Submission to Victorian State Government
Inquiry into proposed Waste to Energy facilities

12th March 2026

O.C.O Technology Australia Pty Ltd

Background

O.C.O Technology (O.C.O) were founded in 2010 following more than 20 years of award-winning university research and are part of the Grundon Waste Management Group (the largest privately owned waste management company in the UK). O.C.O employ over 100 staff across 3 production sites and 2 aggregate processing sites in the UK located in Yorkshire, Bristol and Norfolk. Due to increased customer demand in the UK, investment continues with expansion of two sites to increase production capacity with a 4th production site imminent.

O.C.O has developed a Carbon Capture and Utilisation (CCU) process to treat and stabilise thermal residues, and in turn valorise them into sustainable carbon negative construction products.

O.C.O Technology Australia Pty Ltd is a fully owned subsidiary of O.C.O International Ltd, part of the O.C.O Technology Group. The aspiration of O.C.O is to bring our technology to Australia for the treatment of industrial wastes, our niche market being the treatment and recovery of Air Pollution Control residues (APCr) from Waste to Energy (WtE) facilities.

As well as operating in the UK, we are currently in build with our first facility in Spain in a Joint Venture with Petronor, part of the Repsol Group of companies, the largest oil and gas business in Spain. The Project achieved funding from the EU Innovation Fund which promotes the funding of projects aimed at reducing Green House Gas emissions. The Joint Venture will use captured carbon dioxide (CO_2) from processes operated by Petronor. In Japan we have a licence agreement with Kobelco Eco Solutions with a pilot plant in operation and a commercial plant in build. In Japan our facilities will utilise the CO_2 direct from flue gases to treat thermal residues.

The company is a waste valorisation technology provider, offering an innovative and patented process called Accelerated Carbonation Technology (ACT). Many lime-based wastes react naturally with CO_2. If the conditions are carefully controlled, this natural reaction can be accelerated, taking place in minutes rather than years. This results in the formation of calcium carbonate (limestone).

Larkshall Mill, Thetford Road, East Wretham, Norfolk IP24 1QY
+44 (0)1953 573111 - info@oco.co.uk - oco.co.uk

Our niche market for the ACT process is the treatment of APCr, also known as Flue Gas Treatment residues (FGTr), from WtE plants; this forms about 85-90% of the wastes we treat. However, many other industrial wastes and by-products can also be treated in this way, e.g. fly ash from coal, steel slags, cement kiln dust and other mining wastes and residues.

Further detail on our technology is provided as 'Supplementary Information' attached to this submission.

Introduction

Our interest in this Victorian State Government Inquiry into WtE is as follows:

- To support the use of WtE technology for the treatment of residual waste and the recovery of energy and construction products as part of the integrated waste management infrastructure required by Victoria.
- to ensure that the inquiry does not automatically assume that APCr is a 'toxic' (words used by those that do not support WtE) residue whose only means of treatment is to a specialist hazardous waste landfill.
- to illustrate that WtE with the combined recovery of Incinerator Botton Ash (IBA) and APCr can provide a fully 100% landfill free option and contribute to the circular economy, contrary to some commentator's beliefs.
- that EPA Vic continues to support the re-use of treated APCr as a resource recovery activity.

In terms of our activity in Victoria, we are currently in discussions with several potential WtE developers and have had detailed discussions with EPA Vic, Sustainability Vic and Recycling Vic, having provided them with detailed information on our process and product.

We are in the final processes of site selection for an ACT Facility along with discussions for an offtake agreement for the manufactured aggregate. We have invested significant time and money to date with WtE developers, regulators and customers. Our technology is seen as essential with no long-term landfill option for the APCr within Victoria.

We discuss below what we see as pivotal in regulatory changes to enable a better outcome for WtE and to allow innovative businesses to have confidence to develop within Victoria.

Submission

The Terms of Reference (ToR) for this Inquiry, although succinct, are far ranging. It is not proposed to address all issues in this submission. WtE technology providers and operators will be far better placed to do that than O.C.O.

Our submission will therefore only focus on (1) (b), *'annual caps on waste that can be used in thermal WtE processing* and (2) (b) *'the impact of WtE, including from (b) nature and management of emissions, waste and* ***ash byproducts****.'* (our emphasis).

