creating energy from waste

# Energy from Waste Project Summary

Australian Paper
Maryvale

## Contents

# 1 What is the project?

## Background

Australian Paper (AP) is proposing to develop a 225 megawatt thermal Energy from Waste (EfW) plant adjacent to the existing AP Maryvale Pulp and Paper Mill site on land owned by AP in the Latrobe Valley, Victoria. The aim of the proposed $600m EfW plant is to allow AP to attain a sustainable, long-term and stable alternative base load energy source to provide steam and electricity for the existing Maryvale Mill, which has been manufacturing paper since 1938.

The 225 Megawatts of thermal energy ($MW_{th}$) to be generated by the EfW plant would be base load power required to run AP's Maryvale Mill – the Mill requires thermal energy (steam) and high voltage (HV) electricity. Currently, steam is produced by on-site natural gas fired boilers and used in the manufacturing process (e.g. by the paper machines). Steam is also used by four on-site electrical generators to produce about 45 Megawatts of electricity ($MW_e$) each hour. Additional HV electricity demand is supplied from the electricity grid. Maryvale Mill is already Victoria's largest generator of base load renewable energy, producing approximately 600,000 tonnes of biofuel from its pulping process each year.

In addition, the Maryvale Mill purchases approximately 6 million Gigajoules (GJ) of natural gas and 30$MW_e$ of electricity. Significant effort has been invested to improve the energy efficiency per tonne of pulp and paper manufactured by AP. However, due to recent substantial cost increases in the market price of natural gas and electricity, an alternate baseload energy source is being sought to enable the Mill to continue to operate in a reliable, sustainable and cost effective manner.

Having regard to total cost (capital and operating), environmental impacts, employment benefits, plant performance and reliability, there is a clear group of technologies that have been deemed appropriate for AP to consider and are also proven on a global scale – that is the EfW technologies using residual waste as fuel. Most importantly, unlike renewable energy sources such as solar and wind technologies, EfW facilities generate thermal energy in the form of steam which is required by Maryvale to run the majority of its operation on a continuous basis.

For this 225$MW_{th}$ EfW plant the operating waste feed requirement is estimated to be 650,000 tonnes per annum (tpa) of non-hazardous residual waste which would otherwise be sent to landfill. It is proposed to use Municipal Solid Waste (MSW) for approximately 80% of the fuel input to the EfW plant. MSW is waste from household rubbish collections (not recyclable collections). Some Commercial and Industrial (C&I) waste (approx. 20% of fuel input) would also be used, with the non-hazardous C&I waste being similar to MSW, but sourced mostly from manufacturing facilities, shopping centres and office buildings.

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## Energy from Waste plant process

