



## FACT SHEET

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### Market summary – refuse-derived fuel

In 2013–14 Sustainability Victoria commissioned market analysis into four waste materials identified as priorities for market development and four which are emerging materials of interest. This fact sheet summarises the findings for refuse derived fuel (RDF).

#### Terminology

Refuse-derived fuel (RDF) is a broad-ranging term that can be applied to any fuel derived through the processing of residual waste, so it can be used either in a waste-to-energy process or as a substitute for fossil fuels in other industrial thermal systems such as cement kilns.

Quality can vary widely depending on the waste materials and the extent of processing. RDF commonly refers to fuels of lower quality that have undergone relatively basic processing.

#### Composition

RDF generally consists of the dry calorific fractions derived from residual non-hazardous waste sources including Municipal Solid Waste (MSW), Commercial and Industrial (C&I) waste and Commercial and Demolition (C&D) waste. Materials usually include plastics, timber, paper and cardboard, rubber and textiles. Wet putrescible organics such as food and garden waste may be used if the moisture content can be reduced through bio-drying or thermal drying.

RDF composition and properties vary widely and are usually set by customers, depending on their process limitations. Key parameters that might be specified include:

- net calorific value (NCV)
- moisture content (linked to NCV)
- biomass energy content
- ash content
- particle size
- contaminants (such as chlorine, heavy metals).

Regardless of quality, RDF is still considered a waste and subject to waste regulations.

#### Potential volumes

As there is no existing RDF production capacity or RDF market in Victoria, it is difficult to assess the potential volumes.

Hyder Consulting has estimated potential RDF volumes on the basis of an analysis of the components that could be suitable for RDF within the existing waste currently disposed of to landfill in Victoria.

The estimates below provide an upper-range RDF production rate of 1.3 million tonnes per annum (based on 2011–12 waste data). The actual volume will be highly dependent on the development of processing infrastructure, the success of source separation recycling programs, the RDF quality standards demanded by industry, and the mix of other residual waste processing infrastructure that is eventually implemented (e.g. mechanical biological treatment (MBT) or dirty materials recovery facilities (MRFs)).

Table 1: Potential RDF volumes in Victoria

MATERIAL	Tonnes to Landfill (2011-12)				Assumed RDF Capture Rates (from landfill)			Potential RDF Tonnages				RDF Breakdown
	MSW	C&I	C&D	TOTAL	MSW	C&I	C&D	MSW	C&I	C&D	TOTAL	
Paper/cardboard	170,050	239,496	6,273	415,819	80%	90%	90%	136,040	215,547	5,645	357,232	27%
Food waste	562,061	218,569	174	780,805	30%	30%	30%	168,618	65,571	52	234,241	18%
Garden waste	115,684	89,523	20,734	225,941	30%	30%	30%	34,705	26,857	6,220	67,782	5.2%
Wood/timber	4,381	166,322	92,346	263,049	90%	90%	90%	3,943	149,690	83,111	236,744	18%
Textiles	41,740	83,123	10,280	135,143	90%	90%	90%	37,566	74,811	9,252	121,629	9%
Other organic	121	5,552	0	5,674	80%	80%	80%	97	4,442	0	4,539	0.3%
Plastic (codes 1-3)	61,400	93,835	10,106	165,342	20%	20%	20%	12,280	18,767	2,021	33,068	2.5%
Other plastic	83,885	112,484	4,356	200,725	90%	90%	90%	75,496	101,236	3,920	180,652	14%
Metals	26,730	28,219	5,750	60,699	5%	5%	5%	1,337	1,411	287	3,035	0.2%
Inerts (glass, concrete, asphalt)	64,167	174,171	626,556	864,894	5%	5%	5%	3,208	8,709	31,328	43,245	3.3%
Other	430,651	64,560	5,401	500,612	5%	5%	5%	21,533	3,228	270	25,031	1.9%
<b>Total</b>	<b>1,560,871</b>	<b>1,275,855</b>	<b>781,976</b>	<b>3,618,702</b>	<b>32%</b>	<b>53%</b>	<b>18%</b>	<b>494,823</b>	<b>670,267</b>	<b>142,108</b>	<b>1,307,198</b>	<b>100%</b>

## Processing

The main steps in the processing of RDF are as follows.

1. Recovery of valuable recyclables (e.g. metals, rigid plastics)
2. Removal of inert components (e.g. glass, stones, masonry)
3. Removal of hazardous materials (e.g. batteries, gas bottles, chemicals, PVC plastics)
4. Removal or drying of wet organic components
5. Homogenisation of the fuel through shredding and screening to a consistent particle size and bulk density.

RDF could be readily produced as a by-product of many existing waste recovery and processing operations, providing an alternative outlet for residues which are currently landfilled. Alternatively, dedicated RDF production facilities could be developed either as part of an energy from waste (EfW) facility or as a stand-alone process feeding a separate EfW plant.

