A Price on Carbon

Implications for Waste Management

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Clean Energy Bill - Overview

- **Scheme**: The Clean Energy Bill (CEB) will establish an emissions trading scheme with wide coverage across the Australian economy including stationary energy, manufacturing and landfills.

- **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.

  - On 1 July 2015, the carbon price will transition to a fully flexible price under an emissions trading scheme, with the price determined by the market.

Note - As landfill gas emissions occur in the future the 'effective' price for landfill emissions at the start of the scheme is estimated to be around $30 per tonne of CO_2-e.

- **Coverage:** All landfills with annual emissions greater than 25,000 tonnes CO_2-e will be covered. Landfills with emissions as low as 10,000 tonnes per annum may be included from 2015/16.

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.

Landfill Emissions

- When deposited waste decomposes without oxygen it produces Methane
- 47.6 kg of Methane = 1 tonne CO_2-e
- Methane is a greenhouse gas and covered by NGERS
- The Federal Government's Department of Climate Change and Energy Efficiency (DCCEE) has responsibility for NGERS reporting
- NGERS landfill emission reporting is based on the IPCC modeling.

The IPCC Landfill Emission Model

- The Intergovernmental Panel on Climate Change (IPCC) has developed a model to estimate landfill gas emissions.

- This model is based on a first order of decay approach and is calculated using the following formulas:

Landfill Emissions $E_j = [CH_4^* - y (Q_{cap} + Q_{flared} + Q_{tr}] \times (1\text{-}OF)$

where

Methane $CH_4\ gen = (\Delta C_a(t) + \Delta C_{os}(t)) \times F \times 1.336 \times 21$

where

Decomposable Carbon $C_{o(i)}\ (t) = \sum_i Q_i \times DOC_i \times DOCf_i \times MCF$

where

DOC is the quantity of degradable organic carbon in the waste
DOCf is the fraction of the DOC that degrades in the landfill

Carbon Liability NGERS Default Calculations MSW

Emission Factors Effective 1 July 2011				
	Composition	**DOC**	**DOC_f**	**tCO_2-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 (tCO_2-e/t waste) for MSW				**1.19**

Carbon Liability NGERS Default Calculations C&I

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 (tCO_2-e/t waste) for C&I				**1.08**

Carbon Liability NGERS Default Calculations C&D

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 (tCO_2-e/t waste) for C&D				**0.17**

NGERS Emission Estimation

- DCCEE provides software to allow for emission estimation
- Example: 'Determination Compliant' Calculator

