversion efficiency may be expressed simply as operational efficiency; that is, the useful output of energy divided by the total energy input. At a more complex level, issues such as fuel processing and pathway and transport activities need to be considered and compared with locally available energy sources or alternatives.

v) Feedstock preparation can play a role in:

a) narrowing the range of optimisation for the selected process

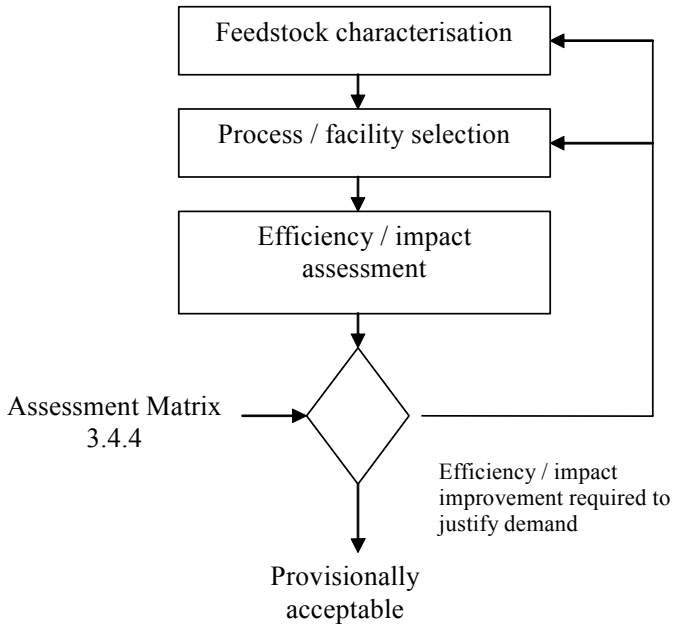
b) demonstrating control of impurities and contaminants

c) providing evidence that any higher value materials have been identified and recovered

d) providing first order value-adding to materials that are identified for future transport and aggregation to larger scale and more efficient facilities.

3.4.3 A three-stage iterative review process is proposed as shown in Figure 3-2:

Figure 3-2: PSP2 – Iterative review process



i) **feedstock characterisation** — the initial supply of urban waste has been identified in PSP1. The characteristics of this material need to be recorded as to:

a) geography — where the materials initially arise or present as an opportunity for assessment and potential resource recovery

b) rate of arising — the volume or quantity of the urban wastes available for assessment

c) reliability of presentation — the seasonability or fluctuations in the availability of the materials including a review of the short-, medium- and long-term prospects for the continued generation of the urban wastes

d) quality and content — a physical and biochemical analysis of the materials including a review of potential changes over time (see c above).

A review of these characteristics will enable an initial needs analysis to be completed that will describe the development of an optimum process specification to accommodate the conversion of the available materials for their calorific value

ii) **conversion pathway, process, facility and site selection** — a range of issues will need to be assessed and reassessed to identify the best fit with the needs analysis and process specification developed in i above including, but not limited to:

a) **on-site, local and embedded facilities** — these facilities or processes would include either new or existing facilities that are suitable to convert the specific materials in question and could include systems mentioned in Section 2.5 (see 2.5.3 iii)

b) **regional facilities** — these facilities, also outlined in Section 2.5, will require a transport or transmission factor to be considered, and may represent an opportunity to aggregate the materials to improve economies of scale or improve the profile of all or any of the factors set out in 3.4.3 i a, b, c and d above

c) **site selection** — the selection of a specific site for the project is an important consideration and, in particular, its proximity to resource supply and the community

d) **sole, alternative or supplementary feed** — the materials might be converted as a sole feed to a new or existing process, as an alternative to some existing feed or as a supplement to an existing feed into a new or existing conversion process

e) **process track record and reliability** — any conversion pathway or specific process in any of the above combinations needs to be assessed for innovation, its track record in similar service, its reliability and general ability to deliver proven and acceptable outcomes

iii) **efficiency and impact assessment** — this process may be conducted iteratively as different combinations of i and ii above are considered. Both qualitative and quantitative items will need to be included.

Eventually the **efficiency** of the proposed process compared with alternative sources of energy locally and the **impacts** (PSPs 3, 4, 5 and 6) will need to be presented in a format and with a level of community credibility which allows reasonable and informed members of the community sufficient justification for granting a community licence to operate. The presentation of an audit trail of the research and assessment undertaken to establish the efficiency and impact values is therefore recommended

iv) **iterative development of options** — after an initial assessment as described in i and ii above, the results at iii may appear sub-optimal, in which case other options may be considered to improve the outcomes, such as:

a) aggregation with other urban wastes — in this situation other sources of materials that can pass the evaluation criteria for PSP1 might be identified that improve the rate and reliability of arising issues and/or quality and content characteristics. Aggregation might involve the original materials being transported to a regional facility or regionally sourced materials being aggregated at the original location

b) transport and transmission issues — aggregation involves net process efficiency and impact criteria to reflect the transport costs and impacts and, in the case of energy generators, future transmission costs and losses

c) review of conversion pathway and process options — following a needs analysis and process specification revised by research into ii) a & b above, the amended situation will require a review of the conversion pathway and process options before a revised efficiency and impact assessment is undertaken

d) assessment of impacts in relation to the receiving environment — this should be done bearing in mind the specific conditions and characteristics of the local or receiving environment since impacts such as emissions to air, water or land, traffic, noise, job creation and local commerce will all be regionally specific.

3.4.4 Qualitative Assessment Matrix

This proposed assessment process assumes that sufficient iterations of the review of 3.4.3 i, ii and iii have occurred independently to provide the basis for the following assessment.

Table 3-3: PSP2 Qualitative Assessment Matrix

Issue	Assessment		
	Yes or not applicable (N/A)	**No**	**Provisional**
i) Has the potential feedstock characterisation occurred to a level of certainty sufficient to objectively scope future conversion pathway and process options?			
ii) Have issues of potential feedstock aggregation been considered to a level that is sufficient to objectively scope future conversion pathway and process options and consider additional transport and transmission issues?			
iii) Has feedstock preparation and pre-treatment been thoroughly evaluated in the development of the proposed conversion pathway and process especially in regard to improving logistics, efficiency and impacts?			
iv) Does the selection of the proposed conversion pathway, process or facility demonstrate a thorough evaluation of all the options within the context of the specific feedstocks available?			