## Standards and guidelines

There are currently no established quality standards or specifications for RDF that specifically apply to Victoria. However, the Energy from Waste Guideline published by Environment Protection Authority (EPA) Victoria<sup>1</sup> sets out how the EPA proposes to apply the *Environmental Protection Act* to EfW projects, and specifies some requirements in relation to RDF production.

The guideline states that stand-alone RDF facilities should have a “viable and current market and be designed to the specification of a customer”. EfW should only be considered for residual waste after all suitable materials have been recovered for reuse and recycling, and the guideline puts the onus on the EfW proponent to demonstrate that EfW is the best management option. The guideline also states that RDF should not contain “contaminants such as batteries, light bulbs or other electrical wastes” and other components should not be added for the purpose of diluting unsuitable chemical substances in the RDF.

In South Australia, the EPA has produced the Standard for the production and use of Refuse Derived Fuel<sup>2</sup> which sets out a risk-based approach to assessing applications for approvals to produce or use of RDF, both of which are licensed activities.

1 “Energy from waste”, publication 1559, December 2013, <http://www.epa.vic.gov.au/business-and-industry/guidelines/waste-guidance/energy-from-waste>.  
 2 Standard for the production and use of Refuse Derived Fuel, SA EPA, February 2010, [http://www.epa.sa.gov.au/environmental\\_info/waste/solid\\_waste/refuse\\_derived\\_fuel](http://www.epa.sa.gov.au/environmental_info/waste/solid_waste/refuse_derived_fuel).

## Competing products

Fossil fuels such as coal and gas are the major competing products for RDF.

### Coal

Coal is cheap and readily available in Victoria due to large storage reserves primarily in the Latrobe Valley. Existing power infrastructure is specifically designed to utilise coal and its availability close to the source means transport costs and handling costs are extremely low. Coal requires little pre-processing before use.

### Natural gas

Natural gas has significantly lower emissions than coal and is easy to store and transport through the establishment of permanent infrastructure like pipelines (although this has higher upfront costs, the ease of transport and long term costs are very attractive). It has a high heating value, burns significantly cleaner than other fuels with much lower contribution to smog, and has no ash residue.

While Australia has significant reserves of natural gas, the expectation is that, due to export commitments, there will be a shortage of gas for the domestic market which will significantly increase gas prices in Australia in the short to medium term.

## Market overview

The only existing market for RDF in Australia is in South Australia where the SITA-Resource Co joint venture facility produces an RDF product from dry C&I waste, which is then used in a cement kiln operated by Adelaide Brighton Cement. The RDF is mostly comprised of timber, plastic, paper and cardboard. The process which produces the RDF is mechanical, consisting of shredding, screening, manual picking, wind sifting and metals extraction. According to published figures, the RDF represents around 30-40 per cent of the incoming C&I waste. In this case, the raw waste is high in inert content (stones, concrete, masonry, sand) which is extracted and recycled separately into the civil construction market.

As stated earlier, there is no market for RDF currently in Victoria (although there are some internal markets within specific companies). In addition, there are very few facilities that could accept an RDF product in Australia, although a number of projects are known to be in various stages of development in New South Wales and Western Australia.

The use of RDF in cement kilns is well established internationally and has a number of advantages. Compared with other industrial processes, cement kilns can usually use RDF as a direct substitute for fossil fuels with minimal process changes due to high temperatures ensuring complete combustion.



This fact sheet summarises a more comprehensive market analysis report completed by Hyder Consulting on behalf of Sustainability Victoria (May 2014). Due to the confidential nature of some information provided by stakeholders the full market analysis report is not publicly available.

There is limited potential for the Adelaide model to be replicated in Victoria. Victoria's only cement kiln near Geelong was meeting about half its fuel needs with various waste materials, however the facility recently closed.

It is possible to use RDF in other thermal industrial processes such as coal-fired power stations and metallurgical industries, depending on the nature of the combustion processes employed. Environmentally, this option can have significant benefits. However, plant upgrades would involve capital costs.

There is potential in the Asia-Pacific region for a market in RDF to develop. A large number of cement kilns operate in China and other parts of Asia that currently rely on coal, and dedicated EfW capacity is rapidly expanding across south-east Asia.

Industry consultation suggests that export of RDF from Victoria to Asia could be a feasible option and that the cost of shipping the product is likely to be a relatively small component of the overall cost structure.

## Market risks

Apart from the lack of local markets, other risks and/or barriers to RDF production include:

- › cost of processing infrastructure
- › site availability
- › existing cheap fuel alternatives
- › reliance on export markets which introduce quality restrictions (such as China's "Operation Green Fence")
- › community opposition
- › policy uncertainty
- › supply of feedstock
- › use of less proven technology and limited local technical expertise.

## Market opportunities

The following actions would support market opportunities for RDF in Victoria.

- › The development of an industry standard for RDF could help to develop the domestic market by supporting customer confidence in RDF products and changing the perceptions.
- › Undertaking demonstration projects to test the technical risks associated with emerging technologies.
- › Planning for treatment of hazardous residues from EfW processing.

## Further information

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