Waste to Energy

Regulatory Impact Statement: Amending Regulations to Increase Waste to Energy Cap Limit

Table of Contents

[Index of tables and figures 1](#_Toc192593778)

[Abbreviations and Definitions 4](#_Toc192593779)

[Executive summary 7](#_Toc192593780)

[1. Background 21](#_Toc192593781)

[2. Problem analysis 41](#_Toc192593782)

[3. Objectives 48](#_Toc192593783)

[4. Options 51](#_Toc192593784)

[5. Impact analysis 53](#_Toc192593785)

[6. Summary of preferred option 90](#_Toc192593786)

[7. Implementation plan 93](#_Toc192593787)

[8. Evaluation strategy 96](#_Toc192593788)

[9. Appendix – Model inputs and assumptions 101](#_Toc192593789)

[10. References 137](#_Toc192593790)

[Publication information 141](#_Toc192593791)

# Index of tables and figures

**Tables**

[Table 1: Cumulative tonnes of materials recovered from WtE to 2049–50 11](#_Toc192593351)

[Table 2: Summary of avoided use of landfill savings 12](#_Toc192593352)

[Table 3: Cumulative tonnes of materials recovered from WtE to 2049–50 14](#_Toc192593353)

[Table 4: Summary of MCA 16](#_Toc192593354)

[Table 5: Categories of waste under the WtE Scheme   
(CE Act - sections 74N and 74L) 31](#_Toc192593355)

[Table 6: Material recovery assumptions 63](#_Toc192593356)

[Table 7: Cumulative tonnes of materials recovered from WtE to 2049–50 63](#_Toc192593357)

[Table 8: Proportion of landfill capacity saved, cumulative landfill capacity   
saved, avoided landfill costs, and net % increase between scenarios 65](#_Toc192593358)

[Table 9: Total of additional electricity generation up to 2050 relative   
to the base case (MWh) 66](#_Toc192593359)

[Table 10: Net emissions impact beyond 2 Mtpa cap for both 2.5 Mtpa   
and 3 Mtpa cap options to 2050 71](#_Toc192593360)

[Table 11: Lifetime emissions impacts of WtE cap options 73](#_Toc192593361)

[Table 12: Financial transfers of gate fee revenues 76](#_Toc192593362)

[Table 13: Net present value of incineration bottom ash and metal   
recovery (2025–26 to 2049–50) 77](#_Toc192593363)

[Table 14: Net present value of electricity generation for two cap   
scenarios relative to base case 79](#_Toc192593364)

[Table 15: Summary of cost-benefit analysis 80](#_Toc192593365)

[Table 16: MCA evaluation criteria and weightings 82](#_Toc192593366)

[Table 17: MCA scoring 83](#_Toc192593367)

[Table 18: Summary of the MCA results 87](#_Toc192593368)

[Table 19: Summary of impact analysis of the 2.5 Mtpa cap option 88](#_Toc192593369)

[Table 20: Impacts of the cap limit to competition and small business 89](#_Toc192593370)

[Table 21: Implementation of proposed Regulations 92](#_Toc192593371)

[Table 22: Baseline data sets 96](#_Toc192593372)

[Table 23: Quantitative data sets (collected annually) 97](#_Toc192593373)

[Table 24: Qualitative data metrics (collected 5-yearly) 98](#_Toc192593374)

[Table 25: Recovery Rates for MSW derived waste 103](#_Toc192593375)

[Table 26: Recovery Rates for C&I derived waste 106](#_Toc192593376)

[Table 27: Recovery Rates for C&D derived waste 109](#_Toc192593377)

[Table 28: Implications of a faster roll out 113](#_Toc192593378)

[Table 29: Emission impact by emission type from 2038 to 2100 119](#_Toc192593379)

[Table 30: Electricity grid emissions factors 123](#_Toc192593380)

[Table 31: Carbon pricing values, Australian dollars 2025 value 126](#_Toc192593381)

[Table 32: Electricity generation by WtE (in MWh) relative to the base case 131](#_Toc192593382)

[Table 33: Victorian spot energy price, AEMO 132](#_Toc192593383)

[Table 34: Value of electricity generation by WtE (in MWh) relative to the base case 133](#_Toc192593384)

**Figures**

[Figure 1: Projections of feedstock and WtE capacity to 2050 11](#_Toc192593389)

[Figure 2: Legislative structure of the WtE Scheme in Victoria 31](#_Toc192593390)

[Figure 3: Schematic of permitted, banned and exempt wastes 34](#_Toc192593391)

[Figure 4: Projections of feedstock and WtE capacity to 2050 59](#_Toc192593392)

[Figure 5: Year-by-year electricity generation relative to the base case (MWh) 66](#_Toc192593393)

[Figure 6: Cost of net emissions (NEM wide) in 2025 AUD value 79](#_Toc192593394)

[Figure 7: Projected WtE Capacity Schedule 113](#_Toc192593395)

[Figure 8: Projections of feedstock and WtE capacity assuming   
a faster roll out in capacity. 114](#_Toc192593396)

# Abbreviations and Definitions

List of Abbreviations and their definitions

| Abbreviation | Definition |
| --- | --- |
| AEMO | Australian Energy Market Operator |
| Amended Regulations | Circular Economy (Waste Reduction and Recycling) (Waste to Energy Scheme) Amendment Regulations 2024 |
| BRV | Better Regulation Victoria |
| Cap Licensing Framework | Proposed cap licencing framework to be administered by Recycling Victoria |
| CBA | Cost benefit analysis |
| CE | Circular Economy |
| CE Act | Circular Economy (Waste Reduction and Recycling) Act 2021 |
| Circular Economy Policy | The Victorian Government’s circular economy policy and plan, Recycling Victoria: a new economy(Department of Environment, Land, Water and Planning, 2020) |
| C&D waste | Construction and Demolition waste |
| C&I waste | Commercial and Industrial waste |
| CPI | Consumer Price Index |
| DEECA | Department of Energy, Environment and Climate Action |
| ELA Act 2022 | Environment Legislation Amendment (Circular Economy and Other Matters) Act 2022 |
| ELA Act 2023 | Environment Legislation Amendment (Circular Economy and Other Matters) Act 2023 |
| EO | Existing operator |
| EOI | Expression of Interest |
| EPA | Environment Protection Authority Victoria |
| EP Act | Environment Protection Act 2017 |
| EPA permissions process | Regulatory licensing process administered by the EPA for high-risk activities (including waste to energy operations) provided under the *Environment Protection Act 2017* |
| EU | European Union |
| FOGO | Food Organics and Garden Organics, or green waste |
| Gate fees | Fees charged by landfill operators to individuals and businesses for depositing waste in a landfill or at a waste to energy facility |
| GHG | Greenhouse gas |
| GWP | Global warming potential |
| Hazardous wastes | Wastes that are reportable priority wastes for the purposes of both section 142 and section 143 of the *Environment Protection Act 2017* |
| HDPE | High-density polyethylene, a plastic |
| IPCC | Intergovernmental Panel on Climate Change |
| KWh | Kilowatt hours |
| LDPE | Low-density polyethylene, a plastic |
| MAV | Municipal Association of Victoria |
| MCA | Multicriteria Analysis |
| MSW | Municipal Solid Waste |
| Mtpa | Million tonnes per annum |
| MW | Megawatt |
| MWh | Megawatt-hours |
| NEM | National Electricity Market |
| NPV | Net Present Value |
| PET | Polyethylene terephthalate, the most common thermoplastic polymer resin |
| PP | Polypropylene, a thermoplastic polymer |
| PS | Polystyrene, a synthetic polymer |
| PVC | Polyvinyl Chloride, a type of plastic |
| Residual waste | Wastes for which no further recycling is practicable, even with additional sorting |
| RIS | Regulatory Impact Statement, this document |
| RV | Recycling Victoria, (the Regulator) |
| Subordinate Legislation Act | Subordinate Legislation Act 1994 |
| SV | Sustainability Victoria |
| SV Act | Sustainability Victoria Act 2005 |
| SWRRIP | Statewide Waste and Resource Recovery Infrastructure Plan |
| TEEP | Technically, environmentally and economically practicable |
| The Regulations | Circular Economy (Waste Reduction and Recycling) (Waste to Energy Scheme) Regulations 2023 |
| The Framework | Victorian Waste to Energy Framework, 2021 |
| The proposed Regulations | The Circular Economy (Waste Reduction and Recycling) (Waste to Energy Scheme) Amendment Regulations 2025 (the proposed Regulations) |
| The Regulator | Recycling Victoria |
| VWPM | Victoria’s Waste Projection Model |
| VPA | Victorian Planning Authority |
| VRET | Victoria’s Renewable Energy Targets |
| VRIP | Victorian Recycling Infrastructure Plan |
| WtE | Waste to Energy |
| WtE Scheme | Part 5A (Waste to Energy Scheme) in Circular Economy (Waste Reduction and Recycling) Act 2021 (CE Act) |

# Executive summary

## Background and Objectives

This Regulatory Impact Statement (RIS) focuses on thermal Waste to Energy (WtE) technologies, which involve processes like combustion, gasification, and pyrolysis to recover energy from waste. Thermal WtE technologies generate useful forms of energy such as heat, electricity, and fuels from waste that would otherwise be disposed of in landfills.

Victoria is transitioning towards a circular economy, whereby it aims to maximise resource recovery, minimise waste, and encourage reuse, recycling, and waste reduction. WtE is seen as a viable solution for extracting value from waste materials that are unsuitable for reuse and recycling, particularly as landfill capacity decreases due to population growth and increasing waste generation. By diverting waste from landfills, WtE technologies contribute to preserving landfill space and reduce the environmental impact of waste disposal. While WtE alone cannot eliminate landfill reliance, it is a key component of an integrated waste and resource recovery system that supports Victoria’s transition to a circular economy.

WtE contributes to Victoria’s decarbonisation efforts by providing baseload electricity with lower carbon intensity than fossil fuels. Additionally, WtE plays a role in the circular economy by recovering valuable materials from ash by-products, including metals and bottom ash aggregates, reducing reliance on virgin materials.

Victoria’s Waste to Energy Scheme (WtE Scheme) established in the *Circular Economy (Waste Reduction and Recycling) Act* 2021(CE Act) provides for a cap limit to be prescribed in the Circular Economy (Waste Reduction and Recycling) (Waste to Energy Scheme) Regulations 2023 (Regulations). The cap limit is a maximum aggregate amount of permitted waste that can be processed by thermal WtE facilities in Victoria each financial year, excluding facilities that had the necessary approvals before 1 November 2021. Under Victoria’s WtE Scheme, only those wastes that cannot reasonably be further sorted or recycled are permitted for use in thermal WtE facilities.

The cap limit ensures that WtE remains a complementary solution within Victoria’s circular economy, prioritising waste reduction, reuse, and recycling before energy recovery. By controlling the volume of waste directed to WtE, the cap provides a mechanism to ensure that overall WtE processing capacity does not exceed the available permitted waste feedstock, thereby managing risks, including over-investment in WtE infrastructure, the need to import waste from other jurisdictions, or an underutilisation of facilities leading to dormant or stranded assets.

The previous WtE RIS was published for consultation between December 2023 and February 2024 to assess various options for designing cap licensing arrangements, including prescribing a cap limit. The previous RIS evaluated three cap limit options of 0.5 million tonnes per annum (Mtpa), 1 Mtpa and 2 Mtpa, with impact analysis comparing options to a base case where no new WtE facilities were built beyond those with existing operator licences.

In December 2024, the Victorian Government released the Economic Growth Statement, committing to setting an initial cap of 2 Mtpa in Regulations, and proposing a further increase to the cap to 2.5 Mtpa, subject to further consultation through a RIS process in early 2025. (Source: Department of Treasury and Finance. (2024). Economic Growth Statement – Victoria: Open for Business). The Circular Economy (Waste Reduction and Recycling) (Waste to Energy Scheme) Amendment Regulations 2024 were made in December 2024, setting the cap limit at 2 Mtpa and establishing the cap licensing process.

This RIS examines higher WtE cap limit options not assessed in the previous RIS, in support of the government’s commitment in the Economic Growth Statement. This RIS incorporates new data on waste generation, resource recovery and emissions outcomes across Victoria, allowing for a more refined understanding of waste feedstock availability and greenhouse gas (GHG) emissions impacts of increasing the WtE cap limit. The RIS also explores the potential economic and circular economy benefits of increasing the cap, including diverting more waste from landfill and the recovery of ash and metals as byproducts of thermal WtE processes that would have otherwise ended up in landfill.

The Victorian Government is considering increasing the cap limit in response to projected increases to waste generation, with projections in the Victorian Recycling Infrastructure Plan (VRIP) indicating residual waste could exceed 9 Mtpa by 2053. At this rate, Victoria will start to run out of approved landfill capacity in the mid-2030s. (Source: Recycling Victoria. (2024). Victorian Recycling Infrastructure Plan. P 4. Retrieved from <https://www.vic.gov.au/sites/default/files/2024-10/RV_Victorian-Recycling-Infrastructure-Plan-2024.pdf>). Increasing the cap limit may allow more waste to be converted to energy, preserving available landfill airspace and supporting the state’s ambitious waste diversion targets.

The objectives of this RIS in establishing an appropriate cap limit, are to:

* maximise the amount of residual waste diverted from landfill, while limiting risks of WtE capacity exceeding available feedstock
* increase the value of waste managed in Victoria
* minimise greenhouse gas emissions from waste processing and energy generation, and
* facilitate appropriate investment in the WtE industry to boost economic growth across Victoria.

This RIS models the impacts of three cap limit options through to 2049–50 across a range of factors (feedstock availability, material recovery, avoided use of landfill, electricity generation, net emissions outcomes, and overall costs and benefits), including whether increases to the cap limit will meet the RIS objectives. The three options are:

* **Option 1 (Base case)**: cap limit of 2 Mtpa, which reflects the existing regulations.
* **Option 2**: cap limit of 2.5 Mtpa.
* **Option 3**: cap limit of 3 Mtpa.

## Impact Analysis

### Feedstock availability

As only a subset of overall residual waste is permitted for use in thermal waste to energy facilities, the modelling of feedstock availability only considers permitted waste feedstock availability, rather than overall residual waste availability as modelled for the VRIP. Further, the modelling assumes that all of the cap limit is allocated by RV, which it may not be. The decisions of the Head, Recycling Victoria are independent statutory decisions.

Availability of permitted waste feedstock is critical to the viability of WtE facilities. Figure 1 shows projections of permitted waste feedstock availability to 2050 (central projection in solid blue line, with high/low confidence bands incorporated in blue shaded area), whilst the three orange dashed lines show when additional waste capacity is likely to come online under each cap option, including the volume of 1.055 Mtpa of capacity already approved through existing operator licences.

Modelling of permitted waste feedstock availability for the three cap options under a central projection scenario (solid blue line) suggests that, under the 2 Mtpa and 2.5 Mtpa caps, sufficient feedstock is available in all years to 2050, with 2.5 Mtpa cap option better utilising expected feedstock compared to the 2 Mtpa cap option. Under the 3 Mtpa cap option, there is an expected shortfall of available permitted waste feedstock for a seven-year period from 2040–41 to 2046–47.

**Figure 1: Projections of feedstock and WtE capacity to 2050**

Figure 1: Projections of feedstock and WtE capacity to 2050
The figure shows a graph with a y-axis of “tonnes per annum” and an x-axis showing time marked by financial years.  
A solid blue line representing the central projection of permitted waste feedstock availability begins in 2025-26 at 3.58 Mt before dipping to a low of 3.36 Mt in 2031-32. The line then rises gradually to 4.17 Mt in 2049-50. Upper/lower confidence bands around this central projection are shown as a shaded blue area encased by dashed blue lines. The lines represent +/- 6% of the central projection in 2025-26, fanning out to +/- 20% in 2049-50.
3 dashed orange and brown lines representing the anticipated schedule of when facilities and additional WtE capacity are likely to come online under each cap op-tion is shown. They all rise from 0 tpa in 2025-26 to 1.4 Mtpa in 2032-33, then they all rise at a slightly more rapid pace until the cap limit is reached for each option. Note that the capacity includes both existing operator licenses and new cap licenses. The orange 2 Mtpa cap limit line reaches its maximum of 3.06 Mtpa in 2037-38, the light brown 2.5 Mtpa cap limit line reaches its maximum of 3.56 Mtpa in 2039-40, and the dark brown 3 Mtpa cap limit line reaches its maximum of 4.06 Mtpa in 2041-42.

The brown dashed line showing projections for when WtE processing capacity will come online is in part based on assessment undertaken in preparing the VRIP, combined with the latest market intelligence of possible known facilities. Capacity coming online from 2026–27 up until 2037–38 is based on the timing of some known possible or committed facilities with some conservative simplifying assumptions for additional capacity beyond those dates, rounded and smoothed to the nearest 1,000 tonnes.

In making the assumptions for how long it will take for all WtE processing capacity to come online, the Department of Energy, Environment and Climate Action (DEECA) has taken into consideration the complexity of WtE construction projects and current capacity constraints in the civil construction sector in Victoria, the complex regulatory and permitting processes surrounding WtE/ash re-use, challenges in securing feedstock, addressing community concerns, and the fact that some RV approved projects may not proceed – resulting in the need for cap to be re-allocated in accordance with the CE Act.

It is noted that RV must impose conditions on waste to energy licences under s 74V(b) of the CE Act on facility commissioning dates. It is possible, and desirable for reducing reliance on landfill, that facilities and processing capacity will come online more quickly than is assumed in Figure 1. However, it is appropriate to assume a more conservative projection for this RIS, given that many facilities in the pipeline are in early planning phase.

Furthermore, cap licence holders will need to lock in feedstock promptly in order to commission their facilities in accordance with the date(s) specified in mandatory licence conditions.

### Material recovery

WtE processes enable the recovery of valuable materials, including incinerator bottom ash aggregate (IBAA), ferrous and non-ferrous metals. Recovery of IBAA (used as a substitute for construction aggregate) and metals reduces reliance on virgin materials, supporting circular economy principles by creating additional value streams and minimising waste sent to landfill. Modelling shows that the 3 Mtpa cap option provides the largest cumulative volume of material recovery compared to 2 Mtpa (base case) and 2.5 Mtpa cap options. Table 1 below shows cumulative tonnes of materials recovered from WtE to 2049–50.

Table 1: Cumulative tonnes of materials recovered from WtE to 2049–50

| Total (cumulative) tonnes recovered | 2 Mtpa cap scenario | 2.5 Mtpa cap scenario | 3 Mtpa cap scenario |
| --- | --- | --- | --- |
| Metals (removed from Incinerator Bottom Ash) | 954,888 tonnes | 1,056,088 tonnes | 1,120,208 tonnes |
| Incinerator Bottom Ash Aggregate (metals extracted) | 9,646,539 tonnes | 10,668,889 tonnes | 11,316,642 tonnes |

### Avoided use of landfill

By diverting permitted waste from landfill, WtE facilities can help to preserve limited landfill airspace. This RIS estimates larger landfill capacity savings, with higher cap limit options (once WtE processing capacity comes online) yielding greater benefit (Table 2). Analysis shows landfill savings will increase by 10.6% when increasing the cap from 2 Mtpa to 2.5 Mtpa. Due to projected feedstock shortfalls under the 3 Mtpa scenario, the additional landfill savings from increasing the cap beyond 2.5 Mtpa are more limited (additional 6% saving).

Table 2: Summary of avoided use of landfill savings

|  |  |  |  |
| --- | --- | --- | --- |
| Cap option | Proportion of Victoria’s total landfill capacity saved | Cumulative landfill capacity saved to 2050 | Net % increase from base case |
| 2 Mtpa | 34.77% | 67,276,200 m3 | Baseline |
| 2.5 Mtpa | 38.46% | 74,406,200 m3 | 10.6% |
| 3 Mtpa | 40.80% | 78,923,712 m3 | 17.3% |

### Electricity Generation

The amount of electricity generation under the 2.5 Mtpa and 3 Mtpa cap options are modelled from 2038-39 onwards when there are anticipated additional WtE facilities coming online beyond the base case. Modelling shows that under the 2.5 Mtpa and 3 Mtpa cap options, an additional 5,420,775 MWh and 8,855,077 MWh of electricity will be generated respectively as compared to the base case.

### Net Emissions

Net emissions were analysed by comparing the impacts of increasing the cap limit to 2.5 Mtpa and 3 Mtpa against the base case of 2 Mtpa.

Updated modelling by DEECA provides a whole-of-waste stream assessment, aligning with international emissions reporting standards. The model examines GHG emissions of each cap limit through two lenses:

1. Annual net emissions, which is the sum of emissions from direct WtE combustion, avoided emissions from displaced electricity generation emissions, and avoided emissions that would otherwise have been produced from that waste going to landfill.
2. Net lifetime emissions, which includes the sum of emissions from the same sources as the annual net emissions assessment but calculates the avoided landfill emissions for waste processed up until 2050 over the whole landfill decay period (i.e. were an equivalent volume of waste deposited to landfill rather than treated through a thermal WtE process). Emissions from landfill are assumed to occur for an additional 100 years beyond the modelling period (i.e. to 2150).

Because emissions are released immediately during the incineration process by WtE, sending permitted waste to WtE facilities will result in higher direct emissions over the period to 2050, when compared to sending the waste to landfill where emissions would be released slowly over many decades.

When emissions are assessed on a lifetime emissions basis (taking account of avoided landfill emissions to 2150), both cap limit options result in a net reduction in emissions compared to sending waste to landfill. The 3 Mtpa cap option (-0.70 million tonnes (Mt) CO2-e (carbon dioxide equivalent)) shows stronger overall emissions benefits compared to 2.5 Mtpa cap option (-0.43 Mt CO2-e).

### Cost-benefit analysis

For this RIS, the cost benefit analysis (CBA) evaluates to 2050:

* financial (revenue) transfers between landfill operators, WtE operators and Victorian Government
* financial (revenue) transfers associated with electricity generation from WtE and the generation it displaces
* value of material recovery ($/tonne, ash and metals), and
* value of net emissions. (Note: Net emissions are valued up to the year 2100 – refer to section 5.6 and the Appendix.)

A summary of the CBA is presented below in Table 3.

Table 3: Cumulative tonnes of materials recovered from WtE to 2049–50

| Cap scenario | 2.5 Mtpa (NPV) | 3 Mtpa (NPV) |
| --- | --- | --- |
| **Costs** |  |  |
| Decrease in landfill operator revenue | -$178,642,435 | -$284,151,561 |
| Decrease in Government waste levy receipts | -$453,992,529 | -$722,127,894 |
| Electricity generation by marginal generators | -$201,950,583 | -$321,218,072 |
| **Total** | **-$834,585,548** | **-$1,327,497,527** |
| **Benefits** |  |  |
| Increase in WtE operator revenue | $632,634,965 | $1,006,279,455 |
| Net emissions (NEM) | $8,081,219 | $10,416,273 |
| WtE electricity generation relative to base case | $201,950,583 | $321,218,072 |
| Incineration bottom ash recovery value relative to base case | $12,836,071 | $20,417,263 |
| Metal recovery value relative to base case | $66,773,477 | $106,210,978 |
| **Total** | **$922,276,316** | **$1,464,542,041** |
| **Net benefit** | **$87,690,768** | **$137,044,515** |
| **Benefit-cost ratio** | **1.105** | **1.103** |

Over the modelling period to 2050, using the 4% discount rate, the 2.5 Mtpa cap option generates a net benefit of $87.7 million, while the 3 Mtpa cap generates a higher net benefit of $137 million due to larger values generated by material recovery and net emission benefits. Both options have a benefit-cost ratio (BCR) larger than 1, indicating the present value of the benefits exceeds the costs under both cap limit options. The BCRs of the two options are close as major cost and benefit components scale linearly, making the proportional relationship between the costs and benefits similar in both options relative to the base case.