- *A **yes** or **N/A** response to each question should facilitate a simple response to the next stage (see Table 3.4).*
- *A **no** response to any of the questions would suggest that a review of the particular issue was advisable. **No** responses are likely to feature prominently in any future formal consent or approval process.*
- *A **provisional** response to any of the above questions may also draw attention during a formal consent or approval process but may be offset by positive responses to all other criteria.*

Table 3-4: PSP2 Evaluation Matrix

Issue	Assessment		
	Yes	**No**	**Provisional**
In light of the responses and information provided, can a position be sustained that, on balance, the selected conversion pathway and process is the most efficient for the urban wastes in question?			
Note The issue of the resultant impacts of the project will be evaluated in PSP3 below.			

- *A **yes** response would suggest that a move to PSPs 3–6 was appropriate and that preliminary community consultation could proceed on the basis of the information that had been generated from PSPs 1 and 2.*
- *A **no** response would suggest that further review of the options was required before continuing or that the proposal should proceed no further.*
- *A **provisional** response would indicate that positive results from PSPs 3–6 could improve the project's sustainability profile but that the project was unlikely to satisfy a formal consent or approval process in its current form.*

3.5 PSP3: Control of Environmental Impacts and Outcomes

3.5.1 The purpose or objective of PSP3 is:

to demonstrate that the selected conversion pathway and process and management systems will provide control of all environmental impacts and outcomes.

3.5.2 Explanatory Notes to Assist Assessment

i) Unless they are separated at their source, urban wastes almost by definition present as mixed and indeterminate.

ii) Conversion pathways and processes may be adjustable but will tend to be optimised at certain preset process conditions.

iii) Where materials of indeterminate consistency are processed via a consistent process, the outcomes may well be as variable and indeterminate as the original feedstocks.

iv) This variability may be managed by tertiary processes broadly scoped to treat any unacceptable impacts or outcomes as and when they occur. These techniques can be employed in such areas as gas clean-up, water treatment or ash management. However, there is an inherent inefficiency in this approach since it requires a process to be designed and operated at all times, regardless of whether or not the particular impact is present or evident at any particular time. An alternative approach is to pre-treat or pre-process the feedstocks to remove the indeterminate nature of the material before processing or converting them (see 2.5.2 ii and 2.4.4 iii).

v) **This Sustainability Guide advocates the pre-treatment or fuel preparation route since it has the greatest potential to provide the greatest level of impact control or certainty of outcomes (see 2.4.4 iii).** Fuel preparation by mechanical, manual or automated systems to produce a product to a defined specification that can be made available for direct conversion will not only demonstrate the greatest level of assurance to the community but will allow for a more targeted conversion process design that incorporates management systems to deal with any tertiary impacts.

vi) Fuel preparation can occur at the point of generation as part of the aggregation or logistics network or at the conversion plant itself.

vii) Site availability and selection will be an important factor requiring consideration. Factors to be considered include size, transport access, proximity to the resource, market, community and any sensitive natural surroundings.

viii) The demonstration of appropriate quality assurance/quality control (QA/QC) systems is essential for satisfaction of this PSP. Some of the poor public perception of energy recovery from wastes originates from environmental impact issues.

Historically incineration was adopted as a disposal-based technology that sought to destroy or reduce the volume and toxicity of urban wastes by intense thermal oxidation, with any energy recovery as a by-product of the main activity (see 2.4). The process accommodated the heterogeneous and indeterminate nature of the wastes. If environmental impacts were recognised as an issue they were dealt with by ever-more complex gas clean-up, water treatment, ash management and OH&S techniques.

ix) The EfW approach in this Sustainability Guide does not advocate the destruction or disposal of urban wastes for their own sake. Rather, it seeks to recover the calorific value from those materials that have no higher resource value than to be managed in this way. A fundamental difference between the two approaches is reflected in the QA/QC procedures adopted. An example of this is the pre-treatment or preparation of available wastes into specified fuel products.

x) EfW projects must adhere to the environmental standards in the state where they operate. These require the management of by-products from EfW projects including ash, char and digestate to comply with relevant standards.

xi) Approaches in this PSP are typical of those that need to be addressed in formal approvals from permitting authorities, facilitating formal interactions when required.

3.5.3 Some Suggested Compliance Criteria or Approaches

i) In the first instance the potential impacts from a particular conversion pathway or process will have been defined in evaluation of PSP2 (see 3.4.3 iii).

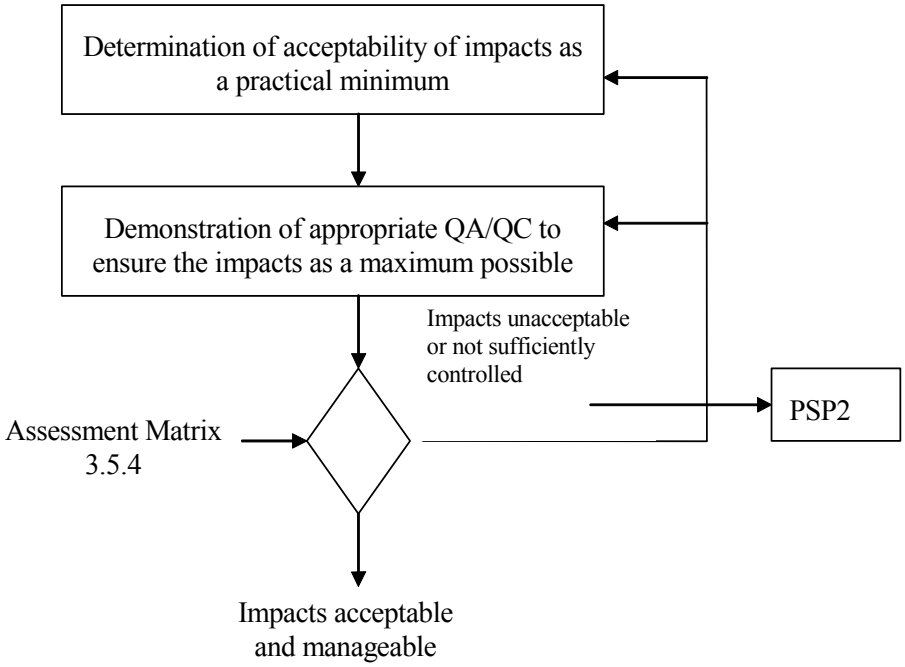
ii) To demonstrate compliance with this PSP proponents need to:

a) determine that these impacts are acceptable and of a minimum that will sustain project viability

b) demonstrate that if any environmental impacts are accepted as reasonable and in proportion to the benefits that they can be systematically controlled throughout the entire life of the project.

This gives rise to a proposed two-stage iterative review process to satisfy this PSP as shown in Figure 3.3: PSP3 - Iterative review process.

Figure 3-3: PSP3 – Iterative review process



iii) The basis for demonstrated QA/QC may be:

a) strategic

b) mechanical

c) systematic

d) a combination of all three.

In any case, evidence would need to be presented that would lead to the conclusion by a suitably informed party carrying out a reasonable assessment that these issues had been thoroughly and conscientiously addressed.

3.5.4 Qualitative Assessment Matrix

This assessment process assumes that sufficient iterations have occurred between 3.5.3 ii a, b and PSP2, if necessary, to provide the basis for the following assessment.

Table 3-5: PSP3 Qualitative Assessment Matrix

Issue	Assessment		
	Yes or not applicable (N/A)	No	Provisional
Are the projected impacts such as emissions and residuals management acceptable as a practical minimum in proportion to the potential benefits and in light of the local, regional or national circumstances?			
Has a sufficient level of control of the impacts been demonstrated to ensure that they will be the maximum experienced for the duration of the project?			

- *A **yes** or **N/A** response to each question should facilitate a simple response to the next stage (see Table3.6).*
- *A **no** response to either question would suggest that a review of the particular issue was advisable. **No** responses are likely to feature prominently in any future consent or approval process.*
- *A **provisional** response to either question may also draw attention during a formal consent or approval process but may be offset by positive responses to all other criteria.*

Table 3-6: PSP3 Evaluation Matrix

Issue	Assessment		
	Yes	No	Provisional
In light of the responses and information provided, can a position be sustained that control of the potential impacts can be maintained for the duration of the project?			

- *A **yes** response would suggest that a move to PSPs 4–6 was appropriate and that preliminary community consultation could proceed on the basis of the information that had been generated from PSPs 1, 2 and 3.*
- *A **no** response would suggest that a further review of the control mechanisms was required or that the proposal should proceed no further.*
- *A **provisional** response would indicate that positive responses to previous or future criteria would be required to provide the level of confidence necessary in a formal consent or approval process.*

3.6 PSP4: Control of Social Impacts and Outcomes

3.6.1 The purpose or objective of PSP4 is:

to demonstrate that measures are in place to adequately manage social and economic impacts for the duration of the project.

3.6.2 Explanatory Notes to Assist Assessment

i) The establishment of an EfW project, whether embedded, local or regional in scale and whether adopting new or existing conversion facilities, can have social and/or economic impacts on the community. These impacts might include:

a) concern over direct environmental impacts such as:

- emissions to air
- emissions to water
- emissions to land
- biodiversity and ecotoxicity concerns
- traffic issues
- increased noise profile
- greenhouse issues
- odour
- dust
- vermin and vectors (see 3.5)

b) employment and training issues

c) OH&S issues

d) local amenity issues and aesthetics

e) commercial effects locally, regionally and nationally

f) pricing signals, effects on other programs (e.g. recycling)

g) delivery of genuinely sustainable resource management outcomes

h) offsets and community infrastructure.

ii) Many of these issues and impacts will be weighted differently in different locations and circumstances and depend on site availability and selection. Different views or perspectives can arise from local, regional and larger scale community interests. For example, a remote rural application may value the employment and commercial benefits more highly but consider impacts of traffic and amenity more negatively. The measurement of net environmental impacts will also be a direct result of considering the totality of the effects within the context of the receiving environment.

iii) Many of these impacts such as b, d, e, f and g above may be observed positively as well as negatively and a community licence to operate may be granted as a result of various representations or understandings on these issues. The objective of this PSP is to ensure that the project is structured so that it can demonstrate an ability to manage and deliver the anticipated social outcomes.

3.6.3 Some Suggested Compliance Criteria or Approaches

i) The direct anticipated environmental impacts will have been established in PSP3. However, the concern will be best managed by a structured program of communication, education and engagement conducted in a participatory, accountable and transparent manner.

This dialogue must be genuinely informative since the objective of sustainable resource use requires responsible decision-making by all stakeholders (see 2.6).

ii) Where a new project has the potential to influence local employment or training opportunities, some measure of assurance needs to be provided that these expectations are realistic.

iii) A monitorable OH&S plan needs to be presented to give confidence that the projected OH&S outcomes will be achieved.

iv) Similarly, an environmental monitoring program needs to be presented to demonstrate commitment to responsible environmental management throughout the life of the project.

v) Process pathway and conversion facility designs need to be sufficiently advanced to allow the community to make fully informed decisions as to local amenity and aesthetics.

vi) Pricing signals for the maintenance and promotion of sustainable resource use are addressed in PSP6. However, new developments will have effects, especially in the local area. These impacts need to be sufficiently defined to allow objective assessment.

vii) The social issues and impacts can be the most subjective or difficult to define or satisfy and yet they may be the very issues that most materially affect the granting of the community licence to operate. For this reason, proactive, informed and sensitive consultation is recommended to ensure the greatest level of common understanding before decisions are made.

viii) In the case of compensatory offers such as the provision of sporting or recreational facilities donations or ongoing royalties, transparency and accountability are vital, as is confirmation of the ability to deliver on behalf of the party making the offer[11].

ix) The objective of this PSP is to demonstrate that the social and economic impacts:

a) have been adequately described and quantified

b) are acceptable to the community

c) can be controlled or delivered in substantially the form described for the life of the project.

