Having a Price on Carbon

Implications for Waste Management

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Carbon Price Mechanism - Overview

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- **Scheme:** The Carbon Price Mechanism (CPM) will establish an emissions trading scheme with wide coverage across the Australian economy including stationary energy, manufacturing and landfills. The CPM only applies to waste landfilled after July 1, 2012

- **Price:** A two-stage approach:
  - The carbon pricing mechanism will commence on 1 July 2012, with a price that will be fixed for the first three years like a tax. The price will start at $23 per tonne CO_2-e and will rise at 2.5 per cent per annum in real terms.
  - Note as landfill gas emissions occur in the future the 'effective' cost for landfill emissions from waste received at the start of the scheme is estimated to be around $30 per tonne of CO_2-e .
  - On 1 July 2015, the carbon price will transition to a fully flexible price under an emissions trading scheme (ETS), with the price determined by the market.
  - Under the ETS up to 50% of international permits may be purchased.

Carbon Price Mechanism - Coverage

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- **<u>Initial Threshold</u>:** All landfills with annual emissions greater than 25,000 tonnes CO_2-e will be covered from July 1, 2012.

  Emissions considered in the threshold include both legacy (waste landfilled up to 30 June, 2102) and non–legacy (waste landfilled from July 1, 2012) waste emissions.

- **<u>Prescribed Distance Rule</u>:** Because of concerns that waste may diverted from 'covered' landfills to 'uncovered' sites provision has been included in the legislation to reduce the threshold in certain areas. This issue will be reviewed in 2015/16. This may mean landfills with emissions as low as 10,000 tonnes per annum may be included from 2015/16 in scheme.

Carbon Farming Initiative Overview

- **Scheme**: The Carbon Farming Initiative (CFI) will create economic incentives to implement land based carbon abatement projects, including the combustion of landfill gas derived from legacy waste.

- **Under the CFI:** Landholders and land managers, farmers, landfill operators and forest growers will be able to earn tradable credits (Australian Carbon Credit Units – ACCUs) in recognition of carbon offsets created by abatement projects meeting approved methodologies.

- **CFI Credits:** ACCUs will be sold to companies with liabilities under the Carbon Pricing Mechanism.
  ACCUs will be bankable for future use and will be able to be exported during both the fixed price and flexible price periods.

- **Kyoto Compliant**: Landfill permits from legacy waste will be Kyoto compliant and will be able to be acquitted against landfill emissions.

Direct Carbon Costs and Landfills

- For 'covered' landfills the carbon permit liability will commence on July 1, 2012.

- There are three 'variables' to consider when calculating the direct carbon cost increase:
  - The waste composition
  - The future carbon cost
  - Each landfill's gas collection efficiency

- Landfills applying a carbon price increase need to be mindful of the ACCC guidelines relating communication and transparency.

Carbon Liability by Waste Category

Landfill Emissions

- When landfilled waste decomposes without oxygen it produces methane
- 47.6 kg of methane = 1 tonne CO_2-e (when a conversion factor of 21 is used)
- Methane is a greenhouse gas and covered by NGERS
- NGERS landfill emission reporting is based on the IPCC first order of decay modeling.
- This modeling in turn is based on the organic content (DOC) and the fraction of the organic material that decomposes in a landfill (DOCf).

Carbon Liability NGERS Default Calculations MSW

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Emission Factors Effective 1 July 2011				
	Composition	**DOC**	**DOCf**	**tCO2-e**
Food	35.0%	0.15	0.84	0.56
Paper and paper board	13.0%	0.4	0.49	0.32
Garden and park	16.5%	0.2	0.47	0.20
Wood and wood waste	1.0%	0.43	0.23	0.01
Textiles	1.5%	0.24	0.5	0.02
Sludge	0.0%	0.05	0.5	0.00
Nappies	4.0%	0.24	0.5	0.06
Rubber and Leather	1.0%	0.39	0.5	0.02
Concrete, metal, plastic and glass or other	28.0%	0	0	0.00
Emission factor (tCO2-e/t waste) for MSW				**1.19**