Australian Government
Department of Climate Change and Energy Efficiency

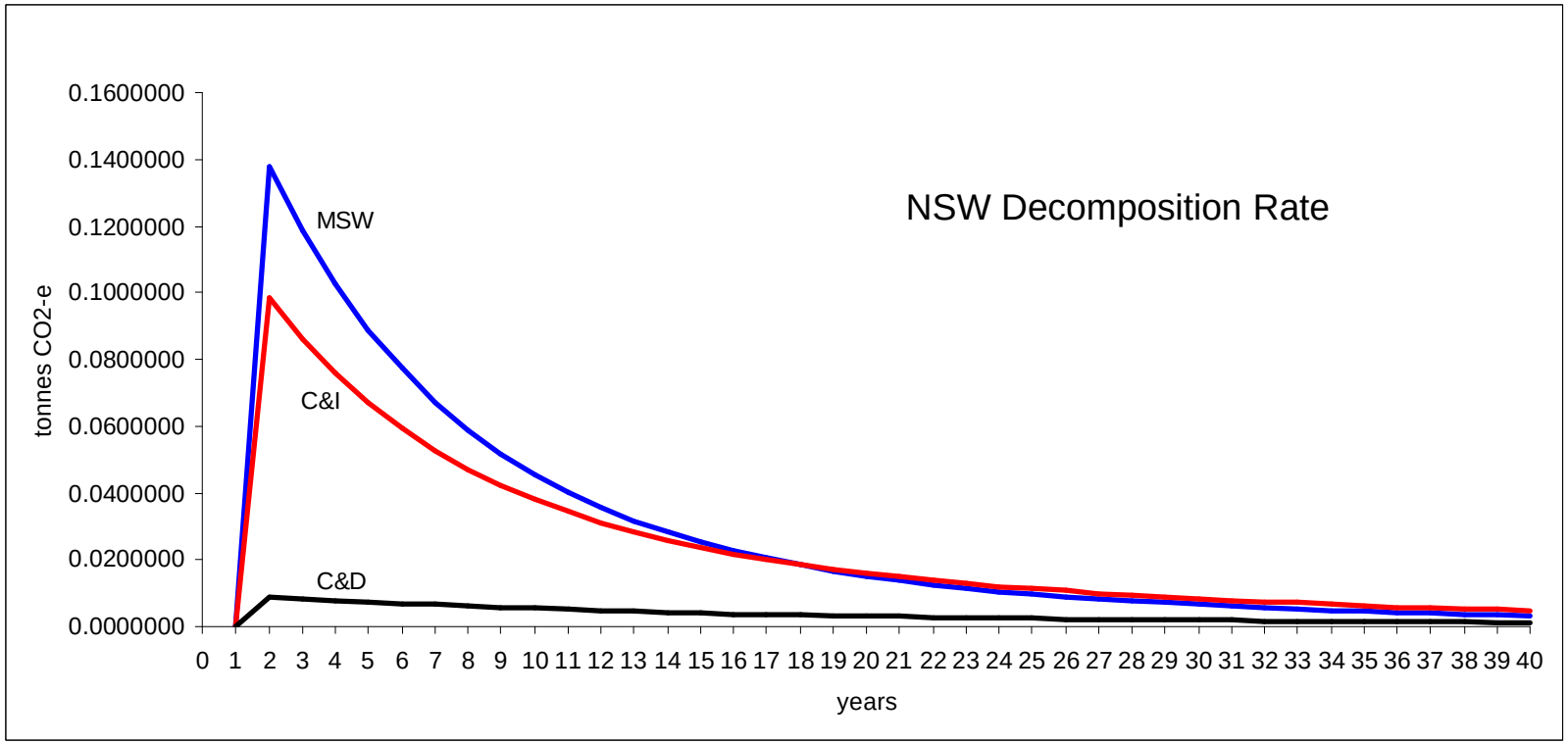
Read "Solid Waste Disposal on Land User Guide" for important information on:
- the landfill facility activities that must be reported (energy/emissions)
- how to use this calculator
- OSCAR reporting

Please click here for user guide!