3.6.4 Qualitative Assessment Matrix

This simple assessment process assumes that sufficient iterations have occurred between 3.6.3 ix a, b, c and other PSPs as required.

[11] Generally, compensatory offers should be considered as unsatisfactory if their primary purpose is to seek to justify what would otherwise have been considered as genuinely unsustainable impacts.

Figure 3-4: PSP4 – Iterative review process

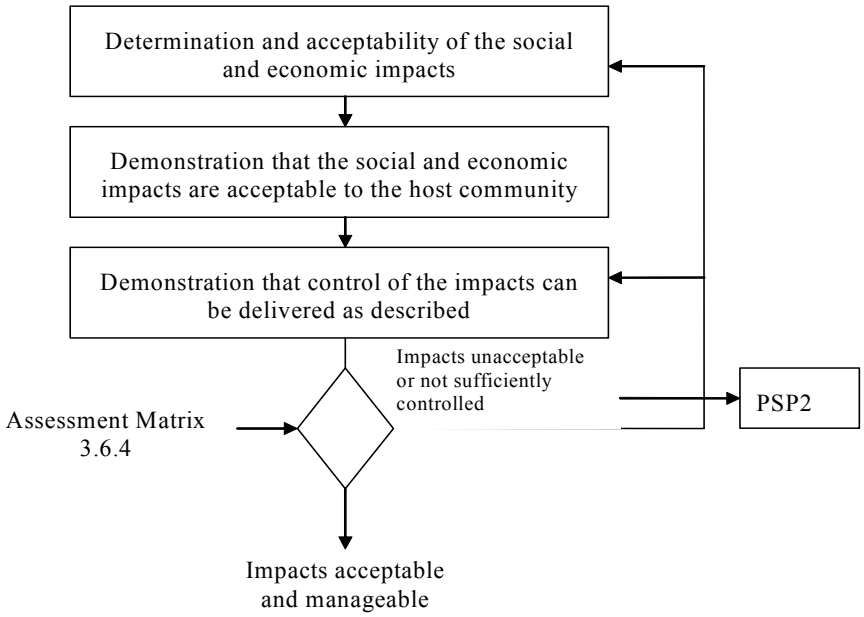


Table 3-7: PSP4 Qualitative Assessment Matrix

Issue	Assessment		
	Yes or not applicable (N/A)	**No**	**Provisional**
i) Have the social and economic impacts been adequately determined and identified?			
ii) Is there evidence that the anticipated social and economic impacts are acceptable to the determining community?			
iii) Can it be demonstrated that control exists to deliver the impacts as described or better?			

- *A **yes** or **N/A** response to each question should facilitate a simple response to the next stage (see Table 3-8).*
- *A **no** response to either question would suggest that a review of the particular issue was advisable. **No** responses are likely to feature prominently in any future consent or approval process.*
- *A **provisional** response to either question may also draw attention during a formal consent or approval process but may be offset by positive responses to all other criteria.*

Table 3-8: PSP4 Evaluation Matrix

Issue	Assessment		
	Yes	**No**	**Provisional**
In light of the above responses and the quality of the information provided, can a position be sustained that acceptability and control of the social and economic impacts can be maintained for the duration of the project?			

- *A **yes** response would suggest that a move to PSPs 5–6 was appropriate and that preliminary community consultation could proceed on the basis of the information that had been generated from PSPs 1, 2, 3 and 4.*
- *A **no** response would suggest that a further review of the control mechanisms was required or that the proposal should proceed no further.*
- *A **provisional** response would indicate that positive responses to previous or future criteria would be required to provide the level of confidence necessary in a formal consent or approval process.*

3.7 PSP5: Assurance of Project Commitments

3.7.1 The purpose or objective of PSP5 is:

to demonstrate that the environmental, social and economic commitments defined at the initiation of the project are understood and delivered over the life of the project.

3.7.2 Explanatory Notes to Assist Assessment

i) One major community concern identified has been the monitoring of the project after the consent to operate has been given. Under the spotlight of a formal consultation, consent or approval process, adequate undertakings or assurances may have been provided but a concern may remain as to whether these undertakings or assurances would be maintained for the life of the project once the initial focus was dissipated and over time. In the absence of these confirmations, the community may be likely to withhold the community licence to operate, forgoing the immediate benefits because of the prospect of medium- to long-term disadvantages. There is therefore a need for the project proponent or formal consent authority to provide or insist on safeguards for the life of the project.

ii) Commitments for the life of the project need to include an eventual closure and site remediation plan so that in the event of circumstances that cause the closure of the project the physical remnants would not be orphaned or left as an unfunded public liability. The proponent's commitments also need to include an undertaking to respond to complaints promptly (e.g. within 24 hours), hold open days and publish community information newsletters and so on.

iii) In the event that a project produces unexpected and unacceptable consequences or that the initial undertakings in regard to foreseen impacts have not been managed appropriately, there is a need for transparent mechanisms by which the situation can be redressed.

3.7.3 Some Suggested Compliance Criteria or Approaches

i) The proponent needs to demonstrate that they are a respected corporate citizen with sufficient means to deliver the project within anticipated timelines.

ii) The formal consent authorities need to note all legitimate community concerns and ensure that the terms and conditions of consent contain mechanisms that will provide the level of monitoring and control appropriate for the circumstances.

iii) The proposed strategies, programs and actions that are developed to demonstrate compliance with this PSP need to be transparent and monitorable during the life of the project and might include:

a) by the proponent:
- International Standards Organisation (ISO) 14000 accreditation
- public reporting through
  - Public Environmental Reporting (PER) (Environment Australia website)
  - Global Reporting Initiative (GRI)
  - Triple Bottom Line (TBL)

- National Pollution Inventory (NPI)

- information dissemination by:
  - website
  - newsletters
  - annual reports
  - regular open days

b) by the formal consent authority:
- compliance audits of consent conditions
- contractual commitments.