Carbon Liability NGERS Default Calculations Wet C&I

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Emission Factors Effective 1 July 2011				
	Composition	**DOC**	**DOC_f**	**tCO_2-e**
Food	21.5%	0.15	0.84	0.34
Paper and paper board	15.5%	0.4	0.49	0.38
Garden and park	4.0%	0.2	0.47	0.05
Wood and wood waste	12.5%	0.43	0.23	0.16
Textiles	4.0%	0.24	0.5	0.06
Sludge	1.5%	0.05	0.5	0.00
Nappies	0.0%	0.24	0.5	0.00
Rubber and Leather	3.5%	0.39	0.5	0.09
Concrete, metal, plastic and glass or other	37.5%	0	0	0.00
Emission factor (tCO2-e/t waste) for Wet C&I				**1.08**

Carbon Liability NGERS Default Calculations Dry C&I

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Emission Factors Effective 1 July 2011				
	Composition	**DOC**	**DOC_f**	**tCO_2-e**
Food	5.0%	0.15	0.84	0.08
Paper and paper board	18.8%	0.4	0.49	0.46
Garden and park	4.9%	0.2	0.47	0.06
Wood and wood waste	15.1%	0.43	0.23	0.18
Textiles	4.9%	0.24	0.5	0.07
Sludge	1.8%	0.05	0.5	0.01
Nappies	0.0%	0.24	0.5	0.00
Rubber and Leather	4.2%	0.39	0.5	0.10
Concrete, metal, plastic and glass or other	45.4%	0	0	0.00
Emission factor (tCO2-e/t waste) for Dry C&I				**0.96**