Sections of NGER (Measurement) Determ. 2008 amended, IPCC 2006	NGER Section 5.5	NGER Section 5.4					NGER Section 5.4/IPCC Equation 3.6	NGER Section 5.4	NGER Section 5.11								
NSW	Select State/Territory, enter landfill opening year and enter Waste (kt), Q_{cap}, Q_{flared}, Q_{tr}				No input required in the fields below				Waste mix types - Commercial and Industry (proportions of total) Note: defaults can be overridden in accordance with NGER Determination								
Financial year ending - input landfill opening year in cell below	Waste received landfill (kt)	Q_{cap} (CH_4 only) (m^3)	Q_{flared} (CH_4 only) (m^3)	Q_{tr} (CH_4 only) (m^3)	CH_4 captured ($Q_{cap}+Q_{tr}+Q_{flared}$ in kt CO_2-e)	CH_4* (kt CO_2-e)	CH_{4gen} (kt CO_2-e)	Emissions E_j (CO_2-e) (kt)	Food	Paper and paper board	Garden and park	Wood and wood waste	Textiles	Sludge	Nappies	Rubber and Leather	Inert (including concrete, metal, plastic, glass) (by deduction)
2013	0.001	0	0	0	0.0000	0.0000	0.0000	0.0000000	0.22	0.16	0.04	0.13	0.04	0.02	0.00	0.04	0.38
2014	0.000	0	0	0	0.0000	0.0001	0.0001	0.0000984	0.22	0.16	0.04	0.13	0.04	0.02	0.00	0.04	0.38
2015	0.000	0	0	0	0.0000	0.0001	0.0001	0.0000862	0.22	0.16	0.04	0.13	0.04	0.02	0.00	0.04	0.38
2016	0.000	0	0	0	0.0000	0.0001	0.0001	0.0000757	0.22	0.16	0.04	0.13	0.04	0.02	0.00	0.04	0.38
2017	0.000	0	0	0	0.0000	0.0001	0.0001	0.0000668	0.22	0.16	0.04	0.13	0.04	0.02	0.00	0.04	0.38
2018	0.000	0	0	0	0.0000	0.0001	0.0001	0.0000592	0.22	0.16	0.04	0.13	0.04	0.02	0.00	0.04	0.38
2019	0.000	0	0	0	0.0000	0.0001	0.0001	0.0000527	0.22	0.16	0.04	0.13	0.04	0.02	0.00	0.04	0.38
2020	0.000	0	0	0	0.0000	0.0001	0.0001	0.0000471	0.22	0.16	0.04	0.13	0.04	0.02	0.00	0.04	0.38
2021	0.000	0	0	0	0.0000	0.0000	0.0000	0.0000422	0.22	0.16	0.04	0.13	0.04	0.02	0.00	0.04	0.38
2022	0.000	0	0	0	0.0000	0.0000	0.0000	0.0000380	0.22	0.16	0.04	0.13	0.04	0.02	0.00	0.04	0.38
2023	0.000	0	0	0	0.0000	0.0000	0.0000	0.0000344	0.22	0.16	0.04	0.13	0.04	0.02	0.00	0.04	0.38

- This Calculator allows for both default (MSW, C&I and C&D) waste inputs and individual waste inputs