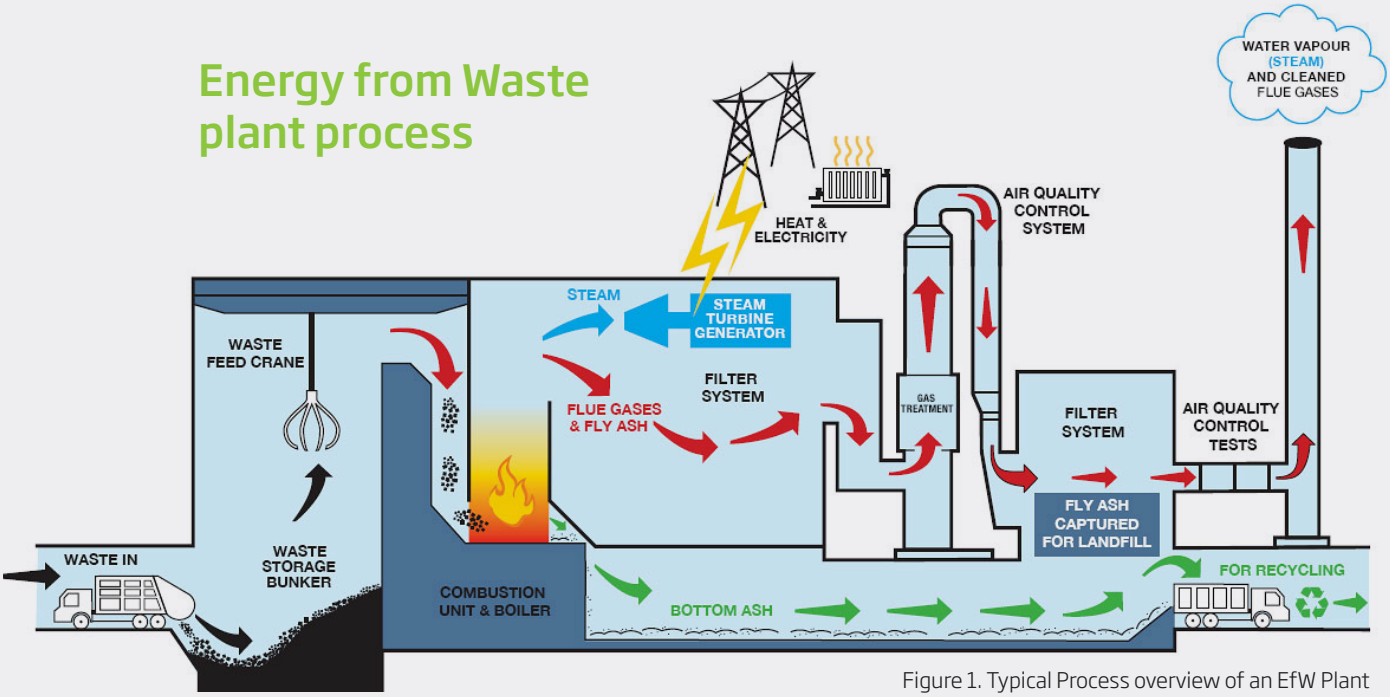
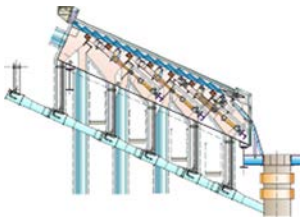



Figure 1. Typical Process overview of an EfW Plant
(Ref: http://www.arc21.org.uk/opencontent/?itemid=27&section=Residual+Waste+Project)



*Above:*
*moving grate system*

## Outline of the EfW process

The key steps in the EfW process are as follows:

- Waste is transported to the EfW plant via train and truck
- Waste is combusted in a boiler (or boilers)
- The boiler(s) produce heat generated by the combustion of waste which produces steam
- Some steam is transferred to the Maryvale Mill
- Some steam is used in generators to produce electricity for use in the Maryvale Mill
- Air from the combustion process is treated to very high cleaning specifications, through gas treatment and filter bags
- Cleaned combustion air is discharged through the stack, while being continuously monitored
- Ash residues from the boiler and filter bags are collected and disposed of

Waste is transported to the site via train and truck and placed within the waste bunker, which is enclosed in a large building. Air is drawn into the building and put through the boiler to minimise the escape of odour to the outside air.

The combustion process occurs on a moving grate floor allowing for mixing and more complete combustion by providing air directly through the grates. As the combustion occurs, temperatures will reach over 850°C for at least two seconds. The combustion gases then cool slightly before entering the boiler tubes section to generate steam.

Following this section the cooled gases then pass through the flue gas treatment system where lime and activated carbon are mixed to absorb trace heavy metals, acid compounds and trace dioxins and furans. These materials are then removed through a process of filtration as solid residues, before the cleaned air passes inline emissions monitoring equipment and is released out of the stack.

Both steam and electricity would be supplied to Maryvale Mill. The intention is that bottom ash from the combustion process would be collected and recycled into road base and construction materials such as concrete.

# 2 Why Energy from Waste?

EfW is recognised as a proven and reliable technology which has been used in Europe, North America and Japan for decades. There are over 500 operational EfW plants in Europe alone, many of which are in and around major cities such as Paris, Zurich, Vienna and London. Countries such as Germany, Austria and Sweden support EfW as a key component in the wastes management hierarchy, reducing their landfill to almost zero.

The technology generates energy from the controlled combustion of non-hazardous waste materials that would otherwise go to landfill. EfW plants can capture and convert the released heat into steam and electricity, with sophisticated filtering technology ensuring compliance with stringent EPA stack emissions standards. EfW plants can provide energy as steam or electricity and can interchange between the two during the plant's operation, providing improved flexibility and efficiency. The use of waste as fuel also enables an EfW plant to be a reliable baseload source of energy.