Carbon Liability NGERS Default Calculations C&D

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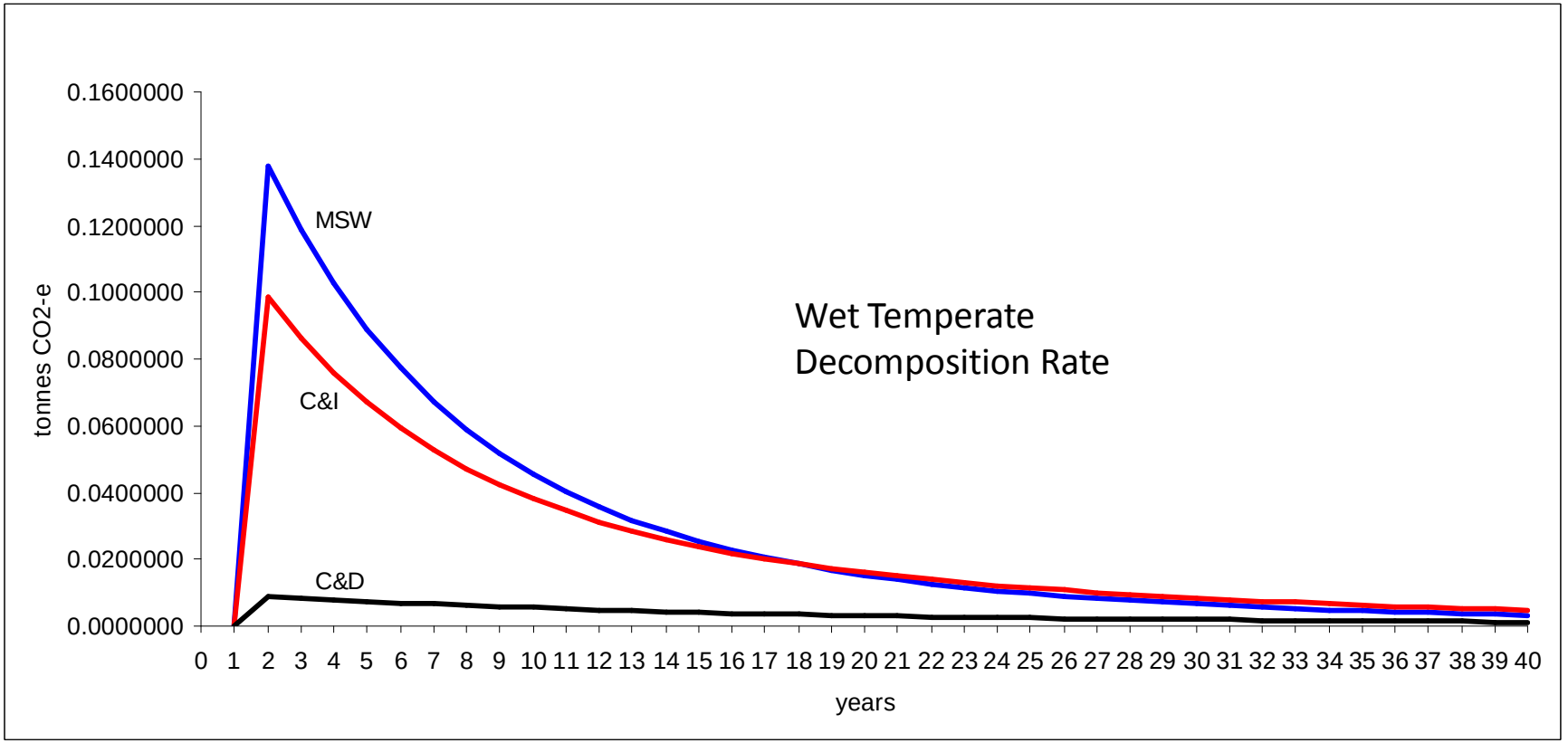
Emission Factors Effective 1 July 2011				
	Composition	**DOC**	**DOC_f**	**tCO_2-e**
Food		0.15	0.84	0.00
Paper and paper board	3%	0.4	0.49	0.07
Garden and park	2%	0.2	0.47	0.02
Wood and wood waste	6%	0.43	0.23	0.07
Textiles		0.24	0.5	0.00
Sludge		0.05	0.5	0.00
Nappies		0.24	0.5	0.00
Rubber and Leather		0.39	0.5	0.00
Concrete, metal, plastic and glass or other	89%	0	0	0.00
Emission factor (tCO2-e/t waste) for C&D				**0.17**