### Multi-criteria analysis

Due to the complexity in costing the risks associated with feedstock shortfalls and the costs or benefits of the avoided use of landfill, these factors have not been included in the CBA. In order to account for these crucial factors in determining the preferred option, a multi-criteria analysis (MCA) was undertaken. The key strengths of an MCA lie in its capacity to accommodate performance measures in any unit, whether quantitative or qualitative, and in its ability to offer decision-makers a structured approach to tackling complex problems.

The MCA assessed the impacts of increasing the WtE cap limit to 2.5 Mtpa and 3 Mtpa relative to the base case. The analysis evaluated options against the RIS objectives, with a score and weighting applied to each criterion. Table 4 summarises the findings of the MCA.

Table 4: Summary of MCA

| Criteria | Weight (%) | 2.5 Mtpa Weighted Score | 3 Mtpa Weighted Score |
| --- | --- | --- | --- |
| **1(a) Maximise the amount of residual waste diverted from landfill** | 30% | 0.75 | 1.20 |
| **1(b) Limit risks of WtE capacity exceeding available feedstock** | 30% | -0.15 | -0.90 |
| **2) Increase the value of waste managed in Victoria** | 20% | 0.21 | 0.33 |
| **3) Minimise greenhouse gas emissions from waste processing and energy generation** | 20% | 0.02 | 0.03 |
| **Total** | **–** | **0.83** | **0.66** |

In conducting the MCA, the 2.5 Mtpa option scored higher overall than the 3 Mtpa cap option (0.83 vs 0.66) as it effectively diverts waste from landfill while minimising risks associated with permitted waste feedstock shortfalls. The 2.5 Mtpa option provides an increase in material recovery and investment benefits relative to the base case, whilst reducing lifetime emissions. Whilst the 3 Mtpa option may provide greater material recovery and energy production, it carries greater risk of WtE capacity exceeding permitted waste feedstock availability, with consequential risks including overinvestment in WtE facilities and interstate importation of waste.

## Preferred Option

When taking account of the RIS objectives in Chapter 3, as well as analysis of feedstock availability, material recovery, avoided use of landfill, electricity generation, net emissions impacts, cost-benefits and the MCA, the 2.5 Mtpa cap limit is the preferred option. The 2.5 Mtpa cap option significantly increases the amount of permitted waste diverted from landfill, reducing pressure on landfill airspace, whilst limiting the risk of WtE capacity exceeding available permitted waste feedstock compared with the 3 Mtpa cap option.

The Circular Economy (Waste Reduction and Recycling) (Waste to Energy Scheme) Amendment Regulations 2025 (the proposed Regulations) have been drafted to provide for the increased cap limit to 2.5 Mtpa.

## Implementation Plan and Evaluation Strategy

The proposed Regulations and RIS will be open for a 28-day public consultation via Engage Victoria, allowing stakeholders—including waste-to-energy proponents, councils, and community groups—to provide feedback.

The RIS facilitates informed consultation by presenting detailed analysis supporting the preferred option. Following the consultation period, DEECA will consider all submissions received during the period of public consultation and will prepare a formal Response to Public Comment, including whether any changes are required to the proposed Regulations.

The proposed Regulations will be settled with the Office of the Chief Parliamentary Counsel and then submitted to the Governor in Council on the recommendation of the Minister for the Environment. Communication of the proposed Regulations coming into effect will occur soon thereafter, along with a publication of a Statement of Reasons. Any amendments to the Regulations will be made prior to the issuing of the first round of cap licences by the Head, Recycling Victoria.

Chapter 8 of this RIS includes an updated evaluation strategy from that presented in the previous RIS, with baseline, annual and five-yearly data collection to inform future evaluations of the WtE Scheme. The evaluation strategy provides for collection of data to inform a future evaluation on the effectiveness of the regulations, compliance levels, and contributions to Victoria’s circular economy. Data collection will include both quantitative and qualitative metrics, with annual reporting on WtE facility operations and a five-year review of compliance costs and industry innovation.

The timing of any formal evaluation of the Regulations will be determined by the Victorian Government. Under the *Subordinate Legislation Act 1994*, regulations sunset after ten years but can be remade to ensure continuity. Any amendments to the WtE cap limit will be incorporated into the Circular Economy (Waste Reduction and Recycling) Regulations 2023, with an evaluation required before 2033 (when the Regulations will sunset). Additionally, the *Circular Economy (Waste Reduction and Recycling) Act 2021* provides for a review of the Act after the first 5 years of operation.

# Background

Waste to Energy (WtE) can refer to any technology applied to waste to generate useful energy resources. It includes thermal treatments which can generate heat, steam, gas and liquid fuels and electricity from combustible waste, and biological technologies such as anaerobic digestion which create biogas and organic residues from organic wastes.

This Regulatory Impact Statement (RIS) concerns thermal WtE, which is defined in section 74(M) of the *Circular Economy (Waste Reduction and Recycling) Act 2021* (CE Act) as a thermal process used:

* to recover energy from waste in the form of heat (which may be converted to steam or electricity), or

to produce fuel from waste.

For the purposes of this RIS, the definition includes combustion, gasification and pyrolysis processes.

## Waste to Energy in Victoria’s waste system

Victoria is in transition to a sustainable and thriving circular economy, where we maximise value extracted from material resources, minimise waste and encourage reuse, repair and recycling. In a circular economy, WtE is an opportunity to extract value from materials that would otherwise go to landfill with limited benefit and allow business to generate more value from the materials they manage. It also provides opportunities to support the decarbonisation of Victoria, including the gas sector as described in the Gas Substitution Roadmap Update 2024. (Source: Victoria State Government. (2024). Gas substitution roadmap update 2024. Retrieved from <https://www.energy.vic.gov.au/renewable-energy/victorias-gas-substitution-roadmap/gas-substitution-roadmap-update-2024.pdf>)

A circular economy prioritises waste avoidance, waste reduction, material use and recycling. Under a circular economy using waste that can’t be recycled to recover energy is a better outcome than disposal in landfill. (Noting some landfills capture methane for the purposes of energy production, however this is minimal compared to the energy generated when waste is processed by WtE.). WtE technologies can play a useful role in an integrated waste and resource recovery system. Victoria’s landfill capacity is becoming increasingly more constrained, particularly across metropolitan Melbourne, as a result of population growth, greater demand for resources and increases in waste generation. Landfilling waste that cannot otherwise be recycled is becoming problematic as landfill capacity for the state is diminishing. WtE offers an alternative to landfilling waste and can help to preserve landfill airspace for wastes that cannot otherwise be recycled or re-used (where those wastes are also not suitable for thermal WtE, for example, hazardous wastes). Increases to Victoria’s landfill levies drive investment in innovative technologies and alternatives to landfill, such as recycling and waste to energy.

Waste to energy facilities will significantly reduce the amount of waste sent to landfill each year.  However, waste to energy alone will not solve Victoria’s reliance on landfill. It is important that Victorians continue to reduce waste, recover and recycle materials, and transition to a circular economy.

WtE technologies and supply chains are playing a vital role in the transition to a circular economy in Victoria. In addition to energy recovery, thermal WtE treatment allows for recovery of some materials recovered from the solid by-products (bottom ash and fly ash). These materials include metals and aggregates, which can be reused to displace virgin materials required in concrete and construction.

### What is a Circular Economy

A circular economy continually seeks to reduce the environmental impacts of production and consumption, while enabling economic growth through more productive use of natural resources.

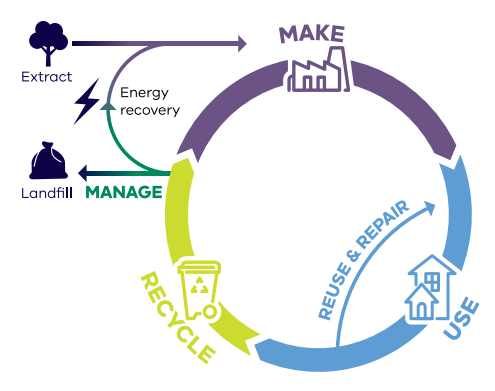
It allows us to avoid waste with good design and effective recovery of materials that can be reused.

It promotes more efficient business models that encourage intense and efficient product use, such as sharing products between multiple users, or supplying a product as a service that includes maintenance, repair and disposal.

The value people obtain from the resources used to create goods and services increases.

It transforms our linear economy mindset—take, use and throw away—and fosters innovation and productivity that invigorates existing businesses and creates new ones, delivering more jobs and more growth for local, regional, state and global economies.

Image 1: Resource flows in a circular economy



[Source: Recycling Victoria: a new economy policy]

## Waste to Energy in Victoria’s energy market

WtE will play a role in the overall Victorian energy system by providing an alternative source of baseload electricity generation. One of the key advantages of WtE currently is its ability to generate electricity with a net lower carbon intensity than fossil fuels (brown coal and natural gas). The emissions benefits from reduced use of grid electricity are influenced by the emissions intensity of the electricity grid compared to WtE, and the avoided emissions associated with the same waste that would have otherwise gone to landfill. For example, if thermal WtE reduces generation from brown coal, the benefit would be more material than reducing the generation of low emissions electricity.

The relative emissions benefits of generating electricity from WtE compared to other technologies in the grid will change over time. As the carbon intensity of the grid declines due to increased renewable energy adoption, the emissions advantage of WtE is expected to decrease, depending on the nature of the WtE technologies deployed in Victoria.

While thermal WtE is expected to make a relatively modest contribution to the overall Victorian energy system, it can still play a role in supporting Victoria's electricity grid through providing additional generation capacity. WtE provides a baseload electricity supply that can complement increasing intermittent supply from other sources (including wind and solar).

Some WtE facilities may provide advantages behind the meter (i.e. be set up on site with industry to provide energy without having to be connected to Victoria’s electricity or gas networks), allowing them to be strategically developed, particularly where gas is consumed for industrial processes. This localised development may reduce transmission losses in the energy system. WtE produced onsite at industrial facilities also promotes circularity, particularly where it is used to re-manufacture recycled materials.

Additionally, WtE facilities have the potential to produce alternative fuels (i.e., biogas and fuels) that can be utilised for transport, including applications in road freight, aviation and shipping.

### Existing waste to energy facilities in Victoria

The CE Act provided a mechanism for the Head, Recycling Victoria to issue licences to existing and new proposed thermal WtE facilities that already had received required approvals under the *Environment Protection Act* 2017 or the *Planning and Environment Act 1987* prior to 1 November 2021.

Four facilities have been issued with EO licences. No other EO licences can now be granted in accordance with s 74ZM of the CE Act. Limits on permitted waste processing volumes set on existing operator licences are not subject of the cap.

Two of the operators that have received an EO licence are Visy Group and Opal Australian Paper.

#### Visy’s Coolaroo Embedded Energy Plant

Visy operates the only thermal embedded energy from waste facility currently operating in Victoria at its 100% recycled paper mill in Coolaroo, in Melbourne’s northern suburbs.

Visy’s plant is embedded into the manufacturing operations of the site. The facility takes material destined for landfill and uses the energy to power the manufacturing operations, reducing the energy needed from the grid.

The facility generates both heat and electricity that can be used to run the rest of the Coolaroo paper recycling site and infrastructure. The steam generated by the facility is used as part of the paper recycling process to dry out wet paper. If Visy did not operate the co-generation plant, they would be more reliant on electricity from the grid and additional gas to generate the steam required to run the paper recycling mill.

The feedstock for the facility is extensively sorted to remove any recyclable materials. This means that only residual materials that cannot be recycled and would otherwise go to landfill are processed at the facility.

 Visy’s co-generation facility is a good example of a circular precinct that:

* maximises the amount of recycled materials like paper and cardboard being made back into new products;
* reduces the amount material going to landfill; and

decreases the need for electricity and gas use and supports more environmentally friendly manufacturing.

Air pollutant emissions are monitored continuously at the Coolaroo Co-Generation facility to ensure compliance with strict environmental standards set by the Victorian Environment Protection Authority (EPA). The EPA regulates air emissions under the *Environment Protection Act 2017*, requiring WtE facilities to adopt Best Available Techniques and Technologies (BATT) to minimise environmental impacts. The facility must also conduct regular pollutant emissions testing and reporting, with real-time monitoring data reviewed by the EPA to ensure ongoing compliance and transparency.

#### Opal Australian Paper

Opal has been operating the large pulp and paper mill at Maryvale in the Latrobe Valley since 1937. The Maryvale Mill is a major employer in the Latrobe Valley and primarily produces brown packaging paper from plantation timber and recycled waste paper.

Opal has partnered with Veolia Australia and New Zealand and Masdar Tribe Australia to develop a WtE facility at Opal’s Maryvale Mill. Once built, the Maryvale WtE facility will only accept residual waste meeting the “permitted waste” criteria as per the CE Act. The residual waste will include:

Municipal solid waste (MSW) from local government areas that cover most of eastern metropolitan Melbourne and regional Gippsland.

Commercial and Industrial waste (C&I) that is not technically, environmentally or economically practicable to reuse, recycle or for further resource recovery - for example, residual waste from the Maryvale Mill including waste paper recycling rejects that are unsuitable for paper making.

The proposed Maryvale WtE facility will generate both electricity and heat/steam capable of powering a large proportion of the energy/heat required for the Maryvale Mill. In this configuration (also called combined heat and power or CHP) the thermal efficiency is estimated at approximately 58%, compared with electricity-only generation facilities estimated at approximately 27%. The supply of steam would reduce natural gas used in gas-fired boilers, reducing supply pressures in the Victorian gas network. Excess electrical energy would also be fed back into the National Electricity Market (NEM), providing additional baseload energy generation that can help to support Victoria’s transition to a net-zero economy powered primarily by renewable energy with intermittent generation.

The bottom ash produced by the proposed Maryvale WtE facility will also be further processed to separate metals and aggregates that do not combust during the thermal process. These metals can then be separated into ferrous and non-ferrous fractions and recycled into new products, displacing some of the need for virgin metals and the consequent greenhouse gas emissions from their production. The remaining mineral aggregate (including masonry, brick rubble, glass) is proposed for use in construction applications such as road base – displacing the need for some virgin aggregate production.

Companies such as OCO Technology (operating in the United Kingdom) have also been able to safely stabilise flue gas treatment residues (FGTr) and use this material in construction applications. With appropriate testing and safeguards in place, this could also be done in Victoria.

If all bottom ash and FGTr is safely treated and recycled, the Maryvale EfW will be able to achieve a 99 per cent diversion of residual waste from landfill.

## Addressing community concerns regarding environmental and human health impacts of WtE facilities

Community consultations on WtE policies and projects in Victoria show that some residents and community groups hold concerns that WtE facilities could bring local human health, and environment impacts and are strongly opposed to the development of WtE facilities. Some of these individuals and groups oppose all WtE developments in Victoria, while others oppose individual facility proposals in their communities, and seek government intervention to limit the development of WtE facilities.

Impacts to human health and the environment associated with WtE facilities are the primary consideration of the Environment Protection Authority (EPA) when considering development licence and operating licence applications under the *Environment Protection Act 2017* (EP Act). The EPA engages the community to inform key decisions on permissions, including on development licences. Proposed WtE facilities will also require approval from the relevant planning authority under the *Planning and Environment Act 1987*, which also provides for consultation with impacted communities.

It is the government’s priority to protect human health and the environment. The EPA, planning authorities and RV each have a role to play in ensuring thermal WtE facilities meet best practice emissions controls, environment protection and local planning requirements, whilst contributing to achievement of Victoria’s circular economy targets and objectives.

## Victoria’s Circular Economy Policy and the role of WtE

In early 2020 the Victorian Government released Recycling Victoria: A new economy (Department of Environment, Land, Water and Planning, 2020) (Circular Economy Policy), a 10-year circular economy policy and action plan. It contains a suite of complementary initiatives to reform Victoria’s waste, recycling and resource management into a robust, innovative and progressive system. Since 2020, Victorian Government actions have delivered substantial improvements to the safety, reliability and resilience of the waste and recycling system, including investment of $380 million to deliver this policy and transform how Victoria’s economy uses materials, designs out waste and provides avenues for new investment in the sector.

The Circular Economy Policy commits to achieving 80% diversion of waste from landfill by 2030, and to reduce waste generation by 15% per capita by 2030, through prioritising activities in line with the waste hierarchy. This includes supporting communities and councils to reduce waste, such as through education and behaviour change campaigns.

The Circular Economy Policy recognises the role of WtE in complementing other outcomes under the waste hierarchy, reflecting the importance of waste minimisation and acknowledging the environmental benefits of recycling over WtE.

Through its Circular Economy Policy, Victorian Government recognises a role for WtE investment, where projects:

* meet best-practice environment protection requirements including air pollution controls
* reduce the amount of waste sent to landfill and do not displace reuse or recycling
* do not inhibit innovation in reuse or recycling of materials
* meet best-practice energy efficiency standards
* reduce greenhouse gas emissions compared to the waste and energy services they displace
* have sustainable business models that create jobs and economic development, and

work well with local communities in which they operate (Department of Environment, Land, Water and Planning, 2020; 2021).

The Circular Economy Policy included a commitment to place a cap on the amount of residual waste that can be used in thermal waste to energy facilities each year.

The circular economy hierarchy embedded in the CE Act acknowledges the importance of reducing reliance of virgin materials and, where appropriate, substituting virgin materials with recycled content to achieve better environmental outcomes.

### The Circular Economy Hierarchy

Where waste does arise from the production and use of products and materials, it should be managed in the following order of preference—

1. waste should be avoided
2. waste should be minimised
3. waste should be reused
4. waste should be recycled
5. energy and other resources should be recovered from waste
6. waste should be treated to reduce the potential impacts of degradation,
7. waste should be disposed of.

(CE Act, pp. 16-17, s. 8)

## Victoria’s Waste to Energy Scheme and legislative context

The Victorian Government’s policy priorities in relation to WtE, as outlined in the Circular Economy Policy, have been given effect through primary legislation (Part 5A of the CE Act), with supporting regulations being made in several successive stages (together referred to as the WtE Scheme). Recycling Victoria is responsible for administering the WtE Scheme as defined in the legislation and regulations. Figure 2 outlines the structure of the WtE Scheme within Victoria.

Figure 2: Legislative structure of the WtE Scheme in Victoria

|  |
| --- |
| **Circular Economy (Waste Reduction and Recycling) Act 2021 - Part 5A** |
| * Part 5A of the CE Act (introduced as part of the *Environment Legislation Amendment (Circular Economy and Other Matters) Act 2022*) provides the legislative basis for the WtE Scheme, including providing for a cap on new and expanded processing of permitted waste and exempt waste at thermal WtE facilities * Part 5A provides the legislative basis for a licensing system (existing operator licences and cap licences) to be established in the Regulations, and outlines which WtE processes are included and excluded from the WtE Scheme. |
| **Circular Economy (Waste Reduction and Recycling) (Waste to Energy Scheme) Regulations 2023** |
| * The *Circular Economy (Waste Reduction and Recycling) (Waste to Energy Scheme) Regulations 2023*, made in 2023, provide for RV licencing of thermal WtE facilities, and establish the existing operator licensing arrangements. * The Regulations were recently amended to provide for the cap licencing process, including: establishing the existing cap limit (2 Mtpa); setting mandatory considerations for the Head, RV when making decisions on Expression of Interest (EOI) and cap licencing applications; and, the administrative fees for parties participating in the EOI and cap licence process (refer to section 1.6) |
| **Recycling Victoria** |
| * RV oversees and delivers WtE licencing. Operations of thermal WtE facilitities are managed under Victoria's planning and environment protection laws. * RV administers the WtE Scheme, including RV issueing guidance to proponents and stakeholders on its operation, inviting applications for WtE licences and granting licences under the cap. |

Victoria’s Waste to Energy Scheme (WtE Scheme) established in the CE Act provides for a cap limit to be prescribed in the Regulations. The cap limit is a maximum aggregate amount of permitted waste that can be processed by thermal WtE facilities in Victoria each financial year, excluding facilities that had the necessary approvals before 1 November 2021. Under Victoria’s WtE Scheme, only those wastes that cannot reasonably be further sorted or recycled are permitted for use in thermal WtE facilities. The CE Act and Regulations define and categorise waste that may be processed in thermal WtE facilities in Victoria, as shown in Table 5 and Figure 3 below.

Table 5: Categories of waste under the WtE Scheme (CE Act - sections 74N and 74L)

| Permitted waste | Exempt waste | Banned waste |
| --- | --- | --- |
| Permitted waste is defined under section 74N of the CE Act and Regulation 8 of the Regulations.  Under 74N of the CE Act, permitted waste is:  Waste that cannot reasonably be the subject of any further recycling; or  Waste prescribed to be permitted waste under the Regulations  Regulation 8 prescribes certain wastes to be permitted wastes, including municipal solid waste (MSW) (other than municipal food organics and garden organics and municipal recycling material) that has undergone source separation, as well as industrial waste (commercial and industrial as well as construction and demolition), where the WtE facility operator can demonstrate that it is not technically, environmentally or economically practicable to further reuse or recycle. This is schematically shown in  Figure 3. | Exempt waste is defined in section 74L of the CE Act as waste prescribed to be exempt waste. Regulation 6 of the Regulations prescribes the following to be exempt waste:  Specific types of waste biomass, and  Reportable priority waste (i.e., hazardous waste). | Banned waste is defined in section 74L of the CE Act as:  Waste other than permitted waste or exempt waste, and  Eligible containers under the Victoria’s Container Deposit Scheme (CDS Vic). |

Figure 3: Schematic of permitted, banned and exempt wastes

Figure 3: Schematic of permitted, banned and exempt wastes
The figure presents a flowchart. The flowchart illustrates the waste management process which looks at the categorisation of “permitted waste”, “banned waste” and “exempt waste”. 

Permitted waste includes municipal solid waste (MSW) particularly municipal residual waste, industrial waste (commercial and industrial (C&I), construction and demolition (C&D) waste, laboratory waste) that cannot be processed at a material recovery facility (MRF) or other sorting process or fail the TEEP test at source separation. 

Banned waste includes waste that can be processed at an MRF or other sorting process, or waste that meets the TEEP test, or is from the Container Deposit Scheme (CDS), or is municipal food organics & garden organics (FOGO) or municipal recycling material (glass) or municipal recycling material (other than glass), as well as is waste biomass that is non-specified waste biomass.
 
Exempt waste includes specified waste biomass and reportable priority waste.


Victoria’s kerbside collection reforms separate residual waste (permitted waste) from recyclable materials (banned). Outside of the kerbside system, for waste to be permitted, it must be sorted and separated appropriately in line with any prescribed requirements. If no prescribed requirements apply, the operator must apply the Technically, Environmentally and Economically Practical ‘TEEP test’, that is to demonstrate that it is not feasible to reuse, recycle or extract further resources or materials from the waste. At present, no industrial waste source separation regulations have been created.

As recycling technologies and end markets improve over time, it may become viable to recycle some wastes that can’t be recycled today. The TEEP test provides an avenue to adapt to innovation and ensure we are reusing and recycling materials where possible, prior to allowing them to be processed through WtE.