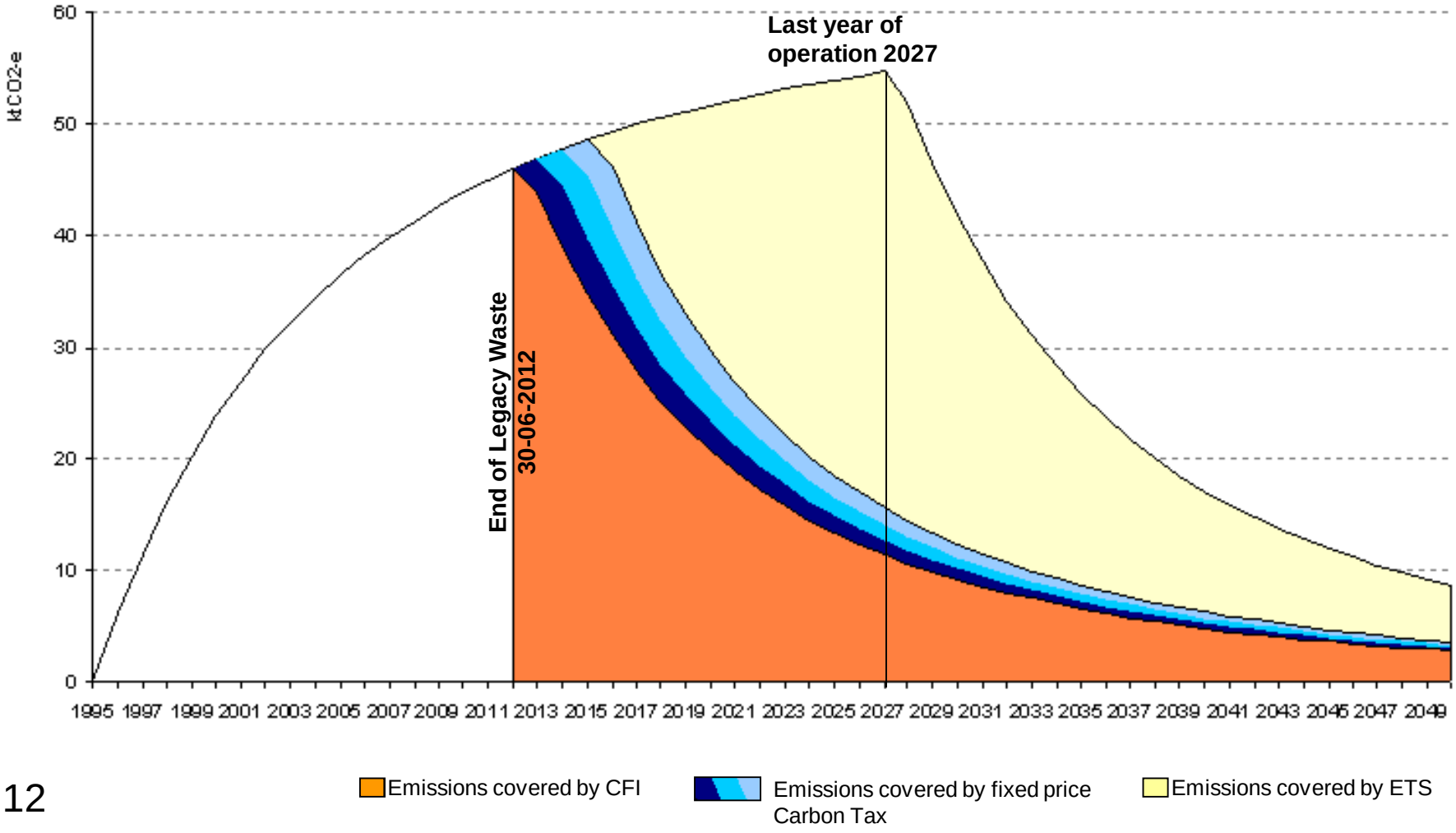
The IPCC Model – Emission against time



- The graphs above highlight that MSW creates the highest emissions followed by C&I and then C&D.
- Note - emissions can continue for up to 40 - 50 years