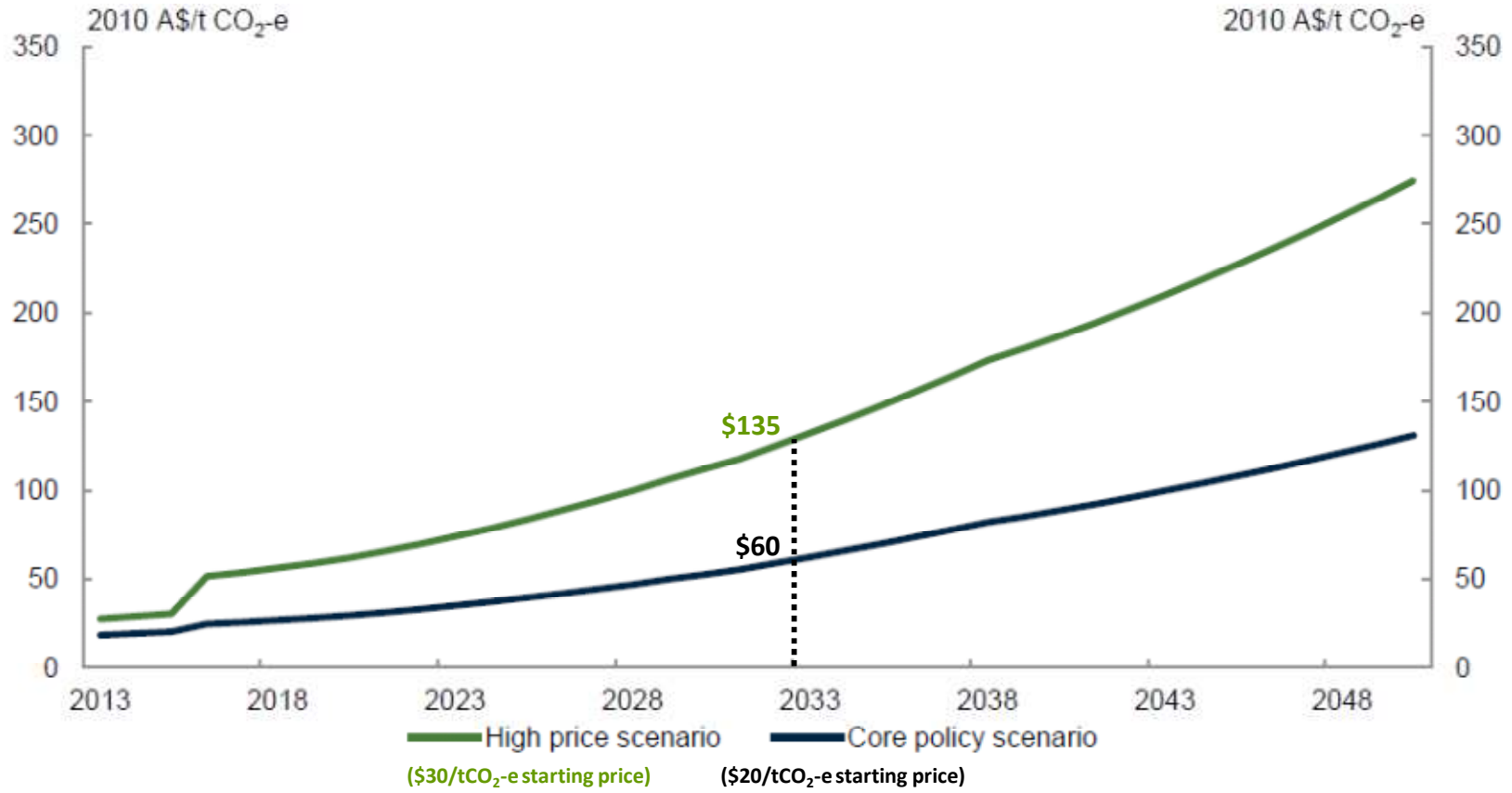
Estimating the future Carbon Cost for waste received during the ‘fixed price’ period

The IPCC Model – Emissions against time



- There are no emissions in the first year
- Around 80% of the emissions occur in the first 20 years
- Emissions may continue for over 50 years

Australian Carbon Price Forecast



Source: Australian Government Treasury, "Strong Growth, Low Pollution: Modelling a Carbon Price", 10 July 2011, p.76

Future Carbon Cost – Discounting Method

Financial Year ending	Emissions for 1t MSW deposited in 2012-2013	Carbon Price per tCO2-e	Carbon Liability (not discounted)	Carbon Liability (discounted @ net 4%)
	tCO2-e	$/tCO2e	$	$
2013	0.000000	$23	$0.00	
2014	0.137784	$24	$3.28	3.06
2015	0.118699	$25	$2.92	2.64
2016	0.102544	$33	$3.36	2.93
2017	0.088846	$34	$3.06	2.58
2018	0.077211	$36	$2.80	2.28
2019	0.067309	$38	$2.56	2.02
2020	0.058864	$40	$2.36	1.79
2021	0.051645	$42	$2.17	1.59
2022	0.045461	$44	$2.01	1.43
2023	0.040149	$47	$1.87	1.28
2024	0.035575	$49	$1.75	1.16
2025	0.031625	$52	$1.65	1.05
2026	0.028205	$55	$1.56	0.96
2027	0.025235	$59	$1.48	0.88
2028	0.022648	$62	$1.40	0.81
2029	0.020388	$66	$1.34	0.75
2030	0.018407	$69	$1.28	0.69
2031	0.016664	$73	$1.22	0.64
2032	0.015128	$78	$1.18	0.59
2033	0.013768	$82	$1.13	0.55
2034	0.012560	$87	$1.09	0.51
2035	0.011485	$92	$1.06	0.48
2036	0.010524	$97	$1.03	0.45
2037	0.009663	$103	$1.00	0.42
2038	0.008890	$109	$0.97	0.40
2039	0.008192	$113	$0.93	0.37
2040	0.007562	$118	$0.89	0.34
2041	0.006991	$123	$0.86	0.32
2042	0.006472	$127	$0.82	0.29
2043	0.005999	$132	$0.79	0.27
2044	0.005568	$138	$0.77	0.25
2045	0.005173	$143	$0.74	0.24
2046	0.004812	$149	$0.72	0.22
2047	0.004480	$155	$0.69	0.21
2048	0.004174	$161	$0.67	0.19
2049	0.003893	$167	$0.65	0.18
2050	0.003633	$174	$0.63	0.17
2051	0.003393	$181	$0.61	0.16
TOTAL	1.1900		**$55.31**	**NPV** **$35.51**