Note: Where any specific environmental impact internalisation mechanisms such as renewable energy certificates (RECs) or carbon credits exist, the auditing and verification process by the issuer of the tradable certificate should provide one more level of assurance in this regard.

3.7.4 Qualitative Assessment Matrix

Given that the environmental, social and economic impacts will have been identified in PSPs 3 and 4, compliance with PSP5 can be assessed by applying Table 3-9.

Table 3-9: PSP5 Qualitative Assessment Matrix

Issue		Assessment		
		Yes or not applicable (N/A)	**No**	**Provisional**
i)	Is the proponent a respected corporate citizen with sufficient means to undertake the proposed project?			
ii)	Have strategies, programs or actions been proposed that if fully and transparently implemented would provide the level of assurance required for the granting of a licence to operate by the community?			
iii)	Have the formal consent authorities shown sufficient regard to these long-term issues in the development and imposition of the consent conditions for the project?			
iv)	Does the proponent have sufficient financial resources or the ability to obtain these resources in order to provide financial assurance for closure and remediation if necessary?			

- *A **yes** or **N/A** response to each question should facilitate a simple response to the next stage (see Table 3-10).*
- *A **no** response to any question would suggest that a review of the particular issue was advisable. **No** responses are likely to feature prominently in any future consent or approval process.*
- *A **provisional** response to any question may also draw attention during a formal consent or approval process but may be offset by positive responses to all other criteria.*

Table 3-10: PSP5 Evaluation Matrix

Issue	Assessment		
	Yes	No	Provisional
In light of the above responses and the quality of the information provided, can it be reasonably determined that the level of environmental, social and economic impacts, positive and negative, deemed both desirable and acceptable at the commencement of the project will be delivered and monitored over the life of the project?			

- *A **yes** response would support the continued development of the project.*
- *A **no** response would suggest that a further review of the proposed assurance mechanisms was required or that the proposal should proceed no further.*
- *A **provisional** response would indicate that positive responses to previous or future criteria would be required to provide the level of confidence necessary in a formal consent or approval process.*

3.8 PSP6: Management of the Commercial Interface

3.8.1 The purpose or objective of PSP6 is:

to demonstrate that the structuring of the project to achieve commercial viability does not compromise the inherent sustainability achieved by observance of the other PSPs.

3.8.2 Explanatory Notes to Assist Assessment

This PSP addresses many of the issues that normally would be part of the continuous and iterative monitoring and incorporation of the sustainability externalities shown in Figure 4.1. However, certain key issues can be identified as needing particular attention.

i) The commercial and financial realities for a project must achieve the prescribed returns and outcomes within the risk profile acceptable to the proponent. However, the achievement of these commercial and financial outcomes should not be at the expense of the strategic and sustainable resource use requirements that created the potential for the project in the first instance.

ii) Supply issues — a facility that can efficiently and safely recover the calorific value from selected urban waste streams may be complex and capital-intensive and the commercial viability of a project is likely to depend on a reliable supply of waste to justify the capital investment for the project (see PSPs 2, 3 and 4). However, the paradox is that sustainable resource use aims to reduce these waste streams to zero wherever possible or practical. Therefore, an EfW facility needs to have the flexibility to take these materials as and when they become available as residuals after all other higher value outcomes have been reviewed (see PSP1). On the other hand, the facility owner, operator or converter may require a fixed and contracted minimum to be provided to justify the project. This can be problematic and needs to be resolved in a manner that is consistent with the philosophies of the Sustainability Guide while simultaneously considering the commercial underpinning of the project.

iii) Energy availability issues — energy (heat or power) generated from urban wastes, even as a minor fraction of the total fuel consumed has the potential to fail the “improved valuation and pricing of environmental resources” test for sustainability (see Annexure F (d)). If the energy value is not fully appreciated, there is a danger that unsustainable pricing signals could present downstream. For example:

a) electricity could be generated at a lower cost than by the alternative or sustainable options and could lead to unsustainable power consumption (because of the low cost)

b) fuel could be supplied for process heat at a significant discount to the existing alternative (e.g. coal) to the extent that either marginal or inefficient operations could be retained or product costs could be “artificially” lowered to promote excessive use of energy or negatively impact on demand management programs.

While these issues may not feature strongly in the evaluation and assessment of a project or proposal, they are important considerations for demonstrating attention to detail when seeking a community licence to operate.

iv) Miscellaneous issues and commercial signals — within the broad context of the feedstock and energy supply issues discussed in ii and iii above, the following lesser issues could impact on the sustainability outcomes if they are handled inappropriately during the development of a commercial framework for a project or proposal.

a) The volume and content of urban wastes that satisfy PSP1 will alter continuously and need to be addressed in proposals. It may be necessary for conversion pathways and facilities to avoid levels of specialisation that cannot accommodate this sort of variability.

b) Long-term commitments of, say, up to 25 years need to be considered carefully by potential suppliers because these sorts of commitments could eventually have the effect of absorbing materials with a higher resource value. Where long-term commitments are not provided the supplier must recognise the offsetting increases in processing costs that need to be borne in order to allow the developer to make a reasonable risk-weighted rate of return.

c) The provision of or access to suitable EfW conversion pathways and facilities need to be part of an integrated suite of options to support optimum resource use outcomes in general, especially as support for whole-of-life planning programs at the point of product initiation and design (this relates to the parallel issues of EPR, lightweighting, post-consumer planning and by-product optimisation).

d) Putrescible urban wastes that could satisfy PSP1 might require immediate processing as a treatment or stabilisation function. This could trouble the orderly observance of this PSP.