Landfill emissions

E.G. NSW Regional Landfill taking 75,000 t/a of mixed waste



Responding to the Clean Energy Bill and Carbon Farming Initiative

- Determine if your site exceeds the 25,000 tonnes per annum CO_2-e threshold

<u>if it does</u>

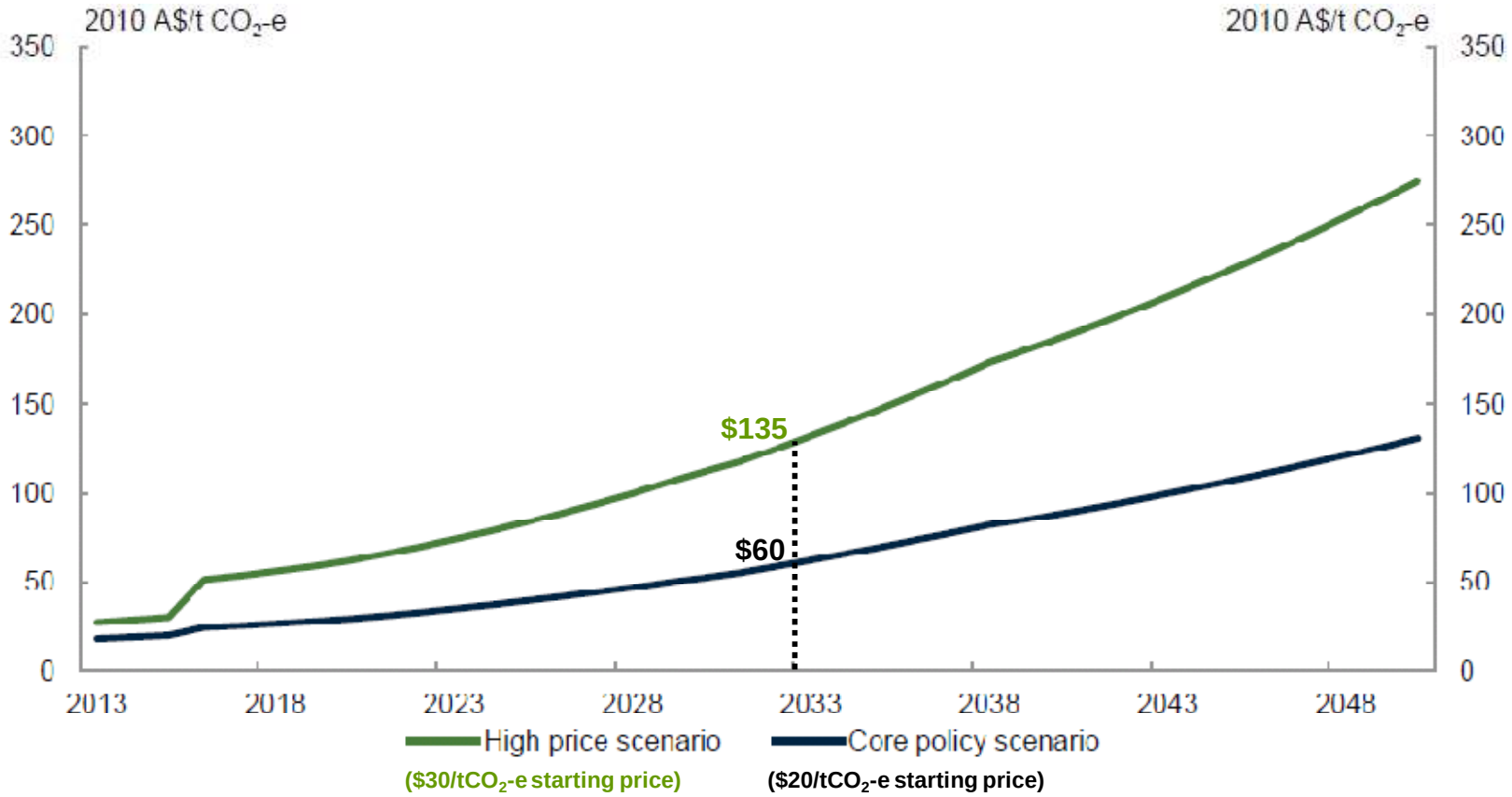
- Evaluate installing a gas collection system or upgrading the existing facility
- Register for CFI credits from combusted ‘legacy waste’

<u>and</u>

- Calculate justifiable pass through costs to clients
- Recover carbon related costs from clients (or rate payers for local government operated landfills) as waste is received
- Acquit permits in accordance with NGERS reporting