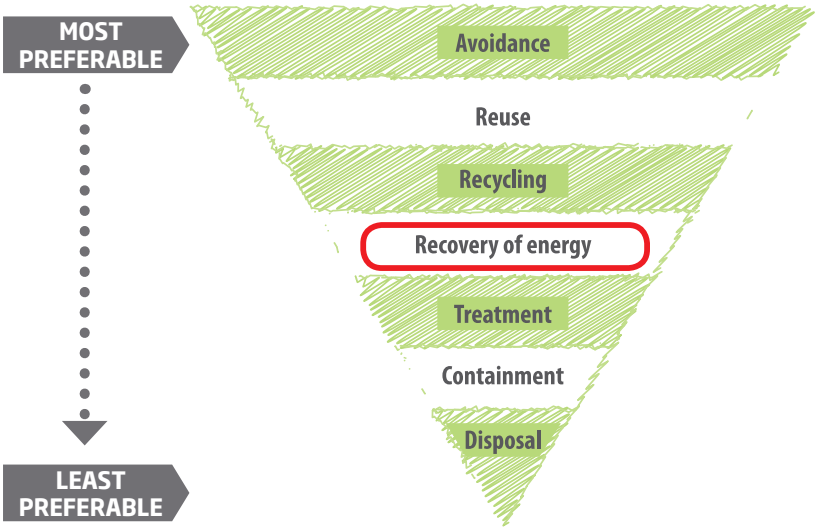



Figure 2: Waste Hierarchy showing the order of preference and where EfW is placed (Environment Protection Act 1970, p.4)

The Maryvale plant would process MSW as well as C&I waste sourced from the Gippsland region and the greater Melbourne metropolitan area. This would greatly reduce pressure on existing landfill sites in Gippsland and Melbourne at a time when many are reaching capacity and closing. The EfW plant would divert an estimated 650,000 tonnes of waste from landfill each year. Due to the variable nature of residual waste the EfW waste throughput will vary to create a steady energy output. Air quality modelling has been evaluated based on the maximum continuous rated thermal capacity of the plant.

According to the Environment Protection Act (1970) Waste Hierarchy, the recovery of energy from waste is preferred after recycling as a method for managing waste (Figure 1). Disposal to landfill is the least preferred method of waste management, yet it is the most widely used in many countries, and many locations around Australia. Leading countries such as the UK have identified this technology as a key solution in conjunction with recycling, to significantly reduce waste sent to landfill. By generating energy from waste in conjunction with recycling, Germany has almost completely eliminated waste being sent to landfill. Additionally these countries have developed significant secondary industries such as bottom ash processing, logistics and maintenance to service their EfW industry.

The AP EfW project Works Approval Application has been considered by the Metropolitan Waste and Resource Recovery Group (MWRRG) and the Gippsland Waste and Resource Recovery Group (GWRRG) and the proposal broadly meets the intent of their respective Implementation Plans.

# 3 Why Maryvale?

The Maryvale Mill currently purchases approximately 6 million GJ of natural gas (approximately 8% of Victoria's total industrial consumption) and 30 $MW_e$ of electricity from the National Electricity Market (NEM). Despite considerable investment and effort in recent years to improve its energy efficiency, substantial price increases in the market price of both natural gas and NEM supplied electricity have put significant pressure on the Maryvale Mill's ability to operate competitively.

AP has deemed EfW to be the most appropriate alternative baseload energy source for its business, after considering:

- Total potential cost (capital and operating)
- Best fit technology for generating significant and variable volumes of steam
- Minimising environmental impacts
- Maximising social benefits
- Employment effects
- Plant performance and reliability, as compared with alternative energy sources
- EfW combustion technologies (using non-hazardous residual waste), which are currently being successfully utilised on a global scale.

By providing energy (electrical and steam) for the Maryvale Mill, the project is expected to enable up to 4 million GJ of natural gas and up to 30 $MW_e$ per annum to be returned for use by the broader market, helping to improve energy security for both the local region and state. Electricity that is produced in excess of Maryvale Mill requirements will be provided back to the NEM, which will increase supply for the broader market.