It is and will remain the responsibility of the WtE facility operator to demonstrate that their commercial and industrial and/or construction and demolition waste streams satisfy the TEEP test at the point in time when that waste is processed by the facility. The TEEP test offers some level of flexibility for licence holders to demonstrate that they satisfy the TEEP over time, particularly if legislation is amended or if new technology becomes available. RV has published guidance on its website as to how the TEEP test will be applied and how it may be satisfied by operators. Further guidance material may be published by RV where required or in response to specific requests by industry.

## Amended Regulations

The 2023 RIS ‘Waste to Energy Regulatory Impact Statement for Victoria’s waste to energy cap and cap licensing’ document was published for consultation on the Engage Victoria platform between December 2023 and February 2024.

The 2023 RIS assessed various options for design of the cap licencing arrangements as drafted in the accompanying regulations for consultation, including prescribing a cap limit, the matters the Head, RV must consider when making decisions about EOIs and cap licence applications, and the associated fees payable to RV for EOIs and cap licence applications.

The 2023 RIS assessed cap limit options of: 0.5 Mtpa, 1 Mtpa and 2 Mtpa, compared to a base case where no new thermal WtE facilities are built.

On 10 December 2024, the Victorian Government released the Economic Growth Statement – Victoria: Open for Business which commits to:

* setting the Waste to Energy cap at 2 Mtpa initially to enable more municipal, commercial and industrial waste to be used to generate energy rather than go to landfill

preparing an additional Regulatory Impact Statement, for consultation in early 2025, on increasing the cap limit to 2.5 Mtpa. (Source: Department of Treasury and Finance. (2024). Economic Growth Statement – Victoria: Open for Business. Retrieved from <https://www.vic.gov.au/sites/default/files/2024-12/Economic-Growth-Statement.pdf>)

The Amended Regulations have now been made to set the cap limit at 2 Mtpa and establish the cap licencing process.

## Related reforms underway in Victoria

### Victorian Recycling Infrastructure Plan (VRIP)

The CE Act establishes RV as the regulator for the WtE Scheme. One of RV’s core functions is to undertake statewide infrastructure planning for the waste and recycling sector through the development and delivery of the Victorian Recycling Infrastructure Plan (VRIP). The purpose of the VRIP is to guide planning and investment in waste, recycling, and resource recovery infrastructure over a 30-year period to support Victoria’s transition to a circular economy. The inaugural VRIP was published by RV in October 2024 and outlines infrastructure needs and gaps, driving innovation and potential investment where it is needed most.

The VRIP examines landfill capacity projections for the state and contains a schedule of existing landfills. On current trends, Victoria will start to run out of approved landfill capacity in the mid-2030s. (Source:) Recycling Victoria. (2024). About waste to energy. Retrieved from <https://www.vic.gov.au/about-waste-energy>). Alongside WtE, achieving Victoria’s existing policy objectives around waste reduction and diversion, and infrastructure opportunities such as advanced recycling processes, would keep cumulative residual waste volumes below the State’s landfill capacity over the next 30 years to 2054.

The VRIP considers that the state’s existing landfill capacity over the next 30 years needs to accommodate wastes that are banned from WtE treatment or wastes that are not appropriate for WtE facilities, such as soil.

The VRIP also notes that landfill capacity could be consumed by unforeseen events such as floods and bushfires.

### Reforms to municipal waste collection and sorting

The Victorian Government is also reforming the way households recycle. Under the CE Act, Councils and Alpine Resorts Victoria have obligations to adopt a standardised four-stream household waste and recycling system. Services will need to be provided for the following waste streams:

* general rubbish (residual waste)
* mixed recycling
* glass recycling, and

combined food organics and garden organics (FOGO).

These reforms have been designed to improve separation of materials at source, resulting in less contaminated and higher value resource streams.

Under Victoria’s WtE Scheme, household residual waste that is source separated and placed in the general rubbish or red lid bin is permitted waste that may be directly processed in thermal WtE facilities with an appropriate WtE licence. Mixed recycling, glass recycling and FOGO are all banned wastes that cannot be processed in thermal WtE facilities under the Circular Economy (Waste Reduction and Recycling) (Waste to Energy Scheme) Regulations 2023 (the Regulations) (pp. 6, reg. 8(2)).

### Container Deposit Scheme

Victoria’s Container Deposit Scheme, (CDS Vic) began on 1 November 2023, fulfilling a key commitment under the Circular Economy Policy.

A container deposit scheme is a form of product stewardship used across Australia and internationally. It places the costs of recovering and recycling beverage containers on the producers and purchasers. Like all Australian schemes, beverage first suppliers are funding Victoria’s scheme, and consumers receive a financial incentive to encourage them to return used beverage containers for recycling. The scheme rewards Victorians with a 10-cent refund for every eligible can, carton and bottle they return.

Containers collected through the CDS Victorian refund network are banned from use in thermal WtE facilities in Victoria.

## About this Regulatory Impact Statement

The preparation and making of regulations and legislative instruments are subject to requirements specified in the *Subordinate Legislation Act 1994*, which include the preparation of a RIS.

A RIS presents analysis based on evidence that enables the government to consider all relevant information before making a policy or regulatory change. This RIS has been prepared in accordance with the Victorian Guide to Regulation, which provides a best practice approach to analysing any proposed regulatory intervention. (Source: Victoria State Government. (2024). Victorian guide to regulation. Retrieved from <https://www.vic.gov.au/victorian-guide-regulation>).

This RIS outlines the range of regulatory options considered and assesses the impacts of each. Analysis is provided in quantitative terms where practicable, to ensure the costs of each option are not disproportionate to the benefits. A multi-criteria analysis is then used to assess quantitative and qualitative considerations against the RIS objectives. The quantitative and qualitative analysis are together used to describe why the Victorian Government’s proposed Regulations are the preferred option.

This RIS aims to assess WtE cap limits not examined in the 2023 RIS and support consultation with the Victorian community on a preferred option for the cap limit in the future. Following the consultation process, if it is determined that a further increase to the cap limit is warranted, amendment Regulations will be made to set the WtE cap at that new (higher) level.

The outcomes of this consultation process will inform the Implementation Plan detailed in Chapter 7. Should an increase to the cap limit be made following the consultation, this will occur in advance of the current cap licencing process being finalised, to enable the Head, RV to issue WtE licences up to that higher limit at the conclusion of the current process. Refer to [Waste to Energy Scheme | vic.gov.au](https://www.vic.gov.au/waste-energy-scheme) for information on the cap licencing process currently being administered by RV.

# Problem analysis

## What is this RIS investigating?

As noted in Chapter 1, the CE Act provides for a cap limit to be prescribed in the Regulations, that is, a cap on the maximum aggregate amount of permitted waste that can be processed by thermal WtE facilities in Victoria each financial year. Thermal WtE facilities that had the necessary statutory approvals in place before 1 November 2021 are deemed to be existing operators and are not included in the cap.

As noted in the previous RIS, the cap is designed to prevent over reliance on WtE as a solution to waste management and to ensure that there remain market incentives to promote further growth and investment in material recovery and recycling activities. Although there are now controls in the CE Act and Regulations (outlined in section 1.5) to ensure that only permitted waste is used for WtE facilities, the cap still has a role in incentivising higher-order recovery and recycling of materials, particularly as technologies improve to sort and separate recycling material, and more advanced recycling infrastructure comes online. Section 2.3 outlines why a cap limit is necessary in regulating WtE within Victoria.

This RIS delivers on the Government’s commitment to investigating increasing the WtE cap to 2.5 Mtpa. The Government’s intent for increasing the WtE cap is outlined in section 2.2.

## Why is the Government considering a further increase to the cap limit?

### Decreasing landfill capacity over time

As noted in the previous chapter, the Victorian Government is committed to a circular economy and has set ambitious targets to divert 80% of waste from landfill by 2030. (Source: Recycling Victoria. (2024). About waste to energy. Retrieved from <https://www.vic.gov.au/about-waste-energy>). WtE provides an alternative to landfills for most types of residual waste, reducing the state’s reliance on landfills for non-recyclable or non-recoverable waste, and supporting the government’s landfill diversion target.

Based on trends in waste generation and population growth, Victoria’s residual waste (waste that cannot practically be recovered or recycled) is projected to increase to nearly 9 million tonnes per year by 2053. At this rate, Victoria will start to run out of approved landfill capacity in the mid-2030’s. (Source: Recycling Victoria. (2024). About waste to energy. Retrieved from <https://www.vic.gov.au/about-waste-energy>). Without additional interventions, large volumes of residual waste will continue to be landfilled, reducing available landfill airspace and accelerating the need for new landfill developments.

Updated data from RV indicates that, in 2022−23, Victorians generated an estimated 14.6 million tonnes of waste. While 69% of this waste was recovered or recycled, an estimated 4.5 million tonnes of residual waste was sent to landfill.

An important issue in considering the volume of material that could be diverted by thermal WtE is the timing of when the facilities will become operational. The finite nature of current landfill capacity within Victoria means the impact of residual waste volumes going to landfill is cumulative, not based on annual throughput. The introduction of thermal WtE facilities that have existing operator (EO) licences (total capacity of 1.055 million tonnes) could result in around 25 million fewer cumulative tonnes of waste going to Victorian landfills by 2050 (equivalent to around 31 million m3 of airspace), assuming all EO facilities are constructed over the next decade. (Source: Recycling Victoria. (2024). Victorian Recycling Infrastructure Plan. Retrieved from <https://www.vic.gov.au/victorian-recycling-infrastructure-plan>).

Additional volumes of waste diverted from landfill by the introduction of thermal WtE facilities licensed under the existing cap arrangements will largely depend on the timing of facilities coming online and whether the full cap is taken up. DEECA estimates that each 1 Mtpa of permitted waste under the cap will divert around 15-20 million cumulative tonnes of waste from Victorian landfills by 2050 (equivalent to around 19-25 million m3 of airspace). (Source: Recycling Victoria. (2024). Victorian Recycling Infrastructure Plan. Retrieved from <https://www.vic.gov.au/victorian-recycling-infrastructure-plan>). The estimate does not however include an allowance for the residues left from the thermal WtE process.

A further increase to the WtE cap may allow more non-recyclable waste to be converted into energy, in turn reducing landfill reliance, extending the life of existing landfill sites, and supporting a more sustainable waste management strategy. Without investment in WtE infrastructure, Victoria will continue to be dependent on landfilling to manage residual wastes.

### Increasing the value of waste by recovering valuable by-products

WtE allows for the capture of valuable metals and aggregates from ash by-products that would otherwise have gone to landfill – replacing virgin materials in manufacturing and construction such as metals and quarried stone. If the cap limit is set too low, an opportunity is lost to recover some of these by-products, which would otherwise go to landfill. Recovery of metals and aggregates from ash by-products ensures that more materials are recycled rather than being sent to landfill.

Ash by-products created by waste to energy facilities include incinerator bottom ash aggregate (IBAA). Non-combustible materials from WtE operations will be leftover as IBAA, which can then be further processed to recover ferrous and non-ferrous metals. Once this process is complete, the resulting IBAA has the following uses:

* secondary aggregate within concrete
* granular material for bases and subbases in pavement or roads

fine aggregate replacement for bound applications, such as in bricks.

Without an increase to the cap limit, these valuable materials will continue to be lost to landfill instead of being re-purposed in manufacturing and construction. Without further increases to the cap limit, Victoria risks missing key opportunities to maximise the potential of material recovery, undermining the state’s transition to a circular economy.

### Addressing emission impacts from the waste sector

Victoria has legislated targets to cut the state’s greenhouse gas (GHG) emissions and achieve net zero emissions by 2045. Achieving net-zero emissions will require action by all governments, businesses and communities across all sectors of our economy including the waste sector. (Source: Victoria State Government. (2021). Victoria’s climate change strategy. Retrieved from [https://www.climatechange.vic.gov.au/\_\_data/assets/pdf\_file/  
0026/521297/Victorian-Climate-Change-Strategy.pdf](https://www.climatechange.vic.gov.au/__data/assets/pdf_file/0026/521297/Victorian-Climate-Change-Strategy.pdf)).

The circular economy reduces emissions by making better use of resources, materials and products already in circulation and reducing waste generation. For waste that is generated, different methods of waste treatment have different impacts on greenhouse gas emissions. Landfills release methane, a potent greenhouse gas, and this release occurs over many decades following the deposition of waste into a landfill. Waste to energy plants release carbon dioxide, a less potent GHG, immediately as the waste is combusted and produce very little methane. When waste is sent to a waste to energy plant instead of a landfill there are emissions immediately as the waste is combusted, and methane emissions are avoided over the following decades. On a lifetime assessment basis, where all the avoided methane emissions are accounted for, waste to energy has a lower net emissions profile than landfill. With the current cap in place, there is still a large amount of residual waste that will continue to be sent to landfills, incurring higher greenhouse gas emissions.

### Diversifying energy production

WtE facilities convert waste into energy for export to the electricity grid, providing an alternative energy source, and displaces higher emissions energy generation in the National Energy Market (NEM). In addition to electricity export, WtE can also replace fossil fuels (such as natural gas) burned to generate heat for industrial processes, for example, where an industrial process (such as paper manufacturing) is co-located with a WtE facility and can capture and use excess steam and heat that is generated by the WtE facility.

Under the current cap limit of 2 Mtpa, there may be foregone opportunity for additional generation from WtE facilities to further displace higher emissions energy sources. By increasing the cap limit, Victoria may be able to enhance its energy production from WtE, contributing to increased energy security and reducing dependence on energy produced from other higher emitting energy sources.

### Other economic benefits of WtE

WtE not only improves waste management outcomes but also delivers significant economic benefits, including job creation and investment. Were the government not to increase the WtE cap limit, there would be several missed economic opportunities, including:

* Further investment in Victoria through construction, operation and maintenance of new WtE facilities

Expansion of nascent WtE industry and development of skilled workforce across Victoria. Support creation of ancillary jobs across transport, engineering, manufacturing, construction and environmental services.

Although these benefits are not valued in this RIS, the additional investment and jobs created by WtE facilities can make an important contribution to Victoria’s economy.

## Establishing an appropriate cap limit

While increasing the WtE cap limit allows for greater diversion of residual waste from landfill and supports Victoria’s circular economy transition, it also introduces risks related to feedstock availability.

Over-investment in WtE infrastructure could lead to an excess of WtE capacity relative to available feedstock. Depending on the quantum and duration of feedstock shortfall, impacted WtE facilities could be forced to respond by limiting, pausing or ceasing their operations. If only small, intermittent feedstock shortfalls are experienced, impacted facilities may temporarily reduce their operating capacity in response. In the worst case, if impacted facilities cannot secure adequate feedstock over the long term to remain viable, they may have to enter a state of dormancy or cease operating entirely, leading to stranded assets.

To sustain operations, WtE facilities could also seek to import waste from interstate, which could increase transport emissions. Importation of waste can be perceived to be undermining local waste reduction efforts and circular economy objectives.

A carefully calibrated WtE cap is therefore essential in ensuring facilities are appropriately scaled to the long-term availability of residual waste. A cap on WtE balances investment in energy recovery with waste reduction and recycling efforts, ensuring WtE remains a complementary solution to waste management in Victoria.

## Updated modelling of waste and greenhouse emissions outcomes of cap limits

Since the previous RIS was published in December 2023, updated data on waste generation, resource recovery trends and population projections have become available, enabling more sophisticated analysis of forecast feedstock availability between now and 2050 (the modelling period used for this RIS). Updated data is also available on emissions impacts of waste to energy relative to landfill that informs the analysis presented in this RIS. This updated data and information has warranted further analysis of increasing the cap limit beyond the current cap of 2 Mtpa.

Updated feedstock and GHG emissions modelling, including the cost-benefit analysis of various options to increase the cap limit is outlined in Chapter 5 of this RIS.

The Appendix contains detailed technical information and modelling data used to inform this RIS, and to explain the key differences in methodology between this RIS and the previous RIS.

# Objectives

## How waste to energy fits in with Victoria’s circular economy objectives

After waste avoidance, reuse, and recycling, waste to energy provides an opportunity to derive value in the form of energy and materials like metals and aggregates from waste that would otherwise go to landfill. WtE provides an alternative to landfills for most types of residual waste, reducing the state’s reliance on landfills for non-recyclable or non-recoverable wastes and supports the governments circular economy landfill diversion targets.

The stated objective of Victoria’s WtE Framework (2021) is to encourage investment that supports diversion of residual waste from landfill, while avoiding risks to recycling outcomes in the future. (Source: Department of Environment, Land Water and Planning. (2021). Victorian waste to energy framework. Retrieved from [https://content.vic.gov.au/sites/ default/files/2022- 02/Victorian%20waste%2 0to%20energy%20framework\_0.pdf](https://content.vic.gov.au/sites/%20default/files/2022-%2002/Victorian%20waste%252%200to%20energy%20framework_0.pdf)). The principles for implementing the Framework are to:

* encourage investment in facilities that help achieve the goals and targets of Victoria’s Circular Economy Policy,
* support a diverse and competitive waste to energy market, and

have a consistent, transparent and fair mechanism.

## RIS and regulatory objectives

Under the Subordinate Legislation Act and associated Guidelines, a RIS is required to adequately assess the likely impacts of any proposed amendments to the Regulations.

The previous RIS, which assessed establishing the cap limit amongst other aspects of the proposed cap licencing framework, included the following objectives:

* increase the value of waste managed in Victoria,
* reduce the amount of virgin materials use in the economy,
* reduce the amount of waste going to landfill,
* minimise greenhouse gas emissions from waste processing and energy generation,
* minimise disamenity resulting from waste processing,
* maximise the amount of waste diverted from landfill to waste to energy and

ensure that waste to energy operations do not displace reuse or recycling.

As noted in previous chapters, this RIS assesses the impacts, costs and benefits of a further increase to the cap limit, noting that the other elements of the cap licencing framework are now established in Regulations. Some of the objectives used for the previous RIS are not relevant for assessing an increase to the cap limit. For example, “ensure that waste to energy operations do not displace waste and recycling” is addressed through the controls in the CE Act and Regulations (outlined in section 1.5) to ensure that only permitted waste is used for WtE facilities.

Drawing from the previous RIS objectives, the objective of this RIS is to establish the most appropriate cap limit to meet Victoria’s circular economy objectives (in priority order). The objectives have been refined from the previous RIS objectives in better analysing the overall impact of increasing the cap limit:

1. maximise the amount of residual waste diverted from landfill, while limiting risks of WtE capacity exceeding available feedstock,
2. increase the value of waste managed in Victoria,
3. minimise greenhouse gas emissions from waste processing and energy generation, and
4. facilitate appropriate investment in the WtE industry to boost economic growth across Victoria.

# Options

As outlined in Victoria’s circular economy plan, *Recycling Victoria: A new economy,* thermal WtE technologies can support the State in achieving its circular economy and waste management goals to reduce its dependence on landfills, provided the right number and scale of facilities are developed. However, if not carefully managed, there is a risk of over-investment in thermal WtE infrastructure more than Victoria’s future residual waste management needs. To mitigate these risks, a cap on the amount of waste permitted for thermal WtE processes is essential.

This chapter presents three cap limit options for permitted waste to be processed in thermal WtE facilities, to assess their impacts on achieving the objectives set out in Chapter 3:

**Option 1 (Base Case): Cap of 2 million tonnes**

This option reflects the existing Regulations which prescribes a cap limit of 2 Mtpa of permitted waste to be processed in thermal WtE facilities.

**Option 2: Cap of 2.5 million tonnes:**

Under this option, 2.5 Mtpa of permitted waste would be prescribed in the proposed regulation. This would be an additional 0.5 Mtpa above what is permitted under the existing Regulations.

**Option 3: Cap of 3 million tonnes**

Under this option, 3 million tonnes of permitted waste would be prescribed in the proposed regulations. This would be an additional 1 Mtpa above what is permitted under the existing Regulations.

As noted in the previous chapter, while the 2023 RIS included an analysis up to a 2 Mtpa cap limit, the proceeding analysis in this RIS supersedes the previous RIS analysis as it:

* uses the most up to date waste generation and recovery data
* includes a more detailed analysis of forecasted feedstock availability, and

uses updated estimates of GHG emissions using government modelling.

Under all the presented options, permitted waste approved under existing operator (EO) licences does not count towards the cap limit. However, if an EO wants to increase the amount of permitted waste they are authorised to process, they are required to obtain a cap licence for that additional amount. The additional authorised amount of permitted waste would contribute towards the cap limit.

The analysis presented in the RIS assumes that cap licences are issued in future by the Head, RV up to the cap limit, and that all licenced facilities proceed to construction and full utilisation of the allocated volumes of permitted waste. The Head, RV has discretion under the CE Act and the Regulations to allocate smaller volumes in cap licences than are available under the overall cap limit. Under the Regulations, the Head, RV will need to consider commercial viability of proposed facilities in allocating cap licences, including an assessment of proposed feedstock sources to ensure feedstock availability to support the business case of individual facilities. Further, section 19 of the Regulations allows the Head, RV to decrease the allocated cap amount for an individual facility if the facility consistently processes significantly less permitted waste than its allocation.

This RIS models the permitted feedstock available for use in WtE facilities through to 2050, presenting the analysis of all three options (including the base case of 2 Mtpa). The assessment of net emissions, economic (cost-benefit) outcomes, and multi-criteria analysis of increasing the cap to 2.5 Mtpa and 3 Mtpa, is analysed against the base case of the current regulated cap limit of 2 Mtpa.

# Impact analysis

Each of the three cap limit options identified in Chapter 4 have been assessed across six key factors for this RIS:

* feedstock availability
* material recovery
* avoided use of landfill
* electricity generation
* net emissions outcomes, and

economic (cost-benefit) outcomes.

These six factors have been selected as each captures a significant impact of WtE to the state’s waste management, recycling and energy systems. The previous RIS did not include the value of materials recovered from WtE, however, this represents an important value stream from WtE operations which should be captured. Since the previous RIS was published, RV has also published the VRIP, which includes projections of landfill capacity. The landfill projections from the VRIP have been evaluated in this RIS, in place of avoided land and water use evaluation that was completed for the previous RIS.

Given the long-term nature of WtE investment, this RIS uses a time horizon from 2025–2026 out to 2049–50 for the impact analysis presented in this Chapter, with lifetime emissions projected out to 2150.

## Feedstock availability under each option

The operation of WtE facilities is contingent on the availability of waste which is truly residual (not able to be further recovered or recycled) and is permitted for use in thermal waste to energy facilities, per the requirements in the CE Act – referred to in this analysis as permitted waste feedstock. Waste streams which are permitted for use in thermal waste to energy facilities are explained in detail in section 1.5.

As only a subset of overall residual waste is permitted for use in thermal waste to energy facilities, the impact analysis in this Chapter only considers permitted waste feedstock availability, rather than overall residual waste availability - in 2023–24 it is estimated that approximately 3.6 million tonnes of waste deposited in landfill could have been diverted to WtE facilities as permitted waste. Further, the analysis assumes that all of the cap limit is allocated by RV, which it may not be. The decisions of the Head, Recycling Victoria are independent statutory decisions.

A decision on the WtE cap limit should be made with reference to the permitted waste feedstock forecast to be available in each year of the forecast period (to 2050), to ensure that facilities developed in Victoria have sufficient access to feedstock going forward. This section of the RIS examines the projected availability of permitted waste feedstock to 2050 with respect to a WtE cap limit of 2 Mtpa, 2.5 Mtpa and 3 Mtpa.