Australian Carbon Price Estimate

Treasury estimates



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

Pass Through Costs - elements to consider

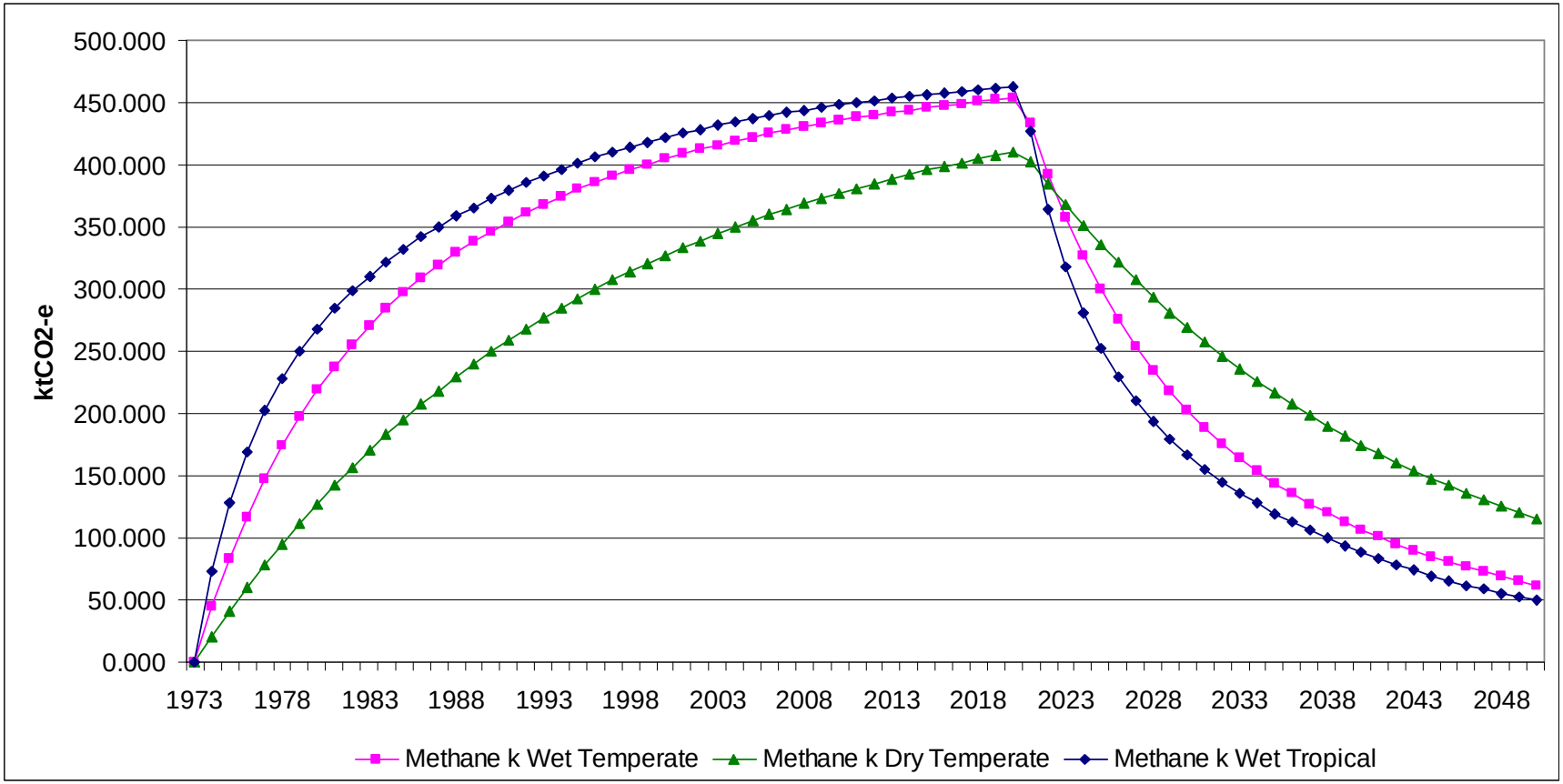
- Cost of carbon – initially estimated to be around $30 per tonne of CO_2-e
- Type of waste
- Landfill gas collection efficiency (with reference to NGERS)
- Cost of gas collection (net of income from gas sales, power generation and/or CFI credits)
- Compliance, administration and corporate tax costs
- GST

Issues to be resolved

- Determine which landfills are ‘covered’ and which aren’t
- Finalisation of the revised NGERS determination
- Finalisation of the ‘methodology’ to divide legacy waste and non-legacy waste emissions
- Finalisation of the CFI landfill gas combustion ‘methodology’ including:
  - Methodology to establish the “additionality” baseline for new projects
  - Transition arranges from GGAS to the CFI for current power generation projects.

NGERS Method 1 Variability

E.G. NSW Landfill taking 450,000 t/a of C&I waste



NGER Emission Reporting

- The rate of decomposition (NGERS Method 1) is determined by the relevant local climate. There are three categories available:
  - Wet Tropical
  - Wet and Dry Temperate
- If these categories overestimate a site's emissions NGERS Method 2 can be utilised.
- Currently the maximum landfill gas collection efficiency is capped at 75%
- NGER modeling does not report any emissions in the year the waste is received

Question & Answers

Thanks