3.8.3 Some Suggested Compliance Criteria or Approaches

i) Some waste supply, fuel demand and energy need issues can be addressed logistically by the fuel preparation approach. By this method urban wastes that satisfy PSP1 are received at a process engineered fuel (PEF) facility as and when they are available and converted into specified and stabilised fuel or energy products immediately. These fuel or energy products would be produced to the specifications required by future energy converters and could be supplied to them as and when required to meet their quite independent, future market demands. This approach would enable the PEF manufacturer to access a range of sources as the basis of production and still provide supply certainty to the end user.

ii) It is important to avoid an overly dependent relationship between the supplier and converter. The converter might manage supply assurance issues by having a range of PEF supplies and/or suppliers. Furthermore, by having a backup supply of fossil fuels, the PEFs are supplementary. This places the PEF product as supplementary or alternative fuel, for conversion as available, as opposed to threatening compliance with this PSP.

iii) Other approaches could involve:

a) modularity

b) process flexibility or turndown capacity

c) a fixed or variable component in the supply agreement. The balancing of base demand versus spot prices.

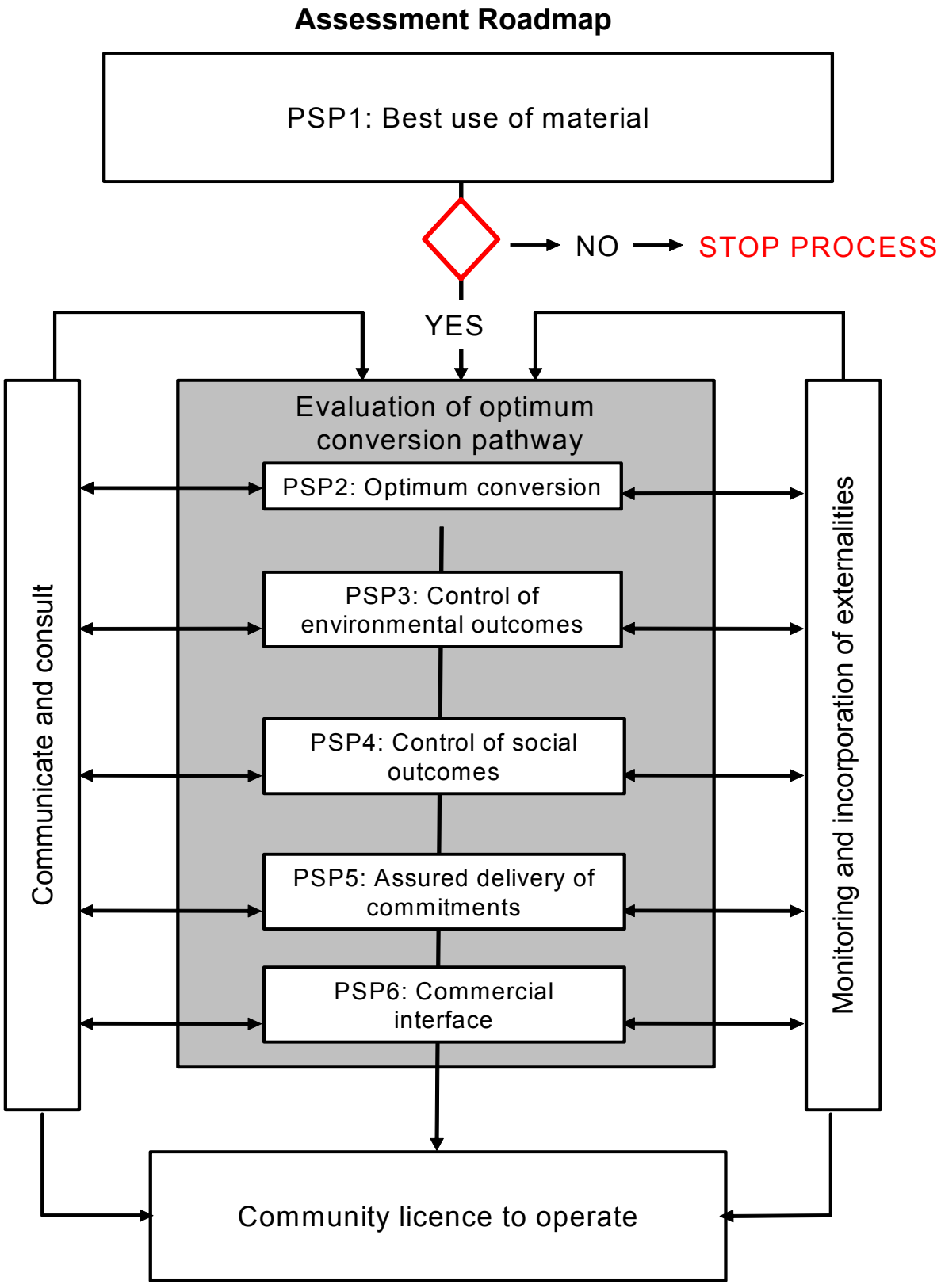
3.8.4 Qualitative Assessment Matrix

Table 3-11: PSP6 Qualitative Assessment Matrix

Issue	Assessment		
	Yes	No	Provisional
Have the commercial arrangements for the proposal or project been developed to support and reinforce the sustainability criteria of all other PSPs?			

- *A **yes** response would support the continued development of the project.*
- *A **no** response would suggest that a further review of the proposed assurance mechanisms was required or that the proposal should proceed no further.*
- *A **provisional** response would indicate that positive responses to previous or future criteria would be required to provide the level of confidence necessary in a formal consent or approval process.*