Siting an EfW plant adjacent to the Maryvale Mill has a range of advantages compared to other potential locations:

- The Maryvale Mill will use the steam and electricity generated by the EfW plant, which would maximise the EfW plant's efficiency
- The Maryvale Mill has existing rail infrastructure which may enable waste to be transported to the plant by train
- The road infrastructure to the Mill is well set up for truck traffic and there are no residential areas from major arterials (Princes Freeway east or west) to the Mill
- Grid electricity connections are available on site with sufficient spare capacity
- It is located in an existing Industrial 2 Zone (for planning) which is ideal for this type of industrial development
- There is an existing suitable buffer (Amenity Rural Buffer in the Latrobe Planning Scheme) around the Mill
- Access to a skilled local workforce

## 4 What are the benefits of an Energy from Waste plant?

If successfully implemented, the project would have a range of important benefits for the local community, and for the local region and state, including:

- Producing 225 $MW_{th}$ of energy
- Helping to secure the future of the Maryvale Mill which is a key employer in the region with approximately 850 direct employees
- Supporting an estimated 1,600 Fulltime Equivalent (FTE) jobs during the construction phase and 440 FTE jobs during the operational phase (direct and flow on) in Victoria
- Diverting an estimated 650,000 tonnes of waste from landfill each year, to a higher order use as per the Waste Hierarchy
- A net reduction in greenhouse gas emissions of approximately 550,000 tonnes per year, the equivalent of taking more than 100,000 cars off the road
- Improving energy security by significantly reducing natural gas usage at the Maryvale Mill by approximately 60%.

## 5 How would it be constructed?

Construction (as well as commissioning and operation) would adhere to the AP integrated Maryvale Operations Management System (OMS) – a structured framework for effective environmental, health and safety practices and performance across all of AP's activities and operations, including developing management plans and procedures for implementation during the development of the project.

Site or phase specific management plans will be developed to describe how significant impacts will be addressed during specific project development phases (i.e. construction, commissioning and operation), including development of a Construction Environmental Management Plan (CEMP) and Operations Environmental Management Plan (OEMP).

Additionally, detailed risk assessments have been conducted to identify the key environmental risks for the construction and operational phases. These risks and associated controls and mitigation measures will be incorporated into the CEMP and OEMP as appropriate.

## 6 Environmental best practice

The proposed EfW plant has been designed with modern technology and best practice environmental techniques. These include:

- The adoption of environmental and sustainability principles and the use of multi-criteria assessments during the optioneering selection phase for key processes
- Conducting a boiler technology study, which concluded that moving grate technology was clearly the most technologically, environmentally and commercially proven technology for treating MSW and C&I waste and would offer the lowest technical and environmental risk for this project's circumstances
- Co-location with the existing Maryvale Pulp and Paper Mill facility, which has an existing and adequate buffer zone in place, yields superior energy efficiency (approximately 58%) due to the supply of Combined Heat and Power (CHP) over a standalone electricity generator (~27%)
- Higher order use of wastes according to the Waste Hierarchy moving from "Disposal" to "Recovery of energy" and "Recycling" for metals and ash generated from the process
- Compliance with stringent European Union Industrial Emissions Directive (IED 2010/75/EU) as adopted by the Victorian EPA.

# 7 Community engagement

*Above:*
*Australian Paper EfW mobile information team on location*

AP has been part of the Latrobe Valley since its Maryvale site began manufacturing paper in 1938. Through the engagement and consultation efforts undertaken to date as part of the feasibility study, the community has shown significant interest in the project and what it means for the local area and the local economy.

Community engagement activities have included:

- Focus groups held in Traralgon, Morwell and Moe
- The establishment of an Information Centre and Project Office in Morwell for local people to visit, find out about the project, and ask questions of the project team
- The production of regular stakeholder newsletters to provide interested parties with project updates
- Regular advertisements in the local newspaper with information about the project and AP
- Pop up information centres in Traralgon, Morwell and Moe (at the shopping centre and library)
- Regular updates with the Maryvale Community Consultative Committee.

To date the Information Centre and Project Office has had 150 visitors and 25 delegations receive a tour and the pop up information centres have had more than 190 visitors.