- Assuming the mid-point treasury price forecast is achieved an estimate of future permit costs can be calculated.
- When a 'secure' 4% net discount rate is applied to permit payments from Years 2 to 38 then the 2012-13 carbon cost ($35.51 ÷ 1.19 tonnes CO_2-e per tonne waste) is approx $30.

Future Carbon Price – Pre-purchase Method

The future carbon cost can be calculated by the 'pre-purchase' approach detailed below –

For one tonne MSW landfilled in 2012/13			
Year	**Emission Tonnes CO_2-e**	**Carbon Price $ / tonne CO_2-e**	**Permit Cost $ / tonne waste**
2012/13	0	23	0
2013/14	0.1376	24	3.28
2014/15	0.1187	25	2.98
2015/16	0.9335	15 - 40	14.00 - 37.44
Total	1.1900	-	20.26 - 43.60

i.e. a future carbon cost between $17 to $37 per tonne of CO_2-e

Estimating the future Landfill Gas Collection Efficiency

Future Landfill Gas Collection Efficiency

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- Current landfill collection efficiency is calculated by dividing a facility's actual gas capture by the facility's NGER generation estimate (this is likely to be in the range of 30 to 60%)
- It is recommended that landfillers seek independent advice to determine their future gas collection efficiency.
- NGER Method 1 limits gas collection efficiency to 75%.
- Income from electricity generation and CFI credits may impact on future collection rates.

Direct Carbon Cost Increase - Case Study

Landfill Characteristics	
Location:	Dry temperature
Commenced:	1990
Expected closure:	2020
Waste tonnage 2012/13:	200,000 tonnes
NGER emission for mixed waste	106.000 tonnes CO_2-e
Gas collection / combustion:	55.000 tonnes CO_2-e
Current NGER Gas Collection Efficiency:	52%
Net Emissions:	51,0000 tonnes CO_2-e
Coverage under CPM scheme:	Yes
Future NGER Gas Collection Efficiency:	50%

Carbon Cost
Assume the midpoint of the 'Treasury' carbon price forecast for2015 i.e. a price of $32 per tonne CO_2-e

Direct Carbon Cost Increase
MSW 1.2 x $30 x (1 - 0.50) = $18.00 per tonne of waste C&I 1.1 x $30 x (1 - 0.50) = $16.50 per tonne of waste C&D 0.2 x $30 x (1 - 0.50) = 3.00 per tonne of waste

In Summary

- Carbon cost increase will likely result in landfill price increases from July 1, 2012.
- As direct carbon cost increases are dependent on:
  - Whether the site is above the CPM threshold,
  - The waste category,
  - The future cost of carbon permits, and
  - The gas collection efficiency at each site.
- Future Landfill prices are likely to reflect both carbon cost increases and commercial considerations.
- Prices will most likely be offered for the 'default' waste categories – MSW, C&I and C&D.
- Waste generators should contact their service providers to discuss prices as soon as possible.

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Thank you