Further detail on the feedstock model, including its inputs and assumptions is provided in the **Appendix** of this RIS.

### Feedstock availability model

The feedstock availability model utilised in this RIS has used the legislative definition of permitted waste to make estimates of feedstock being generated from MSW, C&I, and C&D sources. The model uses, as an input, the Waste Projection Model data from RV, which presents a business-as-usual scenario for waste generation and resource recovery that accounts for population growth over the period to 2050. For simplicity, the model assumes that per capita waste generation remains constant over time, increasing steadily as a result of population growth. Further detail on the application of the Waste Projection Model is provided in the [**Appendix**](#_Appendix_–_Model).

In circular economy and waste management practices, “recovery rate” refers to the proportion of the total waste stream that is diverted from landfill and instead recovered for recycling or other resource recovery processes (such as composting or reuse). (Source: Department of Environment, Land, Water and Planning. (2020). Recycling Victoria: A new economy. Melbourne, Victoria: Victorian Government. Retrieved from [https://www.vic.gov.au/sites/default/files/2020-03/02032020%20Circular%20Economy  
%20Policy%20-%20Final%20policy%20-%20Word%20Accessible%20version%20.pdf](https://www.vic.gov.au/sites/default/files/2020-03/02032020%20Circular%20Economy%20Policy%20-%20Final%20policy%20-%20Word%20Accessible%20version%20.pdf)). It is essentially a measure of how effectively materials are being extracted from the waste stream and sent to recycling or recovery rather than disposal. Higher recovery rates will therefore reduce the amount of eligible WtE feedstock.

Where applicable, the base recovery rates for particular waste streams from the Waste Projection Model have been refined to reflect projected improvements in recovery due to the roll out of related Government interventions, as well as anticipated industry-led initiatives. A list of interventions and industry-led initiatives factored into the assessment of resource recovery rates is provided below:

* **Rollout of kerbside FOGO service and improved organics processing:** As kerbside or drop-off FOGO services roll out in councils and Alpine Resorts, there will be greater separation of organics from residual waste, leading to increased volumes of feedstock for organics processors and decreased residual waste volumes. As of January 2025, 57 Victorian councils are delivering a kerbside FOGO recycling service to their residents, with Regulations soon to be made to require remaining councils and Alpine Resorts to provide a FOGO service by June 2027. (Source: Department of Energy, Environment and Climate Action. (2024). Setting the standard for better recycling at home. Retrieved from <https://engage.vic.gov.au/setting-the-standard-for-better-recycling-at-home>). Investment in FOGO processing facilities to support greater organics processing may also support greater recovery of FOGO from industrial and commercial sources, such as biosolids from waste water treatment.
* **Rollout of the container deposit scheme (CDS Vic):** CDS Vic effectively incentivises the public and industry to sort containers into homogenous clean streams (plastic, glass and aluminium), thereby preventing contamination and improving recovery outcomes. CDS Vic has decreased the volume of eligible containers in residual waste streams, thereby decreasing the volume of residual waste from these sources. (Source: Recycling Victoria. (2024). Container Deposit Scheme. Retrieved from <https://www.vic.gov.au/container-deposit-scheme>).
* **Improvements in source separation for C&I and C&D waste:** Successive increases to Victoria’s landfill levy are incentivising Victorian businesses to reduce waste generation, increase source separation, and in some cases procure dedicated recycling collections services (e.g. paper, organics, soft plastics). The Circular Economy Policy commits to reducing business waste and allows for further government policy and regulatory interventions to be introduced in line with this commitment. The CE Act provides for future regulations to make mandatory the sorting of C&I and C&D waste. These measures are expected to decrease the overall volume of residual wastes from C&I and C&D sources over time.
* **Processing infrastructure investment:** Through industry and government investment, Victoria’s recycling processing infrastructure is increasing in both capability and capacity. This is leading to more material being recycled and decreasing residual waste volumes. For example, Visy’s Coolaroo paper drum pulper improves Victoria’s paper and cardboard recovery and can process greater volumes of kerbside MSW paper and cardboard, which is typically more challenging due to higher levels of contamination. (Source: Visy. (2024). Projects and investments: Australia’s first drum pulper. Retrieved from <https://www.visy.com/about/projects-and-investments/australias-first-drum-pulper>).
* **Advancements in recycling technologies:** There are emerging technologies and markets for timber and other high carbon organic materials. These new technologies will be able to process organic waste into new products such as biochar and biofuels, resulting in less of organic material in residual waste. For example, several companies are developing pyrolysis plants to process timber into liquid fuels which are assumed in the model to be operational from 2030. Similarly, there is investment from Water Authorities and private sector into processing high carbon organic material into biochar which can be used as a soil amendment product. (Sources: Department of Energy, Environment and Climate Action. (2024). Turning timber waste into energy and bio products. Retrieved from <https://www.deeca.vic.gov.au/media-centre/media-releases/turning-timber-waste-into-energy-and-bio-products>; Barwon Water. (No date). Renewable organics network. Retrieved from [https://www.barwonwater.vic.gov.au/  
  about-us/major-projects/renewable-organics-networks](https://www.barwonwater.vic.gov.au/about-us/major-projects/renewable-organics-networks)).
* **Soft plastics recycling:** Soft plastics recovery is expected to improve over time with increasing investment in Victorian recycling infrastructure, new technologies and new markets coming online. Several notable advanced recycling projects expected to be come online in Victoria in coming years are APR (polymers into oil via pyrolysis), Cleanaway and Viva Energy MOU (pyrolysis) and Licella (hydrothermal liquefaction). (Sources: APR Plastics. (No date). Plastics to oil. Retrieved from <https://aprplastics.com.au/plastics-to-oil/>; Viva Energy Australia. (2024). Viva Energy and Cleanaway team up to address hard-to-recycle plastic waste. Retrieved from <https://www.vivaenergy.com.au/media/news/2024/viva-energy-and-cleanaway-team-up-to-address-hard-to-recycle-plastic-waste>; Licella. (No date). Advanced Recycling Australia. Retrieved from <https://www.licella.com/advanced-recycling-australia/>). Several councils are also trialling soft plastic collection through kerbside collections with positive results suggesting potential for further rollout. All these measures will result in reduced volumes of residual waste.
* **Introductions of product stewardship schemes:** Increasing numbers of product stewardship schemes are allowing more recyclable materials to be collected and thereby reducing the volume of residual waste. Product stewardship schemes support the environmentally sound management of products and materials over their life. The Victorian Government is working with other Australian jurisdictions and the Commonwealth Government to progress the development of new or improved product stewardship schemes for problematic waste streams such as textiles and tyres. (Source: Australian Government Department of Climate Change, Energy, the Environment and Water. (2024). Minister’s product stewardship priority list. Retrieved from <https://www.dcceew.gov.au/environment/protection/waste/product-stewardship/ministers-priority-list>).

Waste material types and recovery rates applied are provided in the **Appendix**.

### Projected feedstock availability and WtE capacity to 2050

Since the previous RIS, additional data on waste generation, resource recovery trends and population projections have become available, enabling a more sophisticated analysis of forecast feedstock availability.

The model compares the available feedstock with reference to when new facilities are anticipated to come online. According to RV projections, under the 2 Mtpa cap scenario, all WtE capacity up to the 2 Mtpa cap will come online by 2037–38. The model then assumes that an additional 250,000 tonnes of capacity (approximating one medium-sized facility) is then added each year until the cap is reached, meaning that the 2.5 Mtpa cap limit is reached in 2039–40 and the 3 Mtpa cap limit is reached in 2041–42.

In developing this projection, DEECA has accounted for the complexities of WtE construction projects, existing constraints in Victoria’s civil construction sector, the regulatory and permitting requirements for WtE and ash re-use, challenges in securing feedstock, addressing community concerns, and the possibility that some RV-approved projects may not proceed—necessitating the reallocation of capacity in line with the CE Act.

While it may be desirable for certain WtE investors to delay development of facilities until they have guaranteed adequate feedstock (and therefore slow the rate at which overall WtE capacity comes online), cap licence holders will need to lock in feedstock promptly in order to commission their facilities in accordance with the date(s) specified in mandatory licence conditions. The design of the Waste to Energy Scheme also incentivises prospective investors to apply for a cap licence as early as possible so as to secure an allocation, prior to finalising feedstock contracts. Further, waste suppliers will be reluctant to contract to supply waste feedstock until an investor has made substantial progress towards obtaining the required regulatory permissions, including a cap licence.

The projection of when facilities come online is drawn from modelling completed for the VRIP in late 2024, combined with the latest market intelligence of proposed facilities in the pipeline. Capacity coming online from 2026–27 up until 2037–38 is based on the timing of some known facilities with some simplifying assumptions for additional capacity beyond those dates, rounded and smoothed to the nearest 1,000 tonnes.

The 2023 RIS assumed that the 2 Mtpa capacity would be fully online a decade earlier by 2027-28. However, this is now considered to be unrealistic given that the likelihood that facilities will take between 4-10 years from initial planning through to becoming fully operational. Only a handful of the facilities are expected to seek a cap licence through the current RV cap licensing process.

It is noted that RV must impose conditions on waste to energy licences under s 74V(b) of the CE Act on facility commissioning dates. It is possible, and desirable for reducing reliance on landfill, that facilities and processing capacity will come online more quickly than is assumed in Figure 4. However, it is appropriate to assume a more conservative projection for this RIS, given that many facilities in the pipeline are in early planning phase.

Figure 4 shows projections of permitted waste feedstock availability to 2050, comparing this to the RV projection of when additional capacity is likely to come online under each cap limit option, allowing for the volume of 1.055 Mtpa already approved through existing operator licences (refer to coloured dashed lines at bottom).

Figure 4: Projections of feedstock and WtE capacity to 2050

Figure 4: Projections of feedstock and WtE capacity to 2050
The figure shows a graph with a y-axis of “tonnes per annum” and an x-axis showing time marked by financial years.  
A solid blue line representing the central projection of permitted waste feedstock availability begins in 2025-26 at 3.58 Mt before dipping to a low of 3.36 Mt in 2031-32. The line then rises gradually to 4.17 Mt in 2049-50. Upper/lower confidence bands around this central projection are shown as a shaded blue area encased by dashed blue lines. The lines represent +/- 6% of the central projection in 2025-26, fanning out to +/- 20% in 2049-50.
3 dashed orange and brown lines representing the anticipated schedule of when facilities and additional WtE capacity are likely to come online under each cap option is shown. They all rise from 0 tpa in 2025-26 to 1.4 Mtpa in 2032-33, then they all rise at a slightly more rapid pace until the cap limit is reached for each option. Note that the capacity includes both existing operator licenses and new cap licenses. The orange 2 Mtpa cap limit line reaches its maximum of 3.06 Mtpa in 2037-38, the light brown 2.5 Mtpa cap limit line reaches its maximum of 3.56 Mtpa in 2039-40, and the dark brown 3 Mtpa cap limit line reaches its maximum of 4.06 Mtpa in 2041-42.


The permitted feedstock availability to 2050 is represented by the blue shaded area of Figure 4, with the middle (solid blue) line representing the central projection, and the dotted blue lines the upper and lower confidence limits. By 2050, around 4.2 Mtpa is estimated to be available as permitted waste feedstock under the central projection.

The midline between the higher and lower confidence bands (central projection) provides an estimated trend line that has been used in modelling avoided use of landfill (refer to section 5.3). Where feedstock availability exceeds operating WtE capacity, it is assumed that the excess feedstock will go to landfill.

Under the central projection (solid blue line), there is sufficient feedstock available in all years for a cap limit of 2 Mtpa and 2.5 Mtpa. For the 3 Mtpa scenario, there is a shortfall of feedstock availability relative to WtE capacity for 7 years (2040–41 to 2046–47) which then resolves after this point as available permitted waste feedstock exceeds WtE capacity. This shortfall is shown in Figure 4 as a “triangle” where the red dashed line exceeds the central projection line. The shortfall over this period averages to be 158,121 tonnes per year, or 4% of induced capacity over that period.

### Sensitivity analysis

Sensitivity analysis has also been undertaken to understand the implications of a less conservative schedule of WtE facilities coming online. A faster rollout has been modelled, whereby an additional 50% of capacity above the projected schedule is added each year until the cap limit is reached for each scenario. The sensitivity analysis shows that if capacity was to come online faster in this way, feedstock shortfalls would be experienced in both cap scenarios, with a significantly longer and larger shortfall under the 3 Mtpa scenario. The shortfall period would begin in 2036-37 and extend for 2 years under the 2.5 Mtpa cap scenario. The shortfall averages to be 56,776 tonnes per year over this period. The 3 Mtpa cap scenario would see the shortfall start in 2035-36, going on for 12 years, with an average shortfall of 276,762 tonnes per year over this period. Further detail is provided in the [**Appendix**](#_Appendix_–_Model).

As outcomes of projections of permitted waste feedstock availability (Figure 4) are highly sensitive to input assumptions (for example, resource recovery improvement rates over time), confidence bands have been applied to the results (+-5% in year 1, rising to +-20% by year 30).

The higher confidence band reflects higher than projected feedstock availability due to higher population growth, higher per capita waste generation and/or lower per capita resource recovery. The lower confidence band reflects lower than projected feedstock availability, lower per capita waste generation and/or higher per capita resource recovery.

However, if future waste feedstock availability is less than forecast in the central projection (i.e. follows the lower confidence band projection), there are feedstock availability shortfalls for both the 2.5 Mtpa and 3 Mtpa scenarios:

* **2.5 Mtpa scenario:** feedstock shortfall occurs in all years from 2038–39 until 2050, with an average of 227,708 tonnes per year or 6% of induced capacity over that period.
* **3 Mtpa scenario:** feedstock shortfall occurs in all years from 2038–39 until 2050, with an average shortfall of 644,375 tonnes per year or 16% of induced capacity over that period.

Should future waste feedstock availability be more than forecast in the central projection (i.e. the higher confidence band projection), sufficient feedstock is available in all scenarios in each year.

### Implications of feedstock shortfalls

It is uncertain how the risk of over-investment and feedstock shortages will play out, given the complex interplay of various factors. Some factors may reduce the chance of feedstock shortages, while others can make them worse. On one hand, WtE operators and investors are sophisticated and will want to delay building new facilities until they are sure there is adequate feedstock available. On the other hand, WtE operators are in competition for feedstock and do not have perfect information about the total available feedstock in the system. Their supply depends on contracts with waste companies, and the details of these contracts may not be publicly available (and may also change over time as waste contracts expire and are re-opened to the market).

As noted in section 2.3, where feedstock shortfall occurs, there is the potential for undesirable outcomes. Depending on the quantum and duration of feedstock shortfall, impacted WtE facilities could be forced to respond by limiting, pausing or ceasing their operations. If only small, intermittent feedstock shortfalls are experienced, impacted facilities may temporarily reduce their operating capacity in response. In the worst case, if impacted facilities cannot secure adequate feedstock over the long term to remain viable, they may have to enter a state of dormancy or cease operating entirely, leading to stranded assets.

To sustain operations, WtE facilities could also seek to import waste from interstate, which could increase transport emissions. Importation of waste can be perceived to be undermining local waste reduction efforts and circular economy objectives.

## Material recovery

WtE processes can recover ash as well as ferrous and non-ferrous metals. Incinerator Bottom Ash (IBA) recovered from WtE facilities is used in construction and the built environment as a low carbon concrete and road aggregate. (Source: Waste Management Review (2022). Victoria’s first bottom ash recycling facility approved. Retrieved from <https://wastemanagementreview.com.au/victorias-first-bottom-ash-recycling-facility-approved/>). Valuable ferrous and non-ferrous metals can be extracted from IBA through further processing.

Ferrous metals, such as steel, have iron as their primary component while non-ferrous metals like aluminium and copper do not contain iron. Because iron content affects properties like strength, flexibility, magnetism, corrosion resistance, and weight, it also influences how and where different metals are used. Ferrous metals are chosen primarily for their strength, durability, and often lower cost, making them widely used in construction and infrastructure, automotive and mechanical engineering, tools, and machinery.

Non-ferrous metals such as aluminium, nickel, copper and zinc, are favoured for their light weight, high electrical conductivity, corrosion resistance, and non-magnetic properties. Non-ferrous metals are commonly used in electrical wiring, water piping and product packaging.

Recovery of materials creates an additional value stream from WtE and means that fewer virgin materials need to be extracted and used in the economy. Replacing virgin materials with reclaimed or recovered materials is central to a circular economy, as noted in section 1.1. By comparison, there is no opportunity to recover materials if the same waste streams are deposited in landfill.

Using recovery data from European and UK WtE facilities, along with Australian market prices for ash and metals, this RIS makes the assumptions outlined in Table 6.

It is expected that material recovery of WtE facilities in Victoria will be similar to the UK and Europe, based on industry statements on the recovery capabilities of facilities in development in Victoria, as well as an analysis of the proportion of inert material and metals in the projected Victorian feedstock. (Source: Veolia Australia and New Zealand (2024). Veolia Voice: Turning waste into a resource [https://www.anz.veolia.com/  
newsroom/newsroom/veolia-voice-turning-waste-resource - :~:text=THE MARYVALE EFW PROJECT,of the Maryvale EfW project](https://www.anz.veolia.com/newsroom/newsroom/veolia-voice-turning-waste-resource%20-%20:~:text=THE%20MARYVALE%20EFW%20PROJECT,of%20the%20Maryvale%20EfW%20project)). Further detail about recovery assumptions is provided in the **Appendix.**

Table 6: Material recovery assumptions

|  | Output as %  input feedstock | $/tonne (2023–24 dollars) |
| --- | --- | --- |
| **Ash recovery** |  |  |
| Incinerator Bottom Ash (IBA) | 19.54% | $27 |
| **Metals recovery (Extracted from IBA)** | **1.76%** | **–** |
| Non-Ferrous metals recovery | 0.41% | $3,850 |
| Ferrous metals recovery | 1.35% | $680 |

Based on feedstock availability modelling in section 5.1, the cumulative tonnes of materials recovered from WtE to 2049–50 is set out in Table 7 below.

Table 7: Cumulative tonnes of materials recovered from WtE to 2049–50

|  |  |  |  |
| --- | --- | --- | --- |
|  | 2 Mtpa cap scenario | 2.5 Mtpa cap scenario | 3 Mtpa cap scenario |
| Metals total cumulative tonnes | 954,888 tonnes | 1,056,088 tonnes | 1,120,208 tonnes |
| Bottom Ash (metals extracted) total cumulative tonnes | 9,646,539 tonnes | 10,668,889 tonnes | 11,316,642 tonnes |

The economic benefits of this material recovery are presented in a cost benefit analysis in section 5.6 and further detail is provided in the **Appendix**.

## Avoided use of landfill

As permitted waste is diverted from landfill to WtE facilities under each of the cap options, more landfill space is made available for wastes that require landfilling due to being unsuitable for thermal WtE treatment (for example, hazardous wastes, and wastes with no calorific value), increasing the longevity of existing landfills and avoiding the need to open new landfills.

This RIS uses a conversion factor derived from the VRIP of 1 tonne of permitted waste being equivalent to 1.24 cubic metres of avoided landfill. (Source: Recycling Victoria. (2024). Victorian Recycling Infrastructure Plan. Retrieved from <https://www.vic.gov.au/victorian-recycling-infrastructure-plan>). The potential landfill space savings will accumulate each year, as permitted waste will be continually diverted from landfill to WtE facilities under each of the cap limit options. (Source: There may be capacity gains as material in landfill decomposes over time. However, the process is slow and dependent on various factors. It is difficult to reliably estimate if this is a significant source for new landfill space.).

The assessment of avoided use of landfill assumes that no additional capacity will be added to Victoria’s total available landfill capacity of 193,461,496 m3 (i.e. no new landfills are opened beyond what is already planned).

Table 8Table outlines shows the percentage proportion of Victoria’s landfill savings to 2050 and cumulative landfill capacity in cubic metres saved for each of the three cap options. Each cap option shows a proportional increase in Victoria’s landfill savings, with 3 Mtpa cap option yielding the highest landfill saving.

Increasing the cap limit from 2 Mtpa to 2.5 Mtpa yields an additional 11% in landfill capacity savings, while increasing cap limit from 2.5 Mtpa to 3 Mtpa yields an additional 6% in landfill capacity savings (17% from base case). The lower proportional saving from 2.5 Mtpa to 3 Mtpa is due to the projected feedstock availability shortfall projected for the 3 Mtpa option.

Table 8: Proportion of landfill capacity saved, cumulative landfill capacity saved, avoided landfill costs, and net % increase between scenarios

| Cap option | Proportion of landfill capacity saved | Cumulative landfill capacity saved to 2050 | Net % increase from base case |
| --- | --- | --- | --- |
| 2 Mtpa | 34.77% | 67,276,200 m3 | Base case |
| 2.5 Mtpa | 38.46% | 74,406,200 m3 | 10.60% |
| 3 Mtpa | 40.80% | 78,923,712 m3 | 17.31% |

## Electricity generation

Figure 5 presents the value of the annual electricity generation under the 2.5 Mtpa and 3 Mtpa cap options from 2038-39 onwards when there are anticipated additional WtE facilities beyond the 2 Mtpa option coming online.

As shown in Table 9, the 2.5 Mtpa and 3 Mtpa cap options are estimated to generate additional 5,420,775 MWh and 8,855,077 MWh respectively up to 2050 as compared to the base case.

Figure 5: Year-by-year electricity generation relative to the base case (MWh)

Figure 5: Year-by-year electricity generation relative to the base case (MWh)
This figure is titled “NEM-wide electricity generation (MWh)”
The bar graph illustrates the electricity generation in megawatt-hours (MWh) across the National Electricity Market (NEM) from the year 2040 to 2050. The x-axis represents the years, while the y-axis represents the electricity generation in MWh, ranging from 0 to 1,000,000 MWh. There are two sets of bars for each year: one set in orange representing "2.5 Mt Per Annum - NEM" and another set in green representing "3 Mt Per Annum - NEM." The figure include the following data points:
In 2040, the 2.5 Mtpa cap option generated approximately 100,000 MWh, while the 3 Mtpa cap option generated around 200,000 MWh relative to the base case.
In 2041, the 2.5 Mtpa cap option produced about 150,000 MWh, whereas the 3 Mtpa cap option produced roughly 250,000 MWh relative to the base case.
In 2042, the 2.5 Mtpa cap option's generation increased to approximately 200,000 MWh, and the 3 Mtpa cap option's generation rose to around 300,000 MWh relative to the base case.
In 2043, the 2.5 Mtpa cap option generated about 250,000 MWh, while the 3 Mtpa cap option generated approximately 350,000 MWh relative to the base case.
In 2044, the 2.5 Mtpa cap option produced around 300,000 MWh, and the 3 Mtpa cap option produced about 400,000 MWh relative to the base case.
In 2045, the 2.5 Mtpa cap option's generation reached approximately 350,000 MWh, while the 3 Mtpa cap option's generation was around 450,000 MWh relative to the base case.
In 2046, the 2.5 Mtpa cap option generated about 400,000 MWh, and the 3 Mtpa cap option generated approximately 500,000 MWh relative to the base case.
In 2047, the 2.5 Mtpa cap option produced around 450,000 MWh, whereas the 3 Mtpa cap option produced roughly 550,000 MWh relative to the base case.
In 2048, the 2.5 Mtpa cap option's generation was slightly above 500,000 MWh, and the 3 Mtpa cap option's generation was slightly above 600,000 MWh relative to the base case.
In 2049, the 2.5 Mtpa cap option generated slightly below 600,000 MWh, while the 3 Mtpa cap option generated slightly below 700,000 MWh relative to the base case.
•	Finally, in 2050, the 2.5 Mtpa cap option produced around 650,000 MWh, and the 3 Mtpa cap option produced approximately 750,000 MWh relative to the base case.