Section 4: The Assessment Tools



Section 5: Glossary

Aggregate/aggregation	Collect materials together with a view to create a critical mass for a subsequent operation or activity
Anaerobic digestion (AD)	The decomposition of biologically unstable organic materials by micro-organisms specifically suited for an oxygen depleted (free) environment. The primary products of AD are an energy rich (methane) biogas and a biologically stable residue (digestate).
Ash	The mineral or inorganic residue of a (complete) combustion process
Avoidance	A waste management strategy that seeks to avoid the generation of the waste in the first instance
Bagasse	The residual woody stem material that results from the process to recover the sugar content from sugar cane
Beneficiation	The further improvement by quality of a material stream to specifically meet end user requirements and specifications
Biogas	The off gas produced from the anaerobic digestion or decomposition of biologically unstable materials. Such conditions might be created naturally, or in a landfill or in-vessel in an AD facility.
Biomass	Total quantity or weight of organisms in a given area
Bioreactor Landfill	A landfill where the rate of anaerobic decomposition is specifically managed and accelerated to increase the generation of biogas and to accelerate landfill stabilisation.
Calorific value	The energy value per unit mass (or volume) that is released by a material in combustion, normally measured in mega-joules per kilogram (MJ/kg) or giga-joules per tonne (GJ/t).
Char	Carbon material that remains after the incomplete combustion of biomass, for example, charcoal is left after the incomplete combustion of wood.
Clean(er) production	The management technique that seeks to minimise or eliminate the environmental impacts of manufacturing or productive processes with particular emphasis on presenting unavoidable offcuts, surpluses or residues as useful by-products (for subsequent use) rather than as (mixed) or negatively valued wastes.
Community licence to operate	The consensual agreement of the general community to sanction a particular (industrial) activity in their geographical area of concern
Consent or approval process	The prevailing landuse and planning authorities manage a structured process whereby industrial or productive activities require prescribed consents, approvals or licences for initial establishment and ongoing operations
Digestate	The digested output from an anaerobic digester

Energy from waste (EfW)	An approach to resource recovery that focuses on maximising the amount of **energy** that can be recovered from materials that would otherwise be disposed of to landfill through a variety of energy recovery technologies (contrast with waste to energy).
Energy recovery technologies	Energy recovery technologies refer to a technology or methodology that seeks to recover the calorific value of a material
Environmental externalities	The range of environmental impacts (positive and negative) that are not brought to account in conventional market based accounting systems. This results in a market failure in that the true cost of a given activity is not reflected in the market price of the good or service.
Highest Resource Value	The highest market value of a particular resource after accounting for both the costs of recovery or beneficiation for such a use and after fully accounting for any relevant environmental externalities
Initial arising	The first point at which a waste stream or by-product presents in the value chain requiring an appropriate logistic response
Lignocellulosic	Lignocellulose is the combination of lignin, hemicellulose and cellulose that forms the structural framework of plant cell walls. Here lignocellulosic materials are used to describe wood, garden organics (greenwaste) and other wood derived products such as paper.
Methane	A colourless, odourless and flammable gas that is created by the decay of organic matter. It is the chief component of natural gas and biogas (C_2H_4)
Monofill	The practice of using landfill as a storage receptacle for source separated and homogenous materials such as tyres.
OECD	Organisation for Economic Cooperation and Development
OH&S	Occupational Health & Safety
Process engineered fuels (PEFs)	Refers to fuels that are manufactured from selected materials that would otherwise be disposed of to landfill. They are quality controlled, relatively homogeneous and are produced fit for purpose use in a cement kiln or power station. Sometimes PEF is also referred to as Refuse-Derived Fuel (RDF).
PSP	Project scoping principles
Reduce	See Avoidance
Recycling	The act of reclaiming resources from materials that would otherwise be disposed of to landfill for the purposes of reprocessing into either the same or similar products (direct recycling) or into different product types altogether (indirect recycling).
Residual urban wastes	The residual material that cannot be avoided and that is unable to be re-used or recycled.
Reuse	An activity that re-uses any given material or product for essentially the same original purpose in the same original form.
Secondary resource	A grouping noun for materials recovered from waste streams that would otherwise be disposed of to landfill.

Waste	Any material that has no further use to the owner (perceived or real) and arises from: i) By-product of manufacture or resource extraction, ii) Off-cuts, over runs, out of specification materials in manufacture and assembly, iii) End of service life product, iv) Broken, obsolete or unwanted product.
Waste hierarchy	The name given to a hierarchical approach to resource use and recovery that states that the best outcome is to Avoid the generation of the waste in the first instance, then to Re-use and Recycle and unavoidable wastes, followed by Treatment and Energy Recovery. Landfill is only used as a measure of last resort.
Waste minimisation	There are three interpretations of Waste Minimisation: i) The goal of minimising the generation of all waste as an end in and of itself (see also Waste Avoidance), ii) A tool to achieve sustainability outcomes by looking for opportunities within manufacturing or consuming to minimise the generation of unnecessary waste, iii) A grouping term that covers all resource recovery activities such as re-use and recycling, because in becoming a resource the “waste” is minimised.
Waste to energy (WtE)	Waste to energy is a waste management approach where the focus is on material destruction and where energy recovery is a by-product. This style of approach is best evidenced by mass burn incineration (contrast with energy from waste).

Section 6: Appendixes

Appendix A Working Group Members

Appendix B Reference Group Members

Appendix C Sponsors

Appendix D Australia's National Strategy for Ecologically Sustainable Development

Appendix A – Working Group Members

The Working Group retained editorial control of the project and overall project delivery as to quality, time and budget.

Name	Organisation
Mark Glover (Chair)	Renewed Fuels Pty Ltd
Ron Wainberg (Treasurer)	NSW Branch WMAA
Matthew Warnken (Project Manager)	Warnken ISE
Jeff Angel	Total Environment Centre
Stephen Schuck	Bioenergy Australia
Tony Wright	Wright Corporate Strategy
Neil Chapman	Resource NSW
Graeme Jessup	SEDA
Raymond Kidd	Department of the Environment and Heritage
Jenny Pickles / Cathy Van der Zee	EcoRecycle Victoria
David Moy	Qld Branch WMAA, Qld University
Fraser Bell	SA Branch WMAA, Finlaysons
Carinda Rue / Iain Williams	Tas Branch WMAA, DPIWE
Lillias Bovell	WA Branch WMAA, WA Department of Environmental Protection
Yolande Stone (Observer)	Planning NSW

Appendix B – Reference Group Members

The Reference Group was established to peer-review and critique the initial draft of both the Sustainability Guide and the Code of Practice. The commitment of the Reference Group members was documented by individually signed Consent to Act forms (see attached forms). Formal submissions were received from 22 of the original 51 members of the Reference Group (see table below).