AP has also engaged with a wide range of community and business groups, including:

- Latrobe City Council
- Traralgon Chamber of Commerce
- Committee for Gippsland
- Advance Morwell
- Gippsland Local Government Network
- Latrobe Valley Sustainability Network
- Traralgon Central Rotary Club
- Voices of the Valley

# 8 Key environmental impact assessment findings

## Air quality

An air quality impact assessment was conducted in accordance with EPA requirements (State Environmental Protection Policy for Air Quality Management – "SEPP AQM") and European Union Industrial Emissions Directive 2010/75/EU ("IED"). The computational model used for the assessment was the EPA's preferred model AERMOD and the methodology was discussed and agreed with the EPA prior to commencement.

A range of substances were analysed and modelled in accordance with EPA Victoria and EU procedures.

These included:

- Carbon monoxide (CO)
- Nitrogen dioxide ($NO_2$)
- Sulfur dioxide ($SO_2$)
- Particulate matter 2.5m ($PM_{2.5}$)
- Hydrogen fluoride (HF)
- Hydrochloric acid (HCl)
- Ammonia ($NH_3$)
- Polycyclic aromatic hydrocarbon, as benzo(a) pyrene (pahs as b(a)p)
- Chromium (Cr)
- Cadmium (Cd)
- Mercury (Hg)

The assessment demonstrated that emissions of the above substances from the EfW Plant will meet all SEPP (AQM) and IED stack emission limits. The assessment also demonstrated that emissions of the above substances from the EfW Plant will not cause exceedances of SEPP (AQM) ground level concentration (GLC) limits (known as 'Design Criteria' in SEPP (AQM)), with the exception of PM2.5. For PM2.5, the assessment demonstrated that the infrequent cause of GLC exceedances was due to occasional high background levels of PM2.5 and not due to the EfW plant emissions.

To further demonstrate that the EfW Plant was not the cause of PM2.5 exceedances, modelling was conducted on a range of PM2.5 emission scenarios, including:

- Zero emissions from the EfW plant (i.e. only background air quality)
- PM2.5 emissions at the maximum stack emissions limit allowed by the IED (30 mg/m3)
- PM2.5 emissions at a representative stack emissions value which is an average of UK EfW Plants (0.02 mg/m3)

## Input feedstock

The proposed EfW facility is expected to treat 650,000 tonnes per year of residual waste diverted from landfills, consisting of approximately 80% MSW with the remainder being made up of C&I waste (specific non-hazardous sectors only for MSW-like waste). This is collected post source recycling and therefore will not impact on recycling programs or higher waste hierarchy order activities. Regular auditing of the waste supply will be conducted to assess the waste composition and inspecting for contaminants.

## Waste management

A waste assessment was undertaken to determine the likely composition of the ash residues generated from the EfW plant, along with AP's proposed approach for handling and managing these different waste types. The waste assessment also considered the construction and operation of the project. Construction waste materials were also investigated.

## Construction waste

The site preparatory phase of the project would generate large amounts of excavated earth as the facility is to be located into the side of an existing hill feature. It is AP's intention to reuse the excavated material on the EfW plant site or within the broader Mill site.

The construction phase of the project would generate wastes typical of an industrial building development (e.g. concrete, steel, etc.) with staff compound waste comprising primarily of industrial, office and general waste (a mix of solid inert waste and putrescible waste).

Waste avoidance, recycling and resource recovery measures would be implemented to divert resources from landfill in accordance with the waste hierarchy and the principles of Victoria's State Waste and Resource Recovery Policy Getting Full Value.

## Operational waste

The EfW facility would generate a number of residues as part of routine operation, as well as general wastes from the project overall. The wastes would be categorised, handled, and transported as per EPA Victoria (2009) Publication IWRG631 Solid Industrial Waste Hazard Categorisation and Management. AP intends to pursue beneficial re-use options for this waste material with the objective of realising up to 96% diversion of waste from landfill.

The solid wastes from the EfW Plant will include benign waste ('industrial waste') and Prescribed Industrial Waste ('PIW', which is hazardous).

## Bottom ash

The main source of industrial waste comes from bottom ash (also known as grate ash) – the output collected at the end of the moving grate following combustion in the boiler. A major component of the bottom ash is aggregate (stone, glass, ceramics) which has properties similar to building materials (such as gravel and sand). It would comprise between 20 to 25% of the weight of the input material, and less than 10% by volume. Initially bottom ash will be disposed of at a landfill but it is expected that it can be reused as an aggregate material (e.g. road base, concrete filler) in the future. This type of reuse is common in the UK where bottom ash is recycled as road base.