Table 9: Total of additional electricity generation up to 2050 relative to the base case (MWh)

| Cap scenario | 2.5 Mtpa | 3 Mtpa |
| --- | --- | --- |
| Total additional electricity generation up to 2050 | 5,420,775 MWh | 8,855,077 MWh |

## Emissions

Thermal WtE produces direct GHG emissions through the transformation of waste via:

* Emissions from thermal combustion of waste, or from other treatment process such as gasification or pyrolysis

Emissions from input fuels (such as natural gas) used to maintain the facility’s required operating conditions.

In calculating direct emissions from WtE for the varying options, this RIS only considers direct emissions from waste combustion, and does not consider alternative technologies (gasification or pyrolysis) or the contribution of input fuels. (Note: Non-feedstock input fuels are not a significant contributor to emissions in WtE facilities. Second order emission impacts are not included in the analysis of this RIS as their inclusion does not increase the robustness of emission results.). Although gasification and pyrolysis are understood to have lower emissions impacts, these technologies are newer and less established in Australia as well as overseas, with the dominant technology continuing to be direct combustion (incineration).

This RIS assesses GHG emissions by analysing the impacts of increasing the cap limit to 2.5 Mtpa and 3 Mtpa, against the base case of the existing regulated cap limit of 2 Mtpa. The model assumes that under the base case, the 2 Mtpa cap limit will be fully taken up by operational WtE facilities by 2038, with any changes to emissions resulting from either the 2.5 Mtpa or 3 Mtpa cap options being reflected for the period from 2038–39 to 2049–50.

DEECA has undertaken updated internal GHG emissions modelling, drawing upon the latest emissions, waste feedstock, economic and technology data available, enabling calculation of net emissions year by year of each of the cap options on Victoria’s GHG emissions to 2050.

The model accounts for:

* Direct emissions from combusting (incinerating) permitted waste for electricity generation in a thermal WtE process. Emissions from direct incineration were modelled using equations and factors consistent with IPCC Guidelines for National Greenhouse Gas Inventories. (Source: Intergovernmental Panel on Climate Change. (2019). 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Chapter 5: incineration and open burning of waste. Retrieved from [https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/5\_ Volume5/ 19R\_V5\_5\_Ch05\_IOB.pdf](https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/5_%20Volume5/%2019R_V5_5_Ch05_IOB.pdf)).
* The avoided emissions that would otherwise have been produced from that waste going to landfill (assuming current rates of landfill gas capture continue into the future). Avoided landfill emissions were modelled using a first-order decay model consistent with the approach and factors set out in the National Greenhouse and Energy Reporting (Measurement) Determination 2008. (Source: Federal Register of Legislation - National Greenhouse and Energy Reporting (Measurement) Determination 2008 <https://www.legislation.gov.au/F2008L02309/latest/text>). The first order decay model is used to calculate net emissions relative to the base case and for the cost benefit analysis. This methodology provides a more accurate calculation of the year-by-year release of methane from landfill than what was used in the previous RIS. Further detail is provided in the **Appendix**.

The avoided emissions from displaced electricity generation which would otherwise have been provided by other electricity generators within the NEM. Avoided electricity generation was modelled using energy content and thermal efficiency parameters used in the previous 2023 RIS, whilst avoided emissions are calculated using the same set of marginal emissions factors used in the previous 2023 RIS. Electricity generation that may have occurred from landfill gas capture with electricity generation, were the waste sent to landfill instead of WtE facilities, has not been included in this calculation as it is much smaller than the electricity generated from sending the waste to WtE facilities. The marginal emissions factors are provided in Table 30 of the **Appendix**.

The emissions modelling taken in this RIS differs from the previous RIS in employing a whole-of-waste stream approach. This provides a comprehensive and holistic view of the emissions from the entire waste stream rather than focusing on individual material sub-types, therefore limiting the model’s potential margin of error. To more accurately capture how facilities will be required to report and how these emissions are accounted for, direct incineration emissions are calculated using the parameters and equations consistent with the Intergovernmental Panel on Climate Change and landfill methane emissions are calculated using the parameters and equations consistent with National Greenhouse and Energy Reporting. (Notes: There may be capacity gains as material in landfill decomposes over time. However, the process is slow and dependent on various factors. It is difficult to reliably estimate if this is a significant source for new landfill space; Non-feedstock input fuels are not a significant contributor to emissions in WtE facilities. Second order emission impacts are not included in the analysis of this RIS as their inclusion does not increase the robustness of emission results.)

### Avoided emissions from landfill

Whilst combustion in thermal WtE facilities emits primarily carbon dioxide, organic wastes in landfill generate primarily methane. Methane is produced by the decomposition of waste in landfill through anaerobic processes over many decades and is a significantly more potent greenhouse gas than carbon dioxide. (Source: CSIRO. (2020). Emissions of methane – a greenhouse gas far more potent than carbon dioxide – and rising dangerously. Retrieved from [https://www.csiro.au/en/news/ all/articles/2020/july/emissions-of-methane-are-rising](https://www.csiro.au/en/news/%20all/articles/2020/july/emissions-of-methane-are-rising)). These organic wastes decay exponentially over the following 100 years once it has been deposited into landfill with the methane emissions following a similar exponential pattern. For the purposes of the modelling, emissions from landfill are assumed to occur for an additional 100 years beyond the modelling period (i.e. to 2150). The avoided methane emissions from landfill provided in this RIS are converted into equivalent carbon dioxide emissions.

### Avoided emissions from displaced generation in the National Electricity Market

The NEM covers the east coast of Australia (including South Australia) and has varying energy generation profiles across different jurisdictions, now and into the future. Changes to generation or demand in one part of this interconnected grid impacts generation in all parts of the grid.

WtE facilities are often designed to contribute electricity to the grid, thereby reducing the need for energy to be generated from other sources. Electricity produced from WtE avoids GHG emissions associated with the displaced energy generation source, such as coal or natural gas-fired generation. The generator that would have produced electricity in the absence of the WtE facilities is referred to as the ‘marginal generator’.

In the case of thermal WtE, the ‘marginal generator’ being displaced is the generator that bids into the wholesale market at the highest price at which the market clears to meet demand. Being the generator that determines the wholesale market price at a given time is called ‘generating on the margin’.

While the ‘average’ electricity generated in Victoria and in the NEM typically comes from coal-fired power stations, the marginal generators are a mixture of coal, renewable energy, and gas-fired generators. This means that, currently, the GHG emissions associated with marginal electricity generation, the emissions that are ‘displaced’ by WtE facilities, are lower than the GHG emissions from the ‘average’ electricity generator. The model calculates avoided emissions from displaced electricity generation for the NEM, using marginal electricity emissions factors calculated by DEECA, which are consistent with the previous 2023 RIS.

Over the period where the additional WtE facilities beyond the 2 Mtpa option could be anticipated to come online under the 2.5 Mtpa and 3 Mtpa cap options (i.e. from 2038–41) until the end of the modelling period (2050), it is anticipated that the marginal generator will often be gas-fired generation although renewable generation sources will make up an increasing share of overall generation.

Avoided generation emissions can be assessed in two ways: Victoria-only or whole-of-NEM. Since Victoria is part of an interconnected NEM, the whole-of-NEM assessment is considered more representative of actual outcomes in terms of emissions and electricity generation in future, since Victoria does not operate in an isolated market. Hence the NEM-wide avoided emissions are used for the analysis in this RIS.

This RIS examines GHG emissions of each cap limit option through two lenses:

1. Annual net emissions from waste processing up to 2050, which includes the sum of emissions from direct WtE combustion, avoided landfill emissions and avoided generation emissions for each year over the modelling period.
2. Net lifetime emissions, which includes the sum of emissions from the same sources as the annual net emissions assessment but calculates the avoided landfill emissions over the whole landfill decay period (i.e. were an equivalent volume of waste deposited to landfill rather than treated through a thermal WtE process). Emissions from landfill are assumed to occur for an additional 100 years beyond the modelling period (i.e. to 2150).

### Net emissions to 2050

Projected modelling of net emissions impacts to 2050 is provided in Table 10. It shows an increase in direct emissions to 2050 from WtE incineration beyond the base case for the 2.5 Mtpa and 3 Mtpa cap limit options, with larger direct incineration emissions seen for the 3 Mtpa cap option as compared to 2.5 Mtpa. Because emissions are released immediately during the incineration process by WtE, sending permitted waste to WtE facilities will result in higher direct emissions over the period to 2050, when compared to sending the waste to landfill where emissions would be released slowly over many decades.

Table 10: Net emissions impact beyond 2 Mtpa cap for both 2.5 Mtpa and 3 Mtpa cap options to 2050

| Year | 2.5 Mtpa (NEM) | 3 Mtpa (NEM) |
| --- | --- | --- |
|  | kt CO2e | kt CO2e |
| 2038 | 0 | 0 |
| 2039 | 90 | 90 |
| 2040 | 195 | 195 |
| 2041 | 200 | 267 |
| 2042 | 207 | 298 |
| 2043 | 185 | 289 |
| 2044 | 161 | 274 |
| 2045 | 146 | 269 |
| 2046 | 138 | 276 |
| 2047 | 141 | 300 |
| 2048 | 130 | 295 |
| 2049 | 126 | 287 |
| 2050 | 103 | 237 |

### Lifetime Emissions

Lifetime emissions impacts of WtE for the 2.5 Mtpa and 3 Mtpa cap limit options against the base case (2 Mtpa) are provided in Table 11, including the contributions of each of the three components evaluated to determine net lifetime emissions. Net emissions impact associated with WtE facilities, calculated for the whole decay period for avoided landfill emissions (projected out to 2150), sees a reduction in emissions compared to sending waste to landfill, for both the 2.5 Mtpa and 3 Mtpa options. This is largely attributed to the avoided landfill emissions that would have occurred out to 2150. The full data series to support this assessment is provided in the **Appendix**.

Table 11: Lifetime emissions impacts of WtE cap options

| Emissions type | 2.5 Mtpa (Mt CO2e) | 3 Mtpa (Mt CO2e) |
| --- | --- | --- |
| Direct WtE Incineration Emissions | 3.58 | 5.85 |
| Avoided Landfill Emissions | -2.81 | -4.58 |
| Avoided Generation Emissions - NEM | -1.20 | -1.96 |
| Total Net Emissions | -0.43 | -0.70 |

## Cost Benefit Analysis

For this RIS, the cost benefit analysis (CBA) uses a discount rate of 4% and evaluates the following factors from 2025–26 to 2049–2050 for the 2.5 Mtpa cap and 3 Mtpa cap options (compared to 2 Mtpa ‘base case’):

* Financial (revenue) transfers between landfill operators, WtE operators and the Victorian Government (which collects waste levies for each tonne of waste deposited in landfill).
* Financial (revenue) transfers associated with electricity generation from WtE and the generation it displaces.
* The value of material recovery ($/tonne, ash and metals).

Value of net emission ($/tonne CO2 equivalent up to 2100).

### Financial transfers between landfill operators, WtE operators and Victorian Government

Financial transfers on landfill operators, WtE operators and the government are estimated based on the distributional impacts resulting from shifting more waste away from landfill to WtE.

Financial transfers between landfill operators and waste to energy operators are considered with reference to gate fees. For completeness, decrease in Government waste levy revenue is also included for residual waste deposited in landfill, noting that maintenance of waste levy revenue is not amongst the objectives of increasing the current WtE cap limit. While the government’s reduction in waste levy revenue is considered a cost in the CBA, diverting more waste away from landfill by having additional WtE capacity is consistent with the government’s objective to achieve 80% diversion of waste from landfill by 2030.

Gate fees are the fees charged by landfill operators to individuals and businesses for depositing waste in a landfill and are determined by each landfill operator. They are set with reference to Victoria’s waste levy rate (the rate that landfill operators are required to pay to the Victorian Government for each tonne of waste deposited), as well as other costs (such as operating costs) to which the landfill operator is exposed and any profit margin as determined by the operator. Victoria’s waste levy rate for prescribed metropolitan waste is set to increase by 28% from $132.76/tonne for FY2024-25 to $169.79/tonne from 1 July 2025 onwards, which means landfill operators may increase gate fees to cover the additional costs. (Source: Environment Protection Authority Victoria. (2024). Waste levy. Retrieved from <https://www.epa.vic.gov.au/for-business/find-a-topic/landfill-guidance/waste-levy>).

Gate fees are the standard way of valuing the cost of disposing waste in landfill or waste to energy facilities. Therefore, for this CBA, gate fee revenue is the chosen aspect for the financial consideration, noting that it does not reflect the entire profit-and-loss evaluation of these operators as labour and capital costs of operation are not included, and neither are economic impacts on upstream and downstream industries. It is assumed that landfill gate fee revenue earned by operators based in Victoria stays in Victoria.

A similar assumption is made about gate fee revenue as in the previous RIS, which means the same gate fee value is used for both landfill and WtE operators. Landfill gate fees might continue to change if waste levy rises in the future. It is however challenging to predict the rate of change. For simplicity, this RIS assumes the gate fee value is kept constant (in real terms) throughout the modelling period to 2050. Assuming that landfill operators might pass the full 28% increase in waste levy rates onto councils by increasing landfill gate fees, the chosen gate fee value for this RIS has been adjusted from $185/tonne as seen in the previous RIS to $237/tonne to reflect the increased waste levy rate from 1 July 2025 onwards. This is also aligned with available data from the UK where gate fees at WtE facilities range from £45–175 (AUD $91-353), with £103 (AUD $208) being the median value.(Sources: Dollar values are converted using purchasing power parity adjusted exchange rate between GBP and AUD, using the World Bank Databank 2023 PPP conversion factor: <https://databank.worldbank.org/source/world-development-indicators/Series/PA.NUS.PPP>; Waste and Resources Action Program. (2023). Comparing the costs of alternative waste treatment options. Retrieved from [https://www.wrap.ngo/  
sites/default/files/2023-09/WRAP%202022-23%20Gate%20Fees%20Report.pdf](https://www.wrap.ngo/sites/default/files/2023-09/WRAP%202022-23%20Gate%20Fees%20Report.pdf)).

As there are no large-scale thermal WtE facilities operating in Victoria at present, it is difficult to predict whether gate fees for WtE facilities will differ from landfill gate fees in the future. As shown in Table 12 below, similar to the previous RIS, the current RIS found the gate fee revenue amongst these groups is a pure transfer of financial value and does not reflect additional value to the economy. The financial transfers of gate fee revenue associated with movements of waste from landfill to WtE will be roughly proportional (that is, gate fees charged in future by landfill operators and WtE operators are expected to be of a similar scale), given the two sets of operators are effectively in competition for the same waste streams. WtE operators, who are competing against landfill operators, will be incentivised to set prices to compete with landfill.

Table 12: Financial transfers of gate fee revenues

| Option | 2.5 Mtpa | 3 Mtpa |
| --- | --- | --- |
| Costs |  |  |
| Decrease in landfill operator revenue | -$178,642,435 | -$284,151,561 |
| Decrease in Government waste levy receipts | -$453,992,529 | -$722,127,894 |
| **Total** | **-$632,634,965** | **-$1,006,279,455** |
| **Benefits** |  |  |
| **Increase in WtE operator revenue** | **$632,634,965** | **$1,006,279,455** |

### Value of material recovery

WtE supports the transition to a circular economy by not only reducing waste but also recovering valuable materials that would otherwise be lost in landfill. The materials are recovered from ash and residual products that are generated through WtE processes.

The value of recovered materials depends on two main factors; the proportion of materials that can be recovered from WtE feedstock and the market prices for those materials.

The feedstock model is used to attain the tonnes inputted into WtE facilities under each scenario and European and UK WtE recovery data is used to estimate the tonnes of ash and metals recovered as outputs. The dollar value of the recovered material is then calculated using commodity values based on market prices for recovered ash and metals. Further detail is provided in the **Appendix**.

Table 13 shows the net present value (NPV) of IBA and metal recovery of 2.5 Mtpa and 3 Mtpa cap options relative to 2 Mtpa (base case) cap option. It shows that there is a larger increase in the overall NPV for both the IBA recovery and metals recovery under the 3 Mtpa cap option as compared to 2.5 Mtpa cap option, due to the larger amount of permitted waste feedstock being processed under the 3 Mtpa cap option.

Table 13: Net present value of incineration bottom ash and metal recovery (2025–26 to 2049–50)

| Relative to base case | Metal recovery | IBA recovery ($ million) |
| --- | --- | --- |
| 2.5 Mtpa | $66.8 million | $12.8 million |
| 3 Mtpa | $106.2 million | $20.4 million |

The air pollution control residue (known as fly ash) generated in the WtE process is categorised as hazardous waste. Hence, it is assumed to not be able to be recovered for alternative uses and therefore no economic value has been ascribed. It is noted that there are companies internationally who are seeking to, or have, regulatory approvals in place for technologies which can extract or stabilise the hazardous elements in fly ash – there is some potential that a future market will develop in Australia for fly ash treatment, however, none currently exists.

### Value of net emissions

Net emission costs are measured in terms of emission impacts on the whole NEM. As discussed in section 5.5, WtE has higher emissions over the modelling period to 2050 compared to landfill, due to the more immediate release of GHG from WtE facilities. However, WtE facilities result in a net reduction of emissions compared to landfill once the avoided emissions from landfill are accounted for on a lifetime basis.

Figure 6 shows the changes in costs associated with emissions for the 2.5 Mtpa and 3 Mtpa cap limits, relative to the base case of 2 Mtpa. For both cap options, net emissions increase as additional capacity comes online, but then level off or begin to reduce as landfill emissions are avoided in later years. Net emissions are valued up to the year 2100, as the carbon value series is available only up to that year. (Note: While the amount of avoided landfill emissions is calculated up to the year 2150, the valuation of that type of emission is only possible up to the year 2100 as the carbon value series is available only up to that year. This approach captures the majority of future landfill emissions that are avoided over the whole decay period, with approximately 90% of these occurring before 2100. More details are provided in the Appendix, section 8. Carbon values.).

As shown in Figure 6, the 3 Mtpa cap results in consistently higher net emissions costs compared to the 2.5 Mtpa cap scenario from the start of the modelling period until 2050 as capacity progressively comes online. However, from then onwards, both cap options generate emission cost savings, with the 3 Mtpa cap scenario demonstrating higher emission benefits as the avoided landfill emission is valued.

Figure 6: Cost of net emissions (NEM wide) in 2025 AUD value

Figure 6: Cost of net emissions (NEM wide) in 2025 AUD value
The figure is titled “Net emission cost” and shows a line chart that consists of two lines. The horizontal axis shows the modelling periods starting from 2030 to 2100 with 10-year intervals. The vertical axis shows the numbers ranging from –80 to 120 Australian dollars in 2025 prices with 20-million-dollar intervals. The first line is in the orange colour, showing the net emission cost of the 2.5 Mtpa cap option, starting at the 0 dollar value, trending upwards from the year 2030 to reach 55 million dollars in 2040, trailing off slightly to 43 million dollars in 2050 and reducing significantly from then to reach the lowest point in 2060 at – 41 million dollars. From then on, the net emissions cost for the 2.5 Mtpa cap option continues to be below 0, hitting –31 million dollars in 2090 and –29 million dollars in 2100. The second line is in the green colour, showing the net emission cost of the 3 Mtpa cap option, starting at 0 dollar value, trending upwards from the year 2030 to reach the peak of 100 million dollars in 2050, plummeting to the lowest point of –68 million dollars in 2060 before recovering slightly in 2070 at –55 million dollars. The net emission cost for the 3 Mtpa cap option continues to be below 0, finishing the year 2100 at –49 million dollars.

### Value of electricity generation

Similar to financial transfers between landfill and WtE operators, there are also transfers in the value of electricity generation between WtE and non-WtE electricity generators.

The analysis presented here assumes a constant spot price of $80.11/MWh, based on the average Victorian energy spot prices over the last 12 months from the Australian Energy Market Operator (AEMO). Due to the volatility of energy prices, a simplifying assumption of a constant spot price is used to keep the valuation straightforward.

The previous RIS estimated that WtE facilities represent only a small part of Victoria’s overall energy system, producing 1-5%-6% of total Victorian electricity consumption. Increasing the cap limit is expected to have minimal impact on the electricity price trajectory, given that the electricity price is often determined by major electricity generators such as brown coal, gas and renewables.

Because WtE displaces energy generation from other sources, the transfer of value is represented as a benefit for WtE facility operators, and a cost for other non-WtE energy generators (including from coal, gas, renewables and landfill gas capture).

Table 13 shows the net present value over the modelling period of this transfer under the two cap scenarios, relative to the base case.

Table 14: Net present value of electricity generation for two cap scenarios relative to base case

|  | Electricity generation by WtE (2025-26 to 2049–50) | Electricity generation by other generators  (2025-26 to 2049–50) |
| --- | --- | --- |
| 2.5 Mtpa | $201,950,583 | -$201,950,583 |
| 3 Mtpa | $321,218,072 | -$321,218,072 |

### Summary of CBA assessment

The summary results of the CBA analysis are presented as in Table 15 and includes calculation of an overall benefit-cost ratio (BCR). Over the modelling, using the 4% discount rate, the 2.5 Mtpa cap option generates a net benefit of $87.7 million, while the 3 Mtpa cap generates a net benefit of $137 million. Both cap options each yield a BCR above 1.

The BCRs of the two options are quite close together as the benefits and costs scale similarly as the cap increases from 2.5 Mtpa to 3 Mtpa, causing the ratios not to change much. Even though the net benefit of the 3 Mtpa option is higher than that of the 2.5 Mtpa option, the proportional relationship between the costs and the benefits stays the same. Major components such as the gate fee revenue transfers and electricity generation scale linearly. While benefits under the 3 Mtpa option increase by about 58.7% compared to the benefits under the 2.5 Mtpa option, costs for the 3 Mtpa option also increase by about 59.1%, making the two options’ BCRs ratios quite similar to each other.

Table 15: Summary of cost-benefit analysis

| Cap scenario | 2.5 Mtpa (NPV) | 3 Mtpa (NPV) |
| --- | --- | --- |
| **Costs** |  |  |
| Decrease in landfill operator revenue | -$178,642,435 | -$284,151,561 |
| Decrease in Government waste levy receipts | -$453,992,529 | -$722,127,894 |
| Electricity generation by marginal generators | -$201,950,583 | -$321,218,072 |
| **Total** | **-$834,585,548** | **-$1,327,497,527** |
| **Benefits** |  |  |
| Increase in WtE operator revenue | $632,634,965 | $1,006,279,455 |
| Net emissions (NEM) | $8,081,219 | $10,416,273 |
| WtE electricity generation relative to base case | $201,950,583 | $321,218,072 |
| Incineration bottom ash recovery value relative to base case | $12,836,071 | $20,417,263 |
| Metal recovery value relative to base case | $66,773,477 | $106,210,978 |
| **Total** | **$922,276,316** | **$1,464,542,041** |
| **Net benefit** | **$87,690,768** | **$137,044,515** |
| Benefit-cost ratio | 1.105 | 1.103 |

## Multi-Criteria Analysis

There are crucial considerations for determining the cap limit that are difficult to cost. Due to the complexity in costing the risks associated with feedstock shortfalls outlined in section 5.1, as well as the costs or benefits of the avoided use of landfill outlined in section 5.3, these factors have not been included in the Cost Benefit Analysis. In order to account for these factors, a multi-criteria analysis (MCA) has been used to assess the cap limit options against the base case of a 2 Mtpa cap limit and identify the preferred option.