Name	Organisation
Craig Midson	Australian Greenhouse Office
Stephen Joseph	Biomass Energy Services & Technology
Mark Hipgrave	Brightstar Environmental (Qld)
Don Chambers	C4ES
Patricia Nicholls	C4ES
Kathryn Turner	Cement Industry Federation
Joe Lunardello	City of Monash
Allan Pilcher	Country Energy
Sara Beavis	CRES, Australian National University
Griff Rose	CVC Reef IM
Brett Corderoy	Delta Electricity
Graham Spalding	Department of Environment Waste Management Branch
Clinton Watkins	Development Manager & Economist - EcoCarbon Incorporated
Toby Hutcheon	Ecomatters
Greg Watt	Energy Futures Australia
Louise Drolz	Environment Business Australia
John Lawson	Global Renewables Ltd
Michael Clarke	Griffith University
Russell Wade	Individual
Nick Orr	Individual
Craig Fraser	Individual
Neil Rose	Maroondah City Council
Christine Wardle	Meinhardt
Peter Brotherton	National Environmental Consultative Forum
Sharon Denny	Office of Energy & Treasury (Qld)
Nigel Green	Office of Environment & Heritage, NT Government
David Rossiter	Office of the Renewable Energy Regulator
Shani Bienefelt	Pantechnicon
Peter Goggin	PEG Business Solutions
John Sparkes	Planning NSW
Joanna Missen	PPK
Kylie Hughes	Queensland Environmental Protection Agency
Amy Hogan	Queensland Environmental Protection Agency
Tim Powe	Queensland Environmental Protection Agency
Neil Chapman	Resource NSW
Marc Stammbach	Rethmann Australia Environmental Services
Andrew Thaler	scrapp.com
Chris Pickering	Stanwell Corporation Limited
Gabrielle Henry	Sustainable Energy Authority (VIC)
John Hewitson	Teris (Aust)
Andrew Brownlow	Terra Consulting
Don White	University of Sydney - Department of Chemical Engineering
Lynne Forster	University of Tasmania
Denis James	Visy Recycling
Mohan Selvaraj	Waste Service NSW
Terry Carter	Western Power Corporation
Paul Oakes	Worley Developments

The comments from the review process were assessed by the Working Group and included as deemed appropriate. It should be emphasised that there was a degree of diversity within the comments, ranging from strong support to strong opposition. Thus, the list of contributors should not be taken as an endorsement of the Sustainability Guide by either the individual or the organisation listed below.

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Energy from Waste Division

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Energy from Waste Sustainability Project

Reference Group Consent to Act Form

The Energy from Waste Division of the Waste Management Association of Australia (WMAA), received grant funding from the Australian Greenhouse Office (AGO) to prepare an Energy from Waste (EfW) Sustainability Guide and complementary Industry Code of Practice for the EfW industry. Drafts of these documents have been completed and are now ready for circulation to the Reference Group.

The main role of the Reference Group is to act as the primary body of review for the Sustainability Guide and Code of Practice. It is anticipated that in addition to an individual review, members of the Reference Group will also solicit input, comment and feedback from their respective members/constituency/colleagues on draft documents and then channel this information back to the Working Group. The general duties of the Reference Group include:

- Reviewing draft documentation from the perspective of the organisation being represented and the wider stakeholder group,
- Checking of any technical data where relevant,
- Providing written comment to the Working Group by the due date required (14 May 2003), and through a template that will be supplied by the Project Manager,
- Indicating the level of "sign-off" that the member (individually or on behalf of an organisation) would be prepared to offer in support of the final publications,
- Disseminating the final publications throughout existing networks.

It should be noted that the Working Group does not necessarily undertake to include *verbatim* all of the written submissions received from the Reference Group into the final publication. The Working Group will, however, undertake to consider these views and to strive to reach a consensus position.

Membership on the Reference Group is honorary and has been initiated by application or nomination to the Working Group. By signing this "Consent to Act" form the Reference Group member offers to participate on the Reference Group and agrees to undertake the duties that are outlined above. A list of participating Reference Group members will be maintained on the EfW Division's website.

Name:	Date:
Signature:	Phone:
Organisation Represented:	Fax:

Please sign, date and fax this form back to 02 9571 4900

Appendix C – Sponsors

Australian Greenhouse Office

Renewed Fuels

Cement Industry Federation
QLD Environmental Protection Agency
Resource NSW
SA Environmental Protection Agency
SEDA NSW
Waste Service NSW

Babcock & Brown
Sustainable Energy Authority Victoria

C4ES
Delta Electricity

CS Energy
Global Renewables
Department of the Environment and Heritage

CVC Reef
Novera Energy
Recycling and Recovery Industries
Stanwell Corporation

Appendix D – Australia's National Strategy for Ecologically Sustainable Development

Available online at http://www.deh.gov.au/esd/national/nsesd/strategy/index.html.
Australia's National Strategy for Ecologically Sustainable Development (ESD) aims to provide strategic directions and a framework for government to direct policy and decision-making. The Commonwealth's 1992 definition of ESD was:

"A pattern of development that improves the total quality of life both now and in the future, in a way that maintains the ecological processes on which life depends" (NSESD 1992).

This strategy had 3 core objectives:

1. To enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations.

2. To provide for equity within and between generations (intra-generational and inter-generational equity).

3. To protect biological diversity and maintain essential ecological processes and life support systems.

Seven guiding principles for achieving these objectives are proposed. These are that:

i) decision making processes should effectively integrate both long and short-term economic, environmental, social and equity considerations,

ii) where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation,

iii) the global dimension of environmental impacts of actions and policies should be recognised and considered,

iv) the need to develop a strong, growing and diversified economy which can enhance the capacity for environmental protection should be recognised,

v) the need to maintain and enhance international competitiveness in an environmentally sound manner should be recognised,

vi) cost effective and flexible policy instruments should be adopted, such as improved valuation, pricing and incentive mechanisms, and

vii) decisions and actions should provide for broad community involvement on issues which affect them.

It is identified in the strategy that the guiding principles and core objectives need to be considered in their entirety, and that no objective or principle should predominate over the others.