In addition metal recovery (e.g. iron and aluminium) for recycling would occur post combustion as this will be more efficient and more cost effective than prior to combustion.

## Flue Gas Treatment residues

The main source of PIW would be from the flue gas treatment residues (FGTr), which are the fly ash residues from the air treatment system, and typically comprise 3-4% of the input fuel by weight. This material would contain some hazardous components such as heavy metals (e.g. cadmium, chromium, copper, magnesium) and unprocessed cleaning reagents such as lime and activated carbon. FGTr would be contained and disposed of offsite to an appropriately engineered and licensed landfill by a licensed waste contractor, either directly after or following treatment.

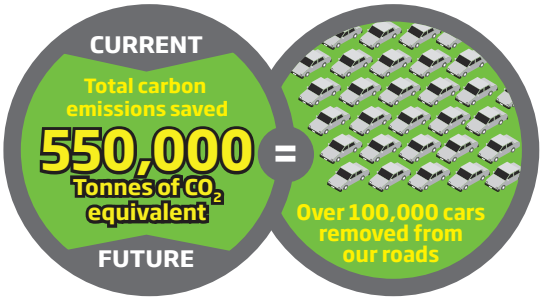
## Noise

The applicable EPA guideline is Noise for Industry in Regional Victoria ("NIRV"). A noise assessment was conducted in accordance with NIRV, which included the calculation of noise limits and design targets. The assessment found that the noise contribution from the proposed EfW plant would meet EPA limits at receptors, particularly the nearest residential receptors to the north, south, east & west of the site.

During the detailed design phase, there will be further opportunities to consider additional mitigation measures to reduce potential noise impacts. This would include dominant noise sources, including:

- Noise from the boiler house
- Water Cooled Condensers (WCCs)
- Train and truck noise

The EfW plant would result in a net reduction of approximately 550,000 tonnes of $CO_2$ emissions each year in comparison to the waste going to landfill. This is equivalent to removing over 100,000 cars from our roads each year.




| | Construction emissions (tCO2e) | Operation energy-related emissions (tCO2e) | Operation non-energy related emissions (tCO2e) | Total emissions (tCO2e) |
|---|---|---|---|---|
| Construction | 14,606 | | | 14,606 |
| Years 1-25 (annual) | | -20,400 | -523,531 | **-543,931** |
| Total (25 years) | 14,606 | -510,001 | -13,088,284 | -13,583,678 |

## Water

The wastewater from the EfW Plant would be generally benign, consisting of particles, salt and chlorine. All liquid wastewater would flow to the existing Mill wastewater treatment systems. The EfW Plant contribution to the wastewater treatment system compared to the existing Mill's operations would be so small that the impact would be negligible. The existing treatment system would cope adequately with the wastewater flows so that there will be no impact on the existing (under EPA Licence) discharge to the Latrobe River.

The EfW flows and concentrations of wastewater would be less than 1% of the existing Mill flows. For example, the chlorine levels in the EfW Plant wastewater would be less than an eighth of what is in a normal public swimming pool.

As the EfW plant would not discharge process water or contaminated storm water to any surface waters, it has been determined that the project complies with the State Environment Protection Policy (Waters of Victoria) 2003 (SEPP (WoV)) requirements for surface water.

# 9 Conclusion

The proposed 225 $MW_{th}$ EfW plant is a significant $600 million project that would provide a suitable baseload energy supply to the Maryvale Mill, which is an important employer in the region. The energy security that would be established from the project would support AP's continued operations in an economically viable manner, generate new energy related employment opportunities throughout the construction and operational phases, and bring significant social and economic benefits to Maryvale and the Latrobe Valley region.

A comprehensive set of environmental assessments have been conducted with all of the assessments concluding that potential environmental impacts from the project would be low. The assessments also support the numerous benefits that the project would provide at a local, regional, state level.

AP has conducted the full suite of environmental, social and economic investigations in an open and transparent manner and has sought public feedback at numerous times and continues to do so as the project develops. More detailed and technical information can be found within the EPA Works Approval Application. All members of the community are also invited to find out more information and ask questions of the Project Team at the Information Centre and Project Office at 126 George St Morwell.


Energy from Waste
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