### Evaluation Criteria

Each option will be assessed against the base case of 2 Mtpa, using the following criteria and associated weightings given their relative importance in achieving the RIS objectives (outlined in Chapter 3). Table 16 provides the evaluation criteria and associated weightings, together with a rationale for the weighting applied to each.

The weightings applied in this MCA reflect the relative importance of the RIS objectives. For the purposes of the MCA analysis, the first objective has been split into two separate criteria – this is to recognise the two-fold nature of this objective, whereby the Victorian Government is seeking to maximise the amount of residual waste diverted from landfill, while limiting risks of WtE capacity exceeding available feedstock.

The fourth RIS objective (to facilitate appropriate investment in the WtE industry to boost economic growth across Victoria) has not been included in the MCA. While this is an important objective of the Victorian Government (as highlighted by the commitment in the Economic Growth Statement), it is not considered to be a quantifiable benefit in either the CBA or the MCA.

Table 16: MCA evaluation criteria and weightings

| Criteria | Weight (%) | Rationale for weighting |
| --- | --- | --- |
| 1(a) Maximise the amount of residual waste diverted from landfill | 30% | Criteria 1(a) has the highest weighting of 30% applied (equal highest priority with 1(b)). The higher weighting reflects the priority in setting the cap limit so as to maximise the amount of residual waste diverted from landfill (within the limits of available feedstock), thereby saving landfill airspace and deferring the need for new landfills to be created or existing landfills expanded between now and 2050. |
| 1(b) Limit risk of WtE capacity exceeding available feedstock | 30% | Similarly to criteria 1(a), a weighting of 30% has been applied to criteria 1(b). Whilst it is important to maximise the amount of residual waste diverted from landfill for use in WtE, it is equally as important to limit the risk of WtE capacity exceeding available feedstock in future. While the impact of a future feedstock supply shortfall is uncertain and some mitigations are possible (as noted in section 5.1), there is potential for significant adverse outcomes if such a risk were fully realised, such as the need to import waste from interstate. In the worst case, if facilities cannot secure adequate feedstock over the long term to remain viable, they may have to enter a state of dormancy or cease operating entirely, leading to stranded assets. |
| 2) Increase the value of waste managed in Victoria | 20% | The moderate weighting given to this criterion reflects the contribution a higher cap limit can have for recovery of by-products (including ash and metals) from WtE that are not recovered when waste is landfilled. Whilst in important consideration in establishing an appropriate cap limit, it is considered a lower order priority than criteria 1(a) and 1(b) (equal with criteria (3)) |
| 3) Minimise greenhouse gas emissions from waste processing and energy generation | 20% | The moderate weighting reflects the importance of ensuring that additional investment in waste to energy also considers the need to limit any adverse emissions impacts. Whilst emissions impacts are an important consideration in establishing an appropriate cap limit, it is considered a lower order priority than criteria 1(a) and 1(b) (equal with criteria (2)). |

### Score

A score has been assigned according to the impact of the option against the evaluation criteria, measured against the base case (2 Mtpa). A rating scale from -10 to +10 outlined in Table 16, has been applied.

Table 17: MCA scoring

| Score | Description |
| --- | --- |
| -5 to -10 | Much worse than the base case |
| -1 to -4 | Somewhat worse than the base case |
| 0 | No change from the base case |
| 1 to 4 | Somewhat better than the base case |
| 5 to 10 | Much better than the base case |

Each option has been assessed against the criteria defined above. An option is preferred where it receives the highest net score after assessment of each criterion.

### Assessment of options against MCA criteria

#### Criteria 1(a) - Maximise the amount of residual waste diverted from landfill

Relative scores are applied to the 2.5 and 3 Mtpa options, with reference to the avoided use of landfill assessment in section 5.3, to consider how much waste each cap option diverts from landfill and the associated landfill airspace savings relative to the base case. Landfill savings increase with each of the higher cap limits, although these gains diminish as the cap size grows, due to constraints in available feedstock under the 3 Mtpa cap option (refer to section 5.1). The 2.5 Mtpa option saves 10.6% more landfill airspace than the base case, while the 3 Mtpa option saves 17.3% relative to base case. Raw scores of 2.5 for the 2.5 Mtpa option and 4 for the 3 Mtpa option, reflecting both being somewhat better than the base case.

#### Criteria 1(b) - Limit risk of WtE capacity exceeding available feedstock

Relative scores are applied to the 2.5 Mtpa and 3 Mtpa options with reference to the risk of WtE capacity exceeding available feedstock over the modelling period under each option.

As noted in section 5.1, under the central feedstock projection there is sufficient feedstock available for the entire modelling period for the base case and 2.5 Mtpa cap options. However, if future waste feedstock availability is less than forecast in the central projection (i.e. follows the lower confidence band projection in section 5.1) or WtE capacity comes online sooner than anticipated, there is a residual risk of feedstock shortfall for the 2.5 Mtpa cap option compared to the base case - reflected as a raw score of -0.5.

For the 3 Mtpa cap option, there is a forecast excess of WtE capacity relative to feedstock for a period of 7 years under the central feedstock projection, equating to 1.1 million tonnes of waste over the modelling period (average of 158,000 tonnes per year from 2040-41 to 2046-47). If realised, this quantum of shortfall could be expected to impact one or several WtE facilities over the period. If future waste feedstock availability is less than forecast in the central projection (i.e. follows the lower confidence band projection in section 5.1), or WtE capacity comes online sooner than anticipated, the feedstock shortfall is further exacerbated. Under the lower confidence band projection, there is a feedstock shortfall commencing from 2038-39 continuing for the duration of the modelling period – and well in excess of the feedstock shortfall under the lower confidence band projection for the 2.5 Mtpa cap option. A similar impact occurs if the rollout of facilities occurs sooner than anticipated (refer to Figure 8 of the **Appendix**).

As noted in section 5.1, while WtE facilities may be able to mitigate this risk by deferring investment or contracting for exempt waste stream(s), the risks may not be able to be effectively mitigated due to the complexity and lack of full transparency in the waste market. If the risk is not effectively mitigated, there could be significant adverse outcomes, such as the need to import waste from interstate. In the worst case, if facilities cannot secure adequate feedstock over the long term to remain viable, they may have to enter a state of dormancy or cease operating entirely, leading to stranded assets. Given the extent of uncertainty of the implications of a feedstock shortfall, a raw score of -3 has been assigned to the 3 Mtpa cap option, reflecting the potential impact of the risk if fully realised.

#### Criteria 2 - Increase the value of waste managed in Victoria

WtE increases the value of waste managed in Victoria by recovering valuable materials that would otherwise be lost in landfill. Using the methodology outlined in Section 5.6 to calculate the net present value of materials recovered against the 2 Mtpa base case, the 2.5 Mtpa option delivers a smaller net benefit ($79.6 million) by approximately 60% compared to the 3 Mtpa option ($126.6 million). Similarly to criterion 1(a), the net benefit of the 3 Mtpa option is impacted by the feedstock shortfall modelled under this option, which has the effect of reducing ash and metal recovery as compared to if there were no feedstock shortfalls occurring. The raw scores of 1.0 for the 2.5 Mtpa option and 1.7 for the 3 Mtpa option reflect they are both somewhat better than the base case.

#### Criteria 3 - Minimise greenhouse gas emissions from waste processing and energy generation

As analysed in section 5.5 and 5.6, when compared against the base case, both cap options generate a net emission benefit over the modelling period, when accounting for avoided landfill emissions up to 2100. The 2.5 Mtpa cap scenario produces $8.1 million of net emission benefits, while the 3 Mtpa cap scenario achieves a slightly higher value of $10.4 million. These values of net emission benefits are proportioned according to the MCA scoring scale, giving a raw score of 0.11 and 0.14 for the 2.5 Mtpa cap and 3 Mtpa cap scenario respectively, reflecting the modest values of net emissions benefit relative to the base case.

### Summary of MCA assessment

Each option has been scored against the evaluation criteria defined above and is summarised in Table 18 below. An option is preferred where it receives the highest net score after assessment of each criterion and the weighting applied.

Table 18: Summary of the MCA results

| Criteria | Weight (%) | 2.5 Mtpa Score | 2.5 Mtpa Weighted Score | 3 Mtpa Score | 3 Mtpa Weighted Score |
| --- | --- | --- | --- | --- | --- |
| **1(a) Maximise the amount of residual waste diverted from landfill** | 30% | 2.50 | 0.75 | 4.00 | 1.20 |
| **1(b) Limit risks of WtE capacity exceeding available feedstock** | 30% | -0.50 | -0.15 | -3.00 | -0.90 |
| **2) Increase the value of waste managed in Victoria** | 20% | 1.05 | 0.21 | 1.67 | 0.33 |
| **3) Minimise greenhouse gas emissions from waste processing and energy generation** | 20% | 0.11 | 0.02 | 0.14 | 0.03 |
| **Total** |  |  | **0.83** |  | **0.66** |

### Overall result

Overall, when comparing against the base case, the MCA shows that the 2.5 Mtpa cap option (weighted score of 0.83) is preferred to the 3 Mtpa cap option (weighted score of 0.66), when assessed against all the criteria. Of the options analysed, the 2.5 Mtpa cap limit is the preferred option as it significantly increases the amount of permitted waste diverted from landfill, reducing pressure on landfill airspace, whilst reducing the risk of WtE capacity exceeding available permitted waste feedstock compared with the 3 Mtpa cap option.

# Summary of preferred option

## Summary of preferred option

When taking account of the RIS objectives in Chapter 3, as well as analysis of feedstock availability, material recovery, avoided use of landfill, net emissions impacts, cost-benefits and the MCA, the 2.5 Mtpa cap limit is the preferred option and is provided for in the proposed Regulations. A summary of the impact analysis for the 2.5 Mtpa cap option is outlined in Table 19.

Table 19: Summary of impact analysis of the 2.5 Mtpa cap option

|  |  |
| --- | --- |
| Impact Analysis | 2.5 Mtpa |
| Permitted waste feedstock availability | Feedstock projected to modestly exceed WtE capacity (lesser reliance on landfill compared to base case)  No feedstock shortfall projected over the modelling period. |
| Material recovery | Cumulative tonnes of material recovery: 11.7 Mt  Net present value of material recovery (ash and metals) relative to base case is $79.6 million. |
| Avoided use of landfill | Cumulative landfill capacity saving of 74.4 M m3 (10.6% increase from base case). |
| Electricity generation | Estimated to generate additional 5,420,775 MWh compared to base case. |
| GHG emissions | Decrease in net emissions impacts (to 2100) and lifetime emissions impacts (to 2150) compared to base case (-0.43 Mt CO2-e lifetime emissions saving). |
| Cost benefit analysis | The CBA shows a net benefit of $87.7 million and a BCR greater than 1, indicating a positive return on investment for this option. |
| Multi-criteria analysis | MCA showed 2.5 Mtpa as the preferred option. |

Of the three options analysed, the 2.5 Mtpa cap limit is the preferred option as it significantly increases the amount of permitted waste diverted from landfill, reducing pressure on landfill airspace, whilst reducing the risk of WtE capacity exceeding available permitted waste feedstock compared with the 3 Mtpa cap option.

## Impacts of the cap limit to competition and small business

Impacts to competition and small business are outlined in Table 20.

Table 20: Impacts of the cap limit to competition and small business

| Competition impact | Answer | Explanation |
| --- | --- | --- |
| Is the proposed measure likely to limit the number of producers or suppliers to:   * only one producer? * only one buyer? * fewer than four producers? | Uncertain. | Given the level of business interest in WtE investment in Victoria, the proposed 2.5 Mtpa cap is expected to increase the number of thermal WtE facilities operating in Victoria, compared to the current cap of 2 Mtpa. However, given the significant variety in WtE facility sizes, it’s not possible to predict how many facilities could be approved and fit within a 2.5 Mtpa cap.  The cap is not expected to limit the number of waste generators who operate upstream of WtE, or the number of energy users who operate downstream of WtE. The cap limit is expected to encourage the presence of alternative processors to recover or recycle streams of waste which are currently residual waste (for example, some types of unrecyclable plastics). |
| Would the proposed measure discourage entry into the industry by new firms/individuals or encourage EO to exit the market? | Not significantly. | The proposed cap limit is likely to encourage entry for some new WtE proponents.  Expanding WtE capacity to 2.5 Mtpa may cause more competition with the landfill sector for residual waste disposal, however some residual waste (e.g. industrial and hazardous wastes) will still require landfill disposal, ensuring that landfills continue to play an essential role in waste management. |
| Would the proposed measure impose higher costs on a particular class of business, for example small business or type of service? | Not significantly. | The cap limit itself does not impose costs on businesses or services. However, cap licence conditions will constrain businesses to a specified limit on waste that can be processed, which may limit a business’ ability to achieve desired economies of scale over time. |
| Would the proposed measure affect the ability of businesses to innovate, adopt new technology or respond to the changing demands of consumers? | No. | The cap does not materially limit innovation in thermal WtE facilities. By limiting the amount of permitted waste processed using thermal WtE, the cap limit encourages innovation in alternatives to thermal WtE.  The 2.5 Mtpa cap option is unlikely to limit innovation in the landfill sector, instead it may incentivise innovation in advanced waste processing and alternative recovery methods (e.g. advanced recycling and landfill gas capture). Landfills that adapt by capturing greater waste streams or offer more specialised waste services are expected to remain competitive despite the expansion of WtE. |

# Implementation plan

## Consultation on proposed Regulations

As required by the *Subordinate Legislation Act 1994* (SL Act), the proposed Regulations and this RIS will be released via Engage Victoria for a 28-day public comment period. This will provide waste to energy project proponents, the broader waste and recycling sector, local councils, community groups, environmental groups and other interested stakeholders the opportunity to consider and provide feedback on the proposed Regulations and RIS.

The RIS supports effective consultation by enabling stakeholders to comment on the detailed analysis and evidence being put forward by the Victorian Government to support the preferred option. Prior to release of this RIS, policy and technical specialists from Better Regulation Victoria and RV have been consulted and contributed data and views to its development.

The RIS and proposed Regulations are available on Engage Victoria, the Victorian Government's online consultation platform. Those who wish to provide feedback can do so by completing the online survey on Engage Victoria.

DEECA will consider all submissions received during the period of public review and will prepare a formal Response to Public Comment summarising the submissions received during the consultation. The Response to Public Comment document will be made available on Engage Victoria.

## Implementing the proposed Regulations

Table 21 outlines the stages and expected implementation timeframe for amending the WtE cap limit through the proposed Regulations, should a change to the cap limit be recommended to the Governor-in-Council by the Minister for Environment following consultation. The below timings assume the RIS is released for consultation in March-April 2025, and the proposed Regulations are made in May 2025, following consultation on the RIS.

Table 21: Implementation of proposed Regulations

| Implementation Stage | Action | Expected Timing |
| --- | --- | --- |
| Consultation on RIS and proposed draft Regulations | Consultation of RIS and proposed Regulations (28 calendar days as required by SL Act) | Mid-March - mid April 2025 |
| Consideration of feedback | DEECA will review feedback on submissions received during the consultation period and consider if any changes are required to the proposed Regulations. | Late April – early May 2025 |
| Proposed Regulations approved and come into effect | The proposed Regulations will be settled with the Office of the Chief Parliamentary Counsel and will be submitted to the Governor in Council, on the recommendation of the Minister for Environment, to be made. | Late May 2025 |
| Communication of proposed Regulations coming into effect | Communication of the proposed Regulations coming into effect will occur, including through correspondence to stakeholders who have made a submission through the consultation period, and publication of a Statement of Reasons, summarising the key matters raised in the public consultation and a response to issues raised.  Along with the dissemination of communication materials, in accordance with requirements of the Subordinate Legislation Act, a notice of the making of the regulations will be published in the Victorian Government Gazette and on the Victorian Public Notices website (publicnotices.vic.gov.au).  The Regulations will also be made available to download from the Victorian Legislation website ([www.legislation.vic.gov.au](http://www.legislation.vic.gov.au/)). | Late May 2025 |

Following the making of the proposed Regulations, the Head, RV will notify project proponents who are participating in the 2025 cap licencing process, which is occurring in parallel with the RIS consultation. Communication and engagement objectives are to:

* provide access to accurate and timely information to support WtE project planning and investment decisions, and

ensure other impacted stakeholders are aware of any change to the cap limit as a result of the proposed Regulations being made.

Once the proposed Regulations are made, the Head, RV will assess cap licence applications and may allocate licences up to any amended cap limit set in the Regulations.

# Evaluation strategy

Under the Subordinate Legislation Act, all regulations sunset ten years after their commencement. Regulations can be remade with or without amendments, so there is no gap in coverage. Any amendments made to the cap limit through making of the proposed Regulations will be consolidated into the Circular Economy (Waste Reduction and Recycling) (Waste to Energy Scheme) Regulations 2023. Evaluation of the Regulations would occur before they sunset in 2033, unless the Victorian Government determines an earlier review is required.

The timing of any future evaluation of the Regulations and cap limit is to be determined by the Victorian Government. The previous RIS committed to a partial evaluation in 2026 (once all licences are issued) and a full evaluation in 2029 (once all facilities are operational). However, as noted in this RIS, it is expected that many of the facilities will not become operational until the 2030s, and therefore it may be premature to commit to evaluations until a timeframe for facilities to become operational is clearer.

It is recommended that any future evaluation of the Regulations (whether prior to sunsetting, or at an earlier time as directed by Government) assess whether the objectives of the Regulations have been met, whether they have been implemented effectively, the level of compliance with the Regulations by licenced operators, any lessons learnt and whether any changes to the Regulations may be required.

More broadly, section 182 of the CE Act requires the Minister to cause a review to be conducted of the first five years of operation of the Act. This includes providing the Minister with a written report, which is required to be tabled in Parliament. The review of the operation of the CE Act may include a recommendation to amend or further review the Regulations and/or the WtE Scheme embedded in Part 5A of the CE Act.

The evaluation strategy outlined in this chapter builds on that presented in the Regulatory Impact Statement for Victoria’s waste to energy cap and cap licensing (December 2023) and is designed to provide data to inform any future evaluation into how efficient and effective the Regulations are in delivering on the objectives of the WtE Scheme. The evaluation strategy will be supported by the routine collection of qualitative information and quantitative data, including through regular reporting by WtE licensees to RV.

The evaluation strategy seeks to better understand:

* how effective and efficient the proposed Regulations have been in achieving their objectives,
* whether there are any improvements that could or should be made to ensure more efficient and effective regulation of WtE in Victoria and

to what extent does the WtE Scheme contribute to Victoria’s circular economy transition.

The evaluation strategy will require the development of a baseline from both quantitative and qualitative information, from:

* data already developed for and included in this RIS,
* data sets collected by RV and

information provided in the consultation process for development of this RIS.

RV will only collect data from WtE facilities that are within scope of the WtE Scheme and require a cap licence. The Act provides for exemptions and carve outs from the requirement to hold a WtE licence. For example, facilities that process only exempt waste (such as wood waste) or facilities that employ ‘advanced recycling’ technologies to process permitted waste are not in scope of the scheme will not require a licence. Therefore, they will not be obligated to provide data to RV.

Table 22 sets out the data that will be collected to be used as a baseline for later analysis as per the previous RIS. The date to capture baseline data has been updated to 1 November 2025.

All data collected and referred to below in this document may be kept internal to RV or DEECA where appropriate. This data may not be made publicly available.

Table 22: Baseline data sets

| Type of data | Output or Outcome | Unit | Baseline date | Data source |
| --- | --- | --- | --- | --- |
| **Number of licensed thermal WtE facilities** | Outcome | Count | 1 November 2025 | RV |
| **Total processing capacity of licensed thermal WtE facilities** | Outcome | Tonnes  per annum | 1 November 2025 | RV |
| **Cost of licensing, monitoring and enforcement activities** | Output | $AUD | 1 November 2025 | RV |
| **Current permitted waste being processed through licensed active WtE facilities** | Outcome | Tonnes | 1 November 2025 | RV |
| **Total electricity exported from licensed WtE facilities** | Outcome | MWh | 1 November 2025 | RV |

A range of quantitative datasets will be collected each financial year, to develop meaningful indicators of change over time from the implementation of the WtE Scheme and proposed Regulations. Data to be evaluated is outlined in Table 23.

Table 23: Quantitative data sets (collected annually)

| Issue | Output or outcome | Purpose | Measure | Data | Frequency | Data source |
| --- | --- | --- | --- | --- | --- | --- |
| Number of full applications under the cap | Output | Level of interest in being an operator under the Scheme | Count | 30 June | Annual, financial year | RV |
| Number of licences issued | Output | Total number of licensed facilities and number of proposed projects | Count | 30 June | Annual, financial year | RV |
| Cumulative permitted waste tonnes of licences issued | Output | Proportion of WtE cap licenced | Tonnes | 30 June | Annual, financial year | RV |
| Volume and composition of permitted waste processed by licensed WtE facilities | Outcome | Comparative proportion of waste in landfill to WtE over time | Tonnes | 30 June | Annual, financial year | RV, operators |
| Total electricity exported from licensed WtE facilities | Outcome | Contribution of WtE to the grid | MWh | 30 June | Annual, financial year | RV, operators |
| CO2-e emitted by licensed WtE facilities | Outcome | Net emissions impact | Tonnes | 30 June | Annual, financial year | RV, operators |

In addition to the quantitative data sets collected annually, certain qualitative data metrics will be collected on a five-yearly basis, including where appropriate via surveys of RV, licence holders, and the broader waste and recycling industry, to examine the WtE Scheme’s effectiveness over time, as outlined in Table 24.

Table 24: Qualitative data metrics (collected 5-yearly)

| Types of data | Output or outcome | Purpose | Technique | Frequency | Stakeholder |
| --- | --- | --- | --- | --- | --- |
| Costs of compliance and effectiveness of WtE Scheme implementation | Outcome | Any changes in perception of scheme compliance and effectives over time | Survey | 5 years | RV and licence holders |
| Impact of the Scheme on innovation in the waste and recycling industry | Outcome | Changing perception of impact of scheme on innovation overtime | Survey | 5 years | Waste industry, RV |

# Appendix – Model inputs and assumptions

## Feedstock model inputs and assumptions

1. Waste generation and recovery (baseline data):
2. RV’s Waste Projection Model (WPM) is used as a baseline of Victoria’s anticipated waste generation and recovery. (Source: Recycling Victoria. (2024). Waste Projection Model. Retrieved from <https://www.vic.gov.au/victorias-waste-projection-model-dashboard>). The data provides tonnes of waste material generation and fate by year, source sector, material type and material sub-type.
3. The WPM presents a business-as-usual baseline of waste generation. It does not attempt to estimate the impact of Victorian Government programs or market forces that will impact waste recovery– the model does account for these in proceeding calculations (see: Revised recovery rates).
4. The WPM projections of generation can be built at the sector (MSW, C&I, C&D) and material level. The following projection methods have been selected as the most appropriate:
5. Aggregates, masonry and soil: linear extrapolation
6. Glass, Metals, Textiles, Tyres and rubber, Organics (excl MSW garden), Plastics (excl PS (6) and Other Plastics (7): projected for population growth consistent with Victoria in Future (ViF) estimates (Source: Department of Transport and Planning. Victoria in Future 2023. (2023). Retrieved from [https://www.planning.vic.gov.au/\_\_data/assets/pdf\_file/0022/  
   703453/DTP0552-Victori-in-Future-2023-report.PDF](https://www.planning.vic.gov.au/__data/assets/pdf_file/0022/703453/DTP0552-Victori-in-Future-2023-report.PDF))
7. MSW garden, PS (6) and Other Plastics (7) = projected for dwellings growth consistent with ViF
8. Paper and cardboard: bespoke projection informed by external SME.
9. Revised recovery rates:
10. Where applicable, baseline recovery rates were refined for waste streams to reflect projected improvements in recovery due to the roll out of related Government interventions, as well as anticipated industry-led initiatives and market factors. These factors have been described in detail in section 5.1.
11. The revised recovery rates for particular waste materials by source sector are provided in Tables 25, 26 and 27.
12. Timing of WtE facilities coming online and total operational capacity:
13. A total WtE capacity projection schedule of when WtE facilities are likely to become operational was based on assessment by DEECA. The projection for when capacity will come online is much more conservative than the 2023 RIS assumptions. Figure 7 visualises the capacity projection schedule under each cap option, as well as the assumptions for the 2 Mtpa made in the previous RIS for comparison.
14. The projection of when facilities come online is drawn from modelling completed for the VRIP in late 2024, combined with the latest market intelligence of proposed facilities in the pipeline. Capacity coming online from 2026–27 up until 2037–38 is based on the timing of some known facilities with some simplifying assumptions for additional capacity beyond those dates, rounded and smoothed to the nearest 1,000 tonnes
15. The model assumes that, from the year that operational capacity reaches 2 Mtpa (under the base case), an additional 250,000 ktpa is added each year until the higher cap limit options are reached. This approximates one medium-sized facility coming online each year, which is broadly consistent with the DEECA projection to 2038 to meet the 2 Mtpa cap limit.
16. While it may be desirable for certain WtE investors to delay development of facilities until they have guaranteed adequate feedstock (and therefore slow the rate at which overall WtE capacity comes online), RV will expect cap licence holders to lock in feedstock promptly and meet required timelines for the commissioning of facilities in accordance with mandatory licence conditions. The design of the Waste to Energy Scheme also incentivises prospective investors to apply for a cap licence as early as possible so as to secure an allocation, prior to finalising feedstock contracts. Further, waste suppliers will be reluctant to contract to supply waste feedstock until an investor has made substantial progress towards obtaining the required regulatory permissions, including a cap licence.
17. Evidence from existing WtE facilities suggests that there is reduced capacity in the first year of operation while the plant equipment is tested and commissioned. The model assumes 50% of a facility’s capacity is operational in Year 1 and 100% capacity becomes operational in Year 2.
18. In developing this projection, DEECA has accounted for the complexities of WtE construction projects, existing constraints in Victoria’s civil construction sector, the regulatory and permitting requirements for WtE and ash re-use, challenges in securing feedstock, addressing community concerns, and the possibility that some RV-approved projects may not proceed—necessitating the reallocation of capacity in line with the CE Act.
19. The model assumes that all of the cap limit is allocated by RV, which it may not be. The decisions of the Head, Recycling Victoria are independent statutory decisions and will not be influenced or affected by the simplifying assumptions made in this RIS.
20. RV must impose conditions on waste to energy licences under s 74V(b) of the CE Act on facility commissioning dates. It is possible, and desirable for reducing reliance on landfill, that facilities and processing capacity will come online more quickly than is assumed. However, it is appropriate to assume a more conservative projection for this RIS, given that many facilities in the pipeline are in early planning phase.
21. Sensitivity analysis has been undertaken to understand the implications of a less conservative capacity schedule. Figure 8 shows a faster rollout, whereby an additional 50% of capacity above the projected schedule is added each year until the cap limit is reached for each scenario. The implications this has on feedstock availability have been summarised in Table 28.

Note that for Table 25, the impact of government interventions and market developments projected to improve material recovery have been incorporated into projections. For example, there is expected to be significant improvements in recovery rate for organics from MSW sources due to 2030 with the rollout of the FOGO services at kerbside level, and improved organics processing. Meanwhile, the introduction of CDS is expected to drive improvements in recovery of container glass, aluminium, and some plastic streams. Rates of cardboard recovery are expected to improve with improvements in paper and cardboard processing infrastructure.

Table 25: Recovery Rates for MSW derived waste

| Material Type | Material Name | Total generation | Recovery rate BAU Baseline | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 | 2047 | 2048 | 2049 | 2050 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Aggregate, masonry and soils | Asphalt | 737 | 0% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Aggregate, masonry and soils | Bricks | 48,416 | 0% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Aggregate, masonry and soils | Concrete | 3,034 | 87% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Aggregate, masonry and soils | Plaster | 4,366 | 0% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Aggregate, masonry and soils | Rubble | 2,949 | 0% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Aggregate, masonry and soils | Soil and natural materials | 31,568 | 51% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Glass | Container glass | 189,529 | 80% | 85% | 85% | 86% | 86% | 86% | 87% | 87% | 87% | 88% | 88% | 89% | 89% | 89% | 90% | 90% | 90% | 91% | 91% | 91% | 92% | 92% | 92% | 92% | 92% | 92% | 92% |
| Glass | Other glass | 38,264 | 0% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Metals | Aluminium | 39,080 | 47% | 49% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 51% | 51% | 51% | 51% | 51% | 51% | 51% | 51% | 51% | 51% | 51% | 51% | 51% | 51% | 51% |
| Metals | Ferrous | 323,613 | 89% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Metals | Other metals | 12,077 | 100% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Organics | Food organics | 616,611 | 24% | 35% | 36% | 37% | 38% | 38% | 39% | 39% | 40% | 40% | 40% | 41% | 41% | 42% | 42% | 42% | 42% | 43% | 43% | 43% | 43% | 43% | 43% | 43% | 44% | 44% | 44% |
| Organics | Garden organics | 927,871 | 89% | 92% | 93% | 94% | 94% | 94% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |
| Organics | Other organics | 131,374 | 24% | 45% | 50% | 55% | 60% | 65% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% |
| Organics | Wood /timber | 62,566 | 55% | 55% | 55% | 55% | 60% | 65% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% |
| Paper and cardboard | Cardboard | 36,963 | 0% | 30% | 40% | 50% | 60% | 70% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% |
| Paper and cardboard | Liquid paperboard | 27,959 | 0% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% |
| Paper and cardboard | Newsprint and magazines | 9,217 | 100% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Paper and cardboard | Other paper | 416,055 | 70% |  | 72% | 74% | 76% | 78% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% |
| Paper and cardboard | Printing and writing paper | 83,989 | 0% |  |  |  |  | 10% | 15% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% |
| Plastic | HDPE (2) | 116,872 | 39% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% |
| Plastic | LDPE (4) | 41,223 | 17% |  | 20% | 21% | 22% | 23% | 24% | 26% | 28% | 30% | 35% | 38% | 40% | 45% | 50% | 55% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% |
| Plastic | Other plastics (7) | 96,220 | 12% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Plastic | PET (1) | 95,024 | 50% | 41% | 41% | 41% | 41% | 41% | 41% | 41% | 41% | 41% | 41% | 41% | 41% | 41% | 41% | 41% | 41% | 41% | 41% | 41% | 41% | 41% | 41% | 41% | 41% | 41% | 41% |
| Plastic | PP (5) | 59,397 | 38% | 28% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% |
| Plastic | PS (6) | 10,476 | 9% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Plastic | PVC (3) | 24,042 | 0% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Textiles | Clothing | 126,529 | 51% | 53% | 54% | 55% | 56% | 57% | 58% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% |
| Textiles | Other textiles | 22,024 | 7% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Tyres and rubber | Offroad tyres | 0 | 100% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Tyres and rubber | Other rubber | 3,500 | 30% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Tyres and rubber | Passenger tyres | 1,750 | 100% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Tyres and rubber | Truck tyres | 0 | 100% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

NOTE: a blank row means that recovery rates have not been revised from the baseline in RV's Waste Projection Model

Note that for Table 26, the impact of government interventions and market developments projected to improve material recovery has been incorporated into projections. For example, improvements in source separation and processing infrastructure are expected to drive improvements in recovery of organics, paper and cardboard, and certain plastic streams. Meanwhile, the introduction of CDS is expected to drive improvements in recovery of container glass, aluminium, and certain plastic streams.

Table 26: Recovery Rates for C&I derived waste

| Material Type | Material Name | Total generation | Recovery rate BAU Baseline | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 | 2047 | 2048 | 2049 | 2050 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Aggregate, masonry and soils | Asphalt | 173,424 | 98% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Aggregate, masonry and soils | Bricks | 35,056 | 3% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% |
| Aggregate, masonry and soils | Concrete | 48,160 | 17% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% |
| Aggregate, masonry and soils | Plaster | 28,332 | 1% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% |
| Aggregate, masonry and soils | Rubble | 17,667 | 0% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% |
| Aggregate, masonry and soils | Soil and natural materials | 135,788 | 1% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% |
| Glass | Container glass | 98,142 | 64% | 91% | 92% | 92% | 92% | 93% | 93% | 93% | 94% | 94% | 94% | 95% | 95% | 96% | 96% | 96% | 97% | 97% | 98% | 98% | 98% | 98% | 98% | 98% | 98% | 98% | 91% |
| Glass | Other glass | 29,304 | 41% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Metals | Aluminium | 151,243 | 86% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |
| Metals | Ferrous | 591,321 | 88% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Metals | Other metals | 242,886 | 100% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Organics | Food organics | 393,044 | 21% |  |  |  | 40% | 40% | 45% | 45% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% |  |
| Organics | Garden organics | 146,390 | 47% |  |  |  |  | 50% | 55% | 60% | 65% | 70% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% |  |
| Organics | Other organics | 189,624 | 80% |  |  |  |  |  |  |  | 80% | 85% | 85% | 85% | 85% | 85% | 85% | 85% | 85% | 85% | 85% | 85% | 85% | 85% | 85% | 85% | 85% | 85% |  |
| Organics | Wood /timber | 416,736 | 28% |  |  |  |  | 35% | 45% | 55% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% |  |
| Paper and cardboard | Cardboard | 646,097 | 84% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% | 90% |
| Paper and cardboard | Liquid paperboard | 36,376 | 0% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% |
| Paper and cardboard | Newsprint and magazines | 6,090 | 100% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Paper and cardboard | Other paper | 149,192 | 27% | 33% | 36% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 33% |
| Paper and cardboard | Printing and writing paper | 130,922 | 20% | 30% | 35% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 30% |
| Plastic | HDPE (2) | 75,090 | 8% | 8% | 8% | 8% | 8% | 8% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 13% | 8% |
| Plastic | LDPE (4) | 75,124 | 31% |  |  |  |  |  | 48% | 48% | 48% | 48% | 48% | 48% | 48% | 48% | 48% | 48% | 48% | 48% | 48% | 48% | 48% | 48% | 48% | 48% | 48% | 48% |  |
| Plastic | Other plastics (7) | 41,059 | 5% |  |  |  |  |  | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% | 20% |  |
| Plastic | PET (1) | 30,986 | 7% | 34% | 34% | 35% | 35% | 35% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 34% |
| Plastic | PP (5) | 61,829 | 10% |  |  |  |  |  | 25% | 25% | 25% | 25% | 25% | 25% | 25% | 25% | 25% | 25% | 25% | 25% | 25% | 25% | 25% | 25% | 25% | 25% | 25% | 25% |  |
| Plastic | PS (6) | 15,865 | 9% |  |  |  |  |  | 19% | 19% | 19% | 19% | 19% | 19% | 19% | 19% | 19% | 19% | 19% | 19% | 19% | 19% | 19% | 19% | 19% | 19% | 19% | 19% |  |
| Plastic | PVC (3) | 37,443 | 3% |  |  |  |  |  | 10% | 10% | 10% | 10% | 10% | 10% | 10% | 10% | 10% | 10% | 10% | 10% | 10% | 10% | 10% | 10% | 10% | 10% | 10% | 10% |  |
| Textiles | Clothing | 48,922 | 1% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Textiles | Other textiles | 75,310 | 1% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Tyres and rubber | Offroad tyres | 2,458 | 100% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Tyres and rubber | Other rubber | 19,897 | 47% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Tyres and rubber | Passenger tyres | 3,336 | 66% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Tyres and rubber | Truck tyres | 25,002 | 100% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

NOTE: a blank row means that recovery rates have not been revised from the baseline in RV's Waste Projection Model.

Note that for Table 27, recovery rates for aggregates, masonry and soils have been adjusted to reflect that these materials have viable recycling and recovery pathways which are expected to improve over time. These materials also have a low calorific (energy recovery) value and are generally not suitable for WtE processing.

Table 27: Recovery Rates for C&D derived waste

| Material Type | Material Name | Total generation | Recovery rate BAU Baseline | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 | 2047 | 2048 | 2049 | 2050 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Aggregate, masonry and soils | Asphalt | 650,693 | 100% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Aggregate, masonry and soils | Bricks | 998,079 | 97% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Aggregate, masonry and soils | Concrete | 2,898,312 | 99% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Aggregate, masonry and soils | Plaster | 48,328 | 68% | 90% | 90% | 90% | 95% | 98% | 98% | 98% | 98% | 98% | 98% | 98% | 98% | 98% | 98% | 98% | 98% | 98% | 98% | 98% | 98% | 98% | 98% | 98% | 98% | 98% | 98% |
| Aggregate, masonry and soils | Rubble | 38,736 | 74% | 80% | 80% | 80% | 85% | 90% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |
| Aggregate, masonry and soils | Soil and natural materials | 1,731,697 | 57% | 99% | 99% | 99% | 99% | 99% | 99% | 99% | 99% | 99% | 99% | 99% | 99% | 99% | 99% | 99% | 99% | 99% | 99% | 99% | 99% | 99% | 99% | 99% | 99% | 99% | 99% |
| Glass | Container glass | 8,551 | 92% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Glass | Other glass | 3,567 | 6% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Metals | Aluminium | 28,815 | 86% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Metals | Ferrous | 54,266 | 69% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Metals | Other metals | 4,534 | 100% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Organics | Food organics | 3,072 | 0% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Organics | Garden organics | 22,181 | 0% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Organics | Other organics | 538 | 0% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Organics | Wood /timber | 140,322 | 14% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Paper and cardboard | Cardboard | 4,422 | 0% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Paper and cardboard | Liquid paperboard | 549 | 0% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Paper and cardboard | Newsprint and magazines | 0 | 100% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Paper and cardboard | Other paper | 1,675 | 0% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Paper and cardboard | Printing and writing paper | 1,711 | 0% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Plastic | HDPE (2) | 5,101 | 12% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Plastic | LDPE (4) | 3,673 | 9% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Plastic | Other plastics (7) | 2,560 | 6% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Plastic | PET (1) | 1,854 | 0% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Plastic | PP (5) | 3,622 | 1% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Plastic | PS (6) | 2,467 | 62% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Plastic | PVC (3) | 3,429 | 31% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Textiles | Clothing | 3,791 | 0% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Textiles | Other textiles | 6,757 | 0% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Tyres and rubber | Offroad tyres | 0 | 100% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Tyres and rubber | Other rubber | 184 | 0% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Tyres and rubber | Passenger tyres | 132 | 0% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Tyres and rubber | Truck tyres | 0 | 100% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

NOTE: a blank row means that recovery rates have not been revised from the baseline in RV's Waste Projection Mode

Figure 7: Projected WtE Capacity Schedule

Figure 7: Projected WtE Capacity Schedule
The figure shows a graph with a y-axis of “tonnes per annum” and an x-axis showing time marked by financial years.  
A dark blue line represents the schedule of capacity coming online assumed for the 2Mtpa option in the previous 2023 RIS. It begins at 1 Mtpa in 2025-26, stepping up to 1.35 Mtpa in 2026-27, then rapidly ascending to it maximum of 3 Mtpa in 2027-28.
Oange, green and a light blue lines represent the anticipated schedule of when facilities and additional WtE capacity are likely to come online under each cap option for the current RIS. They all rise from 0 tpa in 2025-26 to 1.4 Mtpa in 2032-33, then they all rise at a slightly more rapid pace until the cap limit is reached for each option. Note that the capacity includes both existing operator licenses and new cap licenses. The orange 2 Mtpa cap limit line reaches its maximum of 3.06 Mtpa in 2037-38, the green 2.5 Mtpa cap limit line reaches its maximum of 3.56 Mtpa in 2039-40, and the light blue 3 Mtpa cap limit line reaches its maximum of 4.06 Mtpa in 2041-42.


Figure 8 displays projections of feedstock and WtE capacity assuming a faster roll out in capacity, whereby an additional 50% of capacity above the projected schedule (see Figure 4 in section 5.1 for comparison) is added each year until the cap limit is reached for each scenario.

Figure 8: Projections of feedstock and WtE capacity assuming a faster roll out in capacity.

Figure 8: Projections of feedstock and WtE capacity assuming a faster roll out in capacity
The figure shows a graph with a y-axis of “tonnes per annum” and an x-axis showing time marked by financial years.  
A solid blue line representing the central projection of permitted waste feedstock availability begins in 2025-26 at 3.58 Mt before dipping to a low of 3.36 Mt in 2031-32. The line then rises gradually to 4.17 Mt in 2049-50. Upper/lower confidence bands around this central projection are shown as a shaded blue area encased by dashed blue lines. The lines represent +/- 6% of the central projection in 2025-26, fanning out to +/- 20% in 2049-50.
3 dashed lines (orange, light brown and brown) representing a more optimistic ramp up pf facilities coming online is shown, whereby an additional 50% of capacity above the projected schedule is added each year until the cap limit is reached for each scenario. They all rise from 0 tpa in 2025-26 to 2.1 Mtpa in 2032-33, then they all rise at a slightly more rapid pace until the cap limit is reached for each option. Note that the capacity includes both existing operator licenses and new cap licenses. The orange 2 Mtpa cap limit line reaches its maximum of 3.06 Mtpa in 2034-35, the light brown 2.5 Mtpa cap limit line reaches its maximum of 3.56 Mtpa in 2035-36, and the dark brown 3 Mtpa cap limit line reaches its maximum of 4.06 Mtpa in 2036-37.


Note that for Table 28, an additional 50% of capacity above the projected schedule is added each year until the cap limit is reached for each scenario.

Table 28: Implications of a faster roll out

| Schedule and cap option scenario | Year excess capacity (feedstock shortfall) begins | Year excess capacity (feedstock shortfall) ends | Total years of feedstock shortfall | Total tonnes feedstock shortfall over the period |
| --- | --- | --- | --- | --- |
| Faster schedule and 2.5 Mtpa limit | 2035-36 | 2036-37 | 2 | 113,553 |
| Faster schedule and 3 Mtpa limit | 2035-36 | 2046-47 | 12 | 3,321,155 |

## Material recovery inputs and assumptions

1. Tonnes of feedstock diverted from landfill to WtE facilities for each year of the period is calculated using the feedstock model.
2. Materials recovered as a proportion of input feedstock:
3. The proportion of material recovered from feedstock through WtE processes was derived from the annual reporting of 60 fully operational WtE facilities in the United Kingdom (UK) which process residual municipal waste. The average recovery as a proportion of feedstock over a five-year period (2019–2023) was taken for incinerator bottom ash (19.54%) and metals (1.76%). (Source: Tolvik Consulting. (2023). UK Energy from Waste Statistics. Retrieved from <https://www.tolvik.com/published-reports/view/uk-energy-from-waste-statistics-2023/>).
4. In using the UK recovery data as basis for calculations, it is assumed that UK’s WtE feedstock is similar to Victoria’s because of comparable demographics, consumption, and waste generation patterns. Several data points support this. Firstly, the projected Victorian WtE feedstock modelled for the RIS shows that total inert material (the material without calorific value that is left over as bottom ash) makes up 22%. Secondly, Victorian industry have noted that they anticipate bottom ash recovered will constitute up to 20% of incoming residual feedstock. (Source: Veolia Australia and New Zealand (2024). Veolia Voice: Turning waste into a resource [https://www.anz.veolia.com/newsroom/newsroom/veolia-voice-turning-waste-resource - :~:text=THE MARYVALE EFW PROJECT,of the Maryvale EfW project](https://www.anz.veolia.com/newsroom/newsroom/veolia-voice-turning-waste-resource#:~:text=THE%20MARYVALE%20EFW%20PROJECT,of%20the%20Maryvale%20EfW%20project)). These figures closely match the 19.54% observed in the UK data, which is based on measured WtE input and output and accounts for any losses between inert input and bottom ash output.
5. The model is agnostic in its preference of WtE technology. The UK facilities used in the data reflect a range in age of operational WtE technologies. While Victoria’s newer facilities may be more efficient and produce less bottom ash, this effect is expected to be minor. As per the previous point, industry estimates that new facilities will recover up to 20% of bottom ash from their feedstock.
6. Metal recovery from waste-to-energy incinerator bottom ash involves separating ferrous and non-ferrous metals using eddy currents and magnets. This process is economically attractive because non-ferrous metals, such as aluminium, nickel and copper, typically sell for much higher prices than ferrous metals like iron or steel. Non-ferrous metals are valued for their lightweight nature, excellent electrical conductivity, resistance to corrosion, and non-magnetic characteristics.
7. European WtE incinerator bottom ash contains roughly 1–5% non-ferrous metals and 5–15% ferrous metals. (Source: M Šyc, FG Simon, J Hykš, R Braga, L Biganzoli, G Costa, V Funari, and M Grosso. (2020). ‘Metal recovery from incineration bottom ash: State-of-the-art and recent developments’, Journal of Hazardous Materials. Retrieved from [https://www.sciencedirect.com/  
   science/article/pii/S0304389420304222](https://www.sciencedirect.com/science/article/pii/S0304389420304222)). By taking the midpoint of these ranges, the recovery ratio of non-ferrous to ferrous metals is estimated to be about 3:10. The projected Victorian WtE feedstock modelled for the RIS shows a similar ratio of non-ferrous to ferrous. When coupled with the recovery data from UK WtE facilities, this translates to an average recovery of 0.41% non-ferrous metals and 1.35% ferrous metals as a proportion of feedstock.
8. The market value of recovered material:
9. WtE Incinerator Bottom Ash has applications in construction and the built environment as a low carbon concrete and road aggregate. The value of this material has been derived from Recycling Victoria’s Circular Economy Market Report 2024. (Source: Recycling Victoria. (2024). Circular Economy Market Update 2024. Retrieved from <https://www.vic.gov.au/circular-economy-market-report>). Adjusted for inflation, the $/tonne dollar value is estimated to be $27.
10. Ferrous and non-ferrous metals can be extracted from incinerator bottom ash through additional processing. Their values were determined using ABS export records for recovered metals. (Source: Department of Climate Change, Energy, the Environment and Water. (2024). Waste export summary - January to June 2024. Retrieved from <https://www.dcceew.gov.au/environment/protection/waste/publications/waste-export-summary-jan-jun-2024>). Average values for the 2023–24 financial year were taken for non-ferrous metals at $3,850 per tonne and ferrous metals at $680 per tonne.

## Avoided use of landfill model inputs and assumptions

1. Tonnes of feedstock diverted from landfill to WtE facilities for each year of the period is calculated using the feedstock model.
2. The estimates for landfill savings are calculated using a WtE feedstock weight (tonne) to landfill space volume (m3) conversion factor of 1.24. This factor was derived from the VRIP which states, “The introduction of thermal waste to energy facilities that have current licenses, based on estimates on when facilities may come online and all proposed facilities being delivered, could result in around 25 million fewer cumulative tonnes of waste going to Victorian landfills by 2053 (equivalent to around 31 million m3 of airspace”. (Source: Recycling Victoria. (2024). Victorian Recycling Infrastructure Plan. p. 78. Retrieved from <https://www.vic.gov.au/victorian-recycling-infrastructure-plan>).
3. It is assumed that total landfill capacity in Victoria remains consistent over the period at 193,461,496 m3 (i.e. no new landfills are opened beyond what is already planned).

## Emissions model inputs and assumptions

1. Tonnes of feedstock diverted from landfill to WtE facilities for each year of the period is calculated using the feedstock model.
2. Direct emissions from combusting (incinerating) permitted waste for electricity generation in a thermal WtE process are calculated using the parameters and equations set out in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5: Waste. (Source: Intergovernmental Panel on Climate Change. (2019). 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Chapter 5: incineration and open burning of waste. Retrieved from [https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/5\_Volume5/  
   19R\_V5\_5\_Ch05\_IOB.pdf](https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/5_Volume5/19R_V5_5_Ch05_IOB.pdf)).
3. Avoided emissions that would otherwise have been produced from that waste going to landfill (based on current rates of landfill gas capture):
4. Avoided landfill emissions are modelled using a first-order decay model consistent with the approach and factors set out in the National Greenhouse and Energy Reporting (Measurement) Determination 2008 (NGER Measurement Determination). (Source: National Greenhouse and Energy Reporting (Measurement) Determination 2008, retrieved from <https://www.legislation.gov.au/F2008L02309/latest/text>).
5. The first order decay model is used to calculate annual net emissions relative to the base case. While the avoided landfill emissions are calculated to 2150 for the purpose of assessing lifetime emissions, the valuation in the cost-benefit analysis is to 2100. The year 2100 was chosen as the year out to which these emissions were valued, as carbon values are only available to 2100 and this time period captures the vast majority of the avoided emissions from landfill methane that occur over the whole decay period.
6. The previous RIS took the relative lifetime emissions into the year-by-year net emissions, averaging out the emissions impacts over the modelling period. The first order decay model used for this RIS provides a more accurate calculation of the year-by-year release of methane from landfill over the period than what was used in the previous RIS.
7. Avoided emissions from displaced electricity generation which would otherwise have provided that contribution of demand for electricity into the National Electricity Market (NEM):
8. Avoided electricity generation was modelled using energy content and thermal efficiency parameters consistent with the previous 2023 RIS
9. The marginal energy generation factors used are also consistent with the previous 2023 RIS (see Table 30).
10. Electricity generation that may have occurred from landfill gas capture with electricity generation, were the waste sent to landfill instead of WtE facilities, has not been included in this calculation as it is much smaller than the electricity generated from sending the waste to WtE facilities.
11. While the previous RIS calculated emissions at a material sub-type level, the current RIS utilised a whole-of-stream approach in line with the NGER Regulations and the NGER Measurement Determination. The composition of waste must be reported in terms of the waste streams defined in the NGER Measurement Determination as general waste stream (MSW – separated into class I and/or class II, C&I and C&D) or homogenous waste stream. This is a more holistic approach, limiting the possibilities of estimating errors through using parameters that are based on broader evidence base than material specific analysis. Using material sub-types is not accurate because actual waste streams may have a different composition.
12. Furthermore, regulatory frameworks and environmental impact assessments are often designed around the whole-waste-stream approach. The approach used for the modelling is closely aligned with the emissions reporting requirements that WtE facilities have to follow.
13. Annual net emissions in 2.5 Mtpa and 3 Mtpa cap scenarios are provided in Table 29.

Table 29: Emission impact by emission type from 2038 to 2100

| Scenario |  | 2.5 Mtpa |  |  | 3 Mtpa |  |
| --- | --- | --- | --- | --- | --- | --- |
| Emission type | Avoided Landfill Emissions | Direct WtE Incineration Emissions | WtE Avoided Generation Emissions | Avoided Landfill Emissions | Direct WtE Incineration Emissions | WtE Avoided Generation Emissions |
| Year/Unit | kt CO2e | kt CO2e | kt CO2e | kt CO2e | kt CO2e | kt CO2e |
| 2026 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2027 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2028 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2029 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2030 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2031 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2032 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2033 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2034 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2035 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2036 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2037 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2038 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2039 | 0 | 155 | -65 | 0 | 155 | -65 |
| 2040 | -5 | 310 | -110 | -5 | 310 | -110 |
| 2041 | -16 | 311 | -95 | -16 | 406 | -124 |
| 2042 | -26 | 311 | -79 | -29 | 438 | -111 |
| 2043 | -35 | 311 | -91 | -43 | 470 | -138 |
| 2044 | -44 | 311 | -106 | -57 | 501 | -171 |
| 2045 | -53 | 311 | -113 | -71 | 534 | -193 |
| 2046 | -61 | 311 | -112 | -86 | 566 | -204 |
| 2047 | -69 | 312 | -102 | -102 | 597 | -195 |
| 2048 | -76 | 312 | -105 | -117 | 623 | -211 |
| 2049 | -83 | 312 | -102 | -133 | 623 | -204 |
| 2050 | -90 | 312 | -119 | -148 | 623 | -238 |
| 2051 | -97 | - | - | -163 | - | - |
| 2052 | -92 | - | - | -155 | - | - |
| 2053 | -88 | - | - | -148 | - | - |
| 2054 | -84 | - | - | -142 | - | - |
| 2055 | -80 | - | - | -135 | - | - |
| 2056 | -77 | - | - | -129 | - | - |
| 2057 | -73 | - | - | -123 | - | - |
| 2058 | -70 | - | - | -118 | - | - |
| 2059 | -67 | - | - | -113 | - | - |
| 2060 | -64 | - | - | -108 | - | - |
| 2061 | -61 | - | - | -103 | - | - |
| 2062 | -58 | - | - | -98 | - | - |
| 2063 | -56 | - | - | -94 | - | - |
| 2064 | -53 | - | - | -90 | - | - |
| 2065 | -51 | - | - | -86 | - | - |
| 2066 | -49 | - | - | -82 | - | - |
| 2067 | -47 | - | - | -79 | - | - |
| 2068 | -45 | - | - | -75 | - | - |
| 2069 | -43 | - | - | -72 | - | - |
| 2070 | -41 | - | - | -69 | - | - |
| 2071 | -39 | - | - | -66 | - | - |
| 2072 | -38 | - | - | -63 | - | - |
| 2073 | -36 | - | - | -60 | - | - |
| 2074 | -35 | - | - | -58 | - | - |
| 2075 | -33 | - | - | -55 | - | - |
| 2076 | -32 | - | - | -53 | - | - |
| 2077 | -30 | - | - | -51 | - | - |
| 2078 | -29 | - | - | -49 | - | - |
| 2079 | -28 | - | - | -47 | - | - |
| 2080 | -27 | - | - | -45 | - | - |
| 2081 | -26 | - | - | -43 | - | - |
| 2082 | -25 | - | - | -41 | - | - |
| 2083 | -24 | - | - | -40 | - | - |
| 2084 | -23 | - | - | -38 | - | - |
| 2085 | -22 | - | - | -36 | - | - |
| 2086 | -21 | - | - | -35 | - | - |
| 2087 | -20 | - | - | -34 | - | - |
| 2088 | -19 | - | - | -32 | - | - |
| 2089 | -18 | - | - | -31 | - | - |
| 2090 | -18 | - | - | -30 | - | - |
| 2091 | -17 | - | - | -28 | - | - |
| 2092 | -16 | - | - | -27 | - | - |
| 2093 | -16 | - | - | -26 | - | - |
| 2094 | -15 | - | - | -25 | - | - |
| 2095 | -14 | - | - | -24 | - | - |
| 2096 | -14 | - | - | -23 | - | - |
| 2097 | -13 | - | - | -22 | - | - |
| 2098 | -13 | - | - | -22 | - | - |
| 2099 | -12 | - | - | -21 | - | - |
| 2100 | -12 | - | - | -20 | - | - |
| 2101 | -11 | - | - | -19 | - | - |
| 2102 | -11 | - | - | -18 | - | - |
| 2103 | -11 | - | - | -18 | - | - |
| 2104 | -10 | - | - | -17 | - | - |
| 2105 | -10 | - | - | -16 | - | - |
| 2106 | -9 | - | - | -16 | - | - |
| 2107 | -9 | - | - | -15 | - | - |
| 2108 | -9 | - | - | -15 | - | - |
| 2109 | -8 | - | - | -14 | - | - |
| 2110 | -8 | - | - | -14 | - | - |
| 2111 | -8 | - | - | -13 | - | - |
| 2112 | -8 | - | - | -13 | - | - |
| 2113 | -7 | - | - | -12 | - | - |
| 2114 | -7 | - | - | -12 | - | - |
| 2115 | -7 | - | - | -11 | - | - |
| 2116 | -7 | - | - | -11 | - | - |
| 2117 | -6 | - | - | -11 | - | - |
| 2118 | -6 | - | - | -10 | - | - |
| 2119 | -6 | - | - | -10 | - | - |
| 2120 | -6 | - | - | -9 | - | - |
| 2121 | -5 | - | - | -9 | - | - |
| 2122 | -5 | - | - | -9 | - | - |
| 2123 | -5 | - | - | -8 | - | - |
| 2124 | -5 | - | - | -8 | - | - |
| 2125 | -5 | - | - | -8 | - | - |
| 2126 | -5 | - | - | -8 | - | - |
| 2127 | -4 | - | - | -7 | - | - |
| 2128 | -4 | - | - | -7 | - | - |
| 2129 | -4 | - | - | -7 | - | - |
| 2130 | -4 | - | - | -7 | - | - |
| 2131 | -4 | - | - | -6 | - | - |
| 2132 | -4 | - | - | -6 | - | - |
| 2133 | -4 | - | - | -6 | - | - |
| 2134 | -3 | - | - | -6 | - | - |
| 2135 | -3 | - | - | -6 | - | - |
| 2136 | -3 | - | - | -5 | - | - |
| 2137 | -3 | - | - | -5 | - | - |
| 2138 | -3 | - | - | -5 | - | - |
| 2139 | -3 | - | - | -5 | - | - |
| 2140 | -3 | - | - | -5 | - | - |
| 2141 | -3 | - | - | -5 | - | - |
| 2142 | -3 | - | - | -4 | - | - |
| 2143 | -3 | - | - | -4 | - | - |
| 2144 | -3 | - | - | -4 | - | - |
| 2145 | -2 | - | - | -4 | - | - |
| 2146 | -2 | - | - | -4 | - | - |
| 2147 | -2 | - | - | -4 | - | - |
| 2148 | -2 | - | - | -4 | - | - |
| 2149 | -2 | - | - | -4 | - | - |
| 2150 | -2 | - | - | -3 | - | - |

Table 30: Electricity grid emissions factors

| Year | Unit | NEM emissions |
| --- | --- | --- |
| 2024 | tCO2-e/MWh | 0.56 |
| 2025 | tCO2-e/MWh | 0.56 |
| 2026 | tCO2-e/MWh | 0.56 |
| 2027 | tCO2-e/MWh | 0.4 |
| 2028 | tCO2-e/MWh | 0.53 |
| 2029 | tCO2-e/MWh | 0.44 |
| 2030 | tCO2-e/MWh | 0.44 |
| 2031 | tCO2-e/MWh | 0.44 |
| 2032 | tCO2-e/MWh | 0.46 |
| 2033 | tCO2-e/MWh | 0.47 |
| 2034 | tCO2-e/MWh | 0.44 |
| 2035 | tCO2-e/MWh | 0.42 |
| 2036 | tCO2-e/MWh | 0.29 |
| 2037 | tCO2-e/MWh | 0.29 |
| 2038 | tCO2-e/MWh | 0.29 |
| 2039 | tCO2-e/MWh | 0.28 |
| 2040 | tCO2-e/MWh | 0.23 |
| 2041 | tCO2-e/MWh | 0.2 |
| 2042 | tCO2-e/MWh | 0.17 |
| 2043 | tCO2-e/MWh | 0.19 |
| 2044 | tCO2-e/MWh | 0.22 |
| 2045 | tCO2-e/MWh | 0.24 |
| 2046 | tCO2-e/MWh | 0.24 |
| 2047 | tCO2-e/MWh | 0.22 |
| 2048 | tCO2-e/MWh | 0.22 |
| 2049 | tCO2-e/MWh | 0.22 |
| 2050 | tCO2-e/MWh | 0.25 |

## Carbon values

Like in the previous RIS, the trajectory of ‘carbon values’ is based on scenarios in the Intergovernmental Panel on Climate Change’s (IPCC’s) Sixth Assessment Report (2022) that are consistent with the Paris Agreement, decided by the international community in 2015, to “hold the increase in global average temperature to well below 2°C and to pursue efforts to limit the temperature increase to 1.5°C”. The series is also consistent with the estimated costs of meeting Victoria’s climate goals, as modelled by DEECA for [analysis supporting Victoria’s 2035 emissions reduction target](https://www.climatechange.vic.gov.au/__data/assets/pdf_file/0032/635594/Victorias-2035-Climate-Target-Supporting-Analysis.pdf). (Source: Department of Energy, Environment and Climate Action. Victoria’s 2035 Emissions Reduction Target Supporting Analysis (2023). Retrieved from [https://www.climatechange.vic.gov.au/\_\_data/assets/ pdf\_file/0032/635594/Victorias-2035-Climate-Target-Supporting-Analysis.pdf](https://www.climatechange.vic.gov.au/__data/assets/%20pdf_file/0032/635594/Victorias-2035-Climate-Target-Supporting-Analysis.pdf)). Victoria is delivering its share of global action to achieve the Paris Agreement goal through the *Climate Change Act 2017*. This includes establishing a process to develop emission reduction policies (sector pledges) and committed greenhouse gas emissions reduction targets of:

* 28–33% below 2005 levels by 2025,
* 45–50% below 2005 levels by 2030,
* 75–80% below 2005 levels by 2035 and

Net zero emissions by 2045.

This IPCC trajectory assumes global action is taken to keep global temperature rise to well below 2°C and is maintained out to 2100.  It is derived from the median of costs of abatement that has been assessed by the IPCC as necessary to provide a 50% chance of returning global temperature increases to 1.5 degrees Celsius by 2100, after ‘overshooting’ – Scenario C2 in Figure 3.32, Working Group III Full Report. (This means it is a ‘targets-based’ or ‘targets-consistent’ valuation, not a ‘social cost of carbon’).

The carbon values (see Table 31) were converted into Australian dollars for the relevant year using an annual average of daily exchange rates and then escalated to current values using the historical consumer price index (CPI) series, both sourced from the Reserve Bank of Australia. (Source: Reserve Bank of Australia, Historical Data. Retrieved from <https://www.rba.gov.au/statistics/historical-data.html>).

A straight line was used to connect each data point and calculate a value for each year.

Table 31: Carbon pricing values, Australian dollars 2025 value

| Year | $AUD2025/tCO2 (FY) |
| --- | --- |
| 2026 | 124 |
| 2027 | 131 |
| 2028 | 137 |
| 2029 | 143 |
| 2030 | 150 |
| 2031 | 163 |
| 2032 | 177 |
| 2033 | 190 |
| 2034 | 204 |
| 2035 | 217 |
| 2036 | 231 |
| 2037 | 244 |
| 2038 | 258 |
| 2039 | 271 |
| 2040 | 285 |
| 2041 | 298 |
| 2042 | 312 |
| 2043 | 325 |
| 2044 | 339 |
| 2045 | 352 |
| 2046 | 366 |
| 2047 | 379 |
| 2048 | 393 |
| 2049 | 406 |
| 2050 | 420 |
| 2051 | 442 |
| 2052 | 463 |
| 2053 | 485 |
| 2054 | 506 |
| 2055 | 527 |
| 2056 | 549 |
| 2057 | 570 |
| 2058 | 592 |
| 2059 | 613 |
| 2060 | 635 |
| 2061 | 650 |
| 2062 | 666 |
| 2063 | 682 |
| 2064 | 698 |
| 2065 | 714 |
| 2066 | 730 |
| 2067 | 745 |
| 2068 | 761 |
| 2069 | 777 |
| 2070 | 793 |
| 2071 | 837 |
| 2072 | 882 |
| 2073 | 926 |
| 2074 | 970 |
| 2075 | 1015 |
| 2076 | 1059 |
| 2077 | 1104 |
| 2078 | 1148 |
| 2079 | 1193 |
| 2080 | 1237 |
| 2081 | 1288 |
| 2082 | 1340 |
| 2083 | 1391 |
| 2084 | 1442 |
| 2085 | 1494 |
| 2086 | 1545 |
| 2087 | 1596 |
| 2088 | 1648 |
| 2089 | 1699 |
| 2090 | 1750 |
| 2091 | 1821 |
| 2092 | 1893 |
| 2093 | 1964 |
| 2094 | 2035 |
| 2095 | 2106 |
| 2096 | 2177 |
| 2097 | 2248 |
| 2098 | 2319 |
| 2099 | 2391 |
| 2100 | 2462 |

## Financial transfer input and assumptions

### Financial transfers related to gate fee and waste levy revenues

Similar to the previous RIS’s approach, the current RIS’s model uses a simplifying assumption about the gate fee.

The gate fee value of $237/tonne considers the increase by 28% of waste levy rate from $132.76/tonne (before 1 July 2025) to $169.79/tonne (from 1 July 2025 onwards). Gate fee is kept comparable for landfill and WtE operators with the assumption that these two groups compete for the volume of waste to process. The constant gate fee enables straightforward estimations as it is difficult to make assumptions on how gate fees might change year-on-year. In reality, the value of gate fee will change following the increases in waste levy rates over the years. It is challenging to predict the rate of change for gate fees. However, landfill operators are expected to transfer the higher cost of waste levy onto the landfill gate fee but keep it comparable with the gate fee charged by WtE facilities as the two sectors are effectively in competition for residual waste. The distributional effects of these financial transfers between WtE and landfill operators will largely remain in the same proportion.

The previous RIS examined the financial transfers amongst the landfill sector, the recycling sector, the WtE sector, the energy generation sector and the Victorian Government and observed that the net total of those transfers was zero, providing no impact on the results of the CBA. The current RIS considered the three main sectors (landfill operators, WtE operators and the government) and found the same conclusion. The net impact is zero, with losses experienced by landfill operators, who now have less gate fee revenue and produce less electricity to the grid, offset by gains in gate fee revenue and more electricity produced to the grid by WtE operators.

### Financial transfer of electricity generation by WtE and other generators

The electricity produced by WtE substitutes the electricity that would otherwise be generated by other generators such as coal, gas and renewables plants.

The electricity generation by WtE in the two cap scenarios relative to the base case is estimated in Table 32 over the modelling period by DEECA Emission Analysis:

Table 32: Electricity generation by WtE (in MWh) relative to the base case

| Year | Mt Per Annum – NEM KWh | 3 Mt Per Annum – NEM MWh |
| --- | --- | --- |
| 2038 | 0 | 0 |
| 2039 | 235,772 | 235,772 |
| 2040 | 470,991 | 470,991 |
| 2041 | 471,717 | 616,621 |
| 2042 | 471,658 | 664,333 |
| 2043 | 471,605 | 711,779 |
| 2044 | 471,563 | 759,559 |
| 2045 | 471,360 | 808,120 |
| 2046 | 471,170 | 857,167 |
| 2047 | 471,312 | 903,481 |
| 2048 | 471,258 | 942,515 |
| 2049 | 471,206 | 942,412 |
| 2050 | 471,163 | 942,327 |

The current RIS’s model assumes a constant spot price of $80.11 based on the average Victorian spot price monitored by the AEMO over the last 12-month period (see Table 33). The increase to the cap limit is expected to have minimal impact on the electricity price trajectory, given that the electricity price is often determined by major electricity generators such as brown coal, gas and renewables, and WtE facilities are expected to represent only a small part of Victoria’s overall energy system (producing 1-5%-6% of total Victorian electricity consumption).

Table 33: Victorian spot energy price, AEMO

| Month/Year | Region | Average RRP ($/MWh) |
| --- | --- | --- |
| Jan-24 | VIC | $22.10 |
| Feb-24 | VIC | $82.94 |
| Mar-24 | VIC | $51.99 |
| Apr-24 | VIC | $84.80 |
| May-24 | VIC | $132.97 |
| Jun-24 | VIC | $164.23 |
| Jul-24 | VIC | $149.14 |
| Aug-24 | VIC | $143.40 |
| Sep-24 | VIC | $17.39 |
| Oct-24 | VIC | $20.36 |
| Nov-24 | VIC | $64.08 |
| Dec-24 | VIC | $52.25 |
| Jan-25 | VIC | $55.82 |
| 12-month avg | VIC | $80.11 |

The value of electricity generation by WtE in the two cap scenarios is provided in Table 34 below:

Table 34: Value of electricity generation by WtE (in MWh) relative to the base case

| Year | 2.5 Mtpa - NEM | 3 Mtpa - NEM |
| --- | --- | --- |
| 2025 | $ - | $ - |
| 2026 | $ - | $ - |
| 2027 | $ - | $ - |
| 2028 | $ - | $ - |
| 2029 | $ - | $ - |
| 2030 | $ - | $ - |
| 2031 | $ - | $ - |
| 2032 | $ - | $ - |
| 2033 | $ - | $ - |
| 2034 | $ - | $ - |
| 2035 | $ - | $ - |
| 2036 | $ - | $ - |
| 2037 | $ - | $ - |
| 2038 | $ - | $ - |
| 2039 | $18,888,399 | $18,888,399 |
| 2040 | $ 37,732,524 | $37,732,524 |
| 2041 | $ 37,790,669 | $49,399,443 |
| 2042 | $ 37,786,004 | $53,221,749 |
| 2043 | $ 37,781,720 | $57,022,785 |
| 2044 | $ 37,778,394 | $60,850,614 |
| 2045 | $ 37,762,094 | $64,740,978 |
| 2046 | $ 37,746,869 | $68,670,309 |
| 2047 | $ 37,758,267 | $72,380,651 |
| 2048 | $ 37,753,904 | $75,507,807 |
| 2049 | $ 37,749,751 | $75,499,502 |
| 2050 | $ 37,746,342 | $75,492,685 |

In the CBA, the financial transfer is positive for WtE operators and negative for other generators. By processing more permitted waste as additional capacity is added under the two cap scenarios, WtE operators produce more electricity and therefore displace more electricity otherwise generated by other generators. The scale of transfer between WtE operators and other generators is assumed to be directly proportional.

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# Publication information

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We acknowledge and respect Victorian Traditional Owners as the original custodians of Victoria’s land and waters, their unique ability to care for Country and deep spiritual connection to it.

We honour Elders past and present whose knowledge and wisdom has ensured the continuation of culture and traditional practices.

DEECA is committed to genuinely partnering with Victorian Traditional Owners and Victoria’s Aboriginal community to progress their aspirations.

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