(1)(b) Annual Caps

The issue on annual caps has been subject to public consultation many times through Recycling Victoria (RV). O.C.O have always advocated for no Cap as the investment required for a WtE facility cannot be made without a secure waste feed and consequently are not built on an ad hoc basis. Long term, 25 years waste supply has to be proven even after considering likely recycling initiatives, diversion of waste streams and the legitimate aim to reduce waste per capita. In addition, customers of WtE facilities will want to divert waste to cheaper recovery options rather than commit to supplying waste to an WtE, which is more expensive.

The strong 'permissible waste' regime being adopted in Victoria following TEEP, will ensure that recyclable materials are not delivered to the WtE facilities. The safeguards are there in the market and through existing regulation to avoid a scenario many put forward, where developing WtE will mean reduced recycling or recovery.

It is therefore sensible (waste levy aside) to leave the market to decide whether to invest in WtE as a final recovery facility for residual wastes. Restricting WtE will only increase the need for more landfill. Residual waste will remain an issue for many decades as shown by Recycling Victoria's own assessments, and it is naive to believe we can recover everything from the waste stream.

It is fully understood why the Cap was introduced. However, the complications this creates in an already high-risk industry (regulation, contracts, finance etc) is significant.

Part of the justification for developing the Cap is to provide policy certainty to the WtE industry and investors. Unfortunately, it may have the opposite impact. To reach Financial Close investors need certainty, however significant investment is needed to not just to build the facilities but also to acquire land, obtain permits and regulatory approvals, confirm waste contracts and then ultimately to reach financial close. All prior to starting the build. If after investing heavily prior to build, there is still a risk that the Cap License could be at withdrawn or altered (due to unforeseen delays) then Financial Close may also be at risk.

Already significant delay is seen in the development of WtE plants in Victoria, not because of the Cap but if proposed WtE facilities that do not reach development, the Cap will further delay entry for others.

Developing WtE facilities is a high-risk enterprise. Consequently, many do not get past the initial feasibility stage. This may have impacts in respect of the Cap licencing scheme:

- The Cap concept may hinder entry into the WtE market as significant costs are likely to be incurred prior to receiving another regulatory approval (the cap licence) for the waste inputs.
- Secondly, a cap licence may be issued to one proposal that subsequently fails to get to Financial Close, which can take many years to achieve as it requires all approvals, waste contracts and lending to be in place. This may then have created a lost opportunity to develop another proposal.

- Failed proposals may unintentionally block proposals that perhaps simply lagged on readiness for the Cap Application.
- Equally more 'un-fundable' technologies or proposals may block technologies that are proven and fundable.

In setting a Cap, the further unforeseen consequences should also be appreciated. All business operations need to have economies of scale. The waste industry is no exception. The presumed assumption underlying the Cap is that there will be landfill capacity in order to fill the gap between WtE capacity and actual residual waste arisings. Government and their agencies should therefore also look at landfill capacity and the social and environmental acceptability of landfill when considering promotion of a working residual gap. The Cap designs into the market a residual deficiency, which landfill will have to cater for.

WtE should be seen as part of the overall waste management structure, not in isolation. The technology can form an essential part of the waste management infrastructure, reducing greenhouse gas emissions and providing input into the circular economy with the recovery of energy, metals, use of Incinerator Bottom Ash Aggregates (IBAA) and recovery of APCr for use in the construction market.

Landfill is an outmoded form of waste management, albeit it has a role to play in the wider waste management infrastructure. However, for residual waste that can be treated through WtE it should be avoided as much as possible. WtE has significant carbon advantages over landfill, with methane created by landfilled waste being 25-35 times more potent greenhouse gas than CO_2, and although it has a shorter life than CO_2, when it breaks down it produces CO_2.

(2) (b) Nature and management of emissions, waste and ash byproducts

The reason O.C.O feel this submission is important, is because there is a significant amount of misinformation on WtE and the impacts. Some of this is the creation of residues, and for this submission, specifically the APCr – or fly ash and boiler ash.

Prior to the flue gasses being released to atmosphere, modern WtE facilities use flue gas treatment processes to ensure they can adhere to the strict limits in emission operating permits, a standard approach across the world. There are several technologies available but thus far the type being adopted in Australia, and proven around the world, is known as a semi dry scrubber. This involves the injection of lime and activated carbon into the flue gasses, which allows particulates and contaminants to be removed from the flue gas. This lime and activated carbon are then retrieved in fine mesh bag filters. The resultant lime-based powder is known as APCr, and it is that which O.C.O treat and use to manufacture carbon negative aggregate (see Supplementary Information for detail on this process).

Again, such processes will no doubt be described in detail in submissions to the Inquiry by those that operate, supply and build such technologies.

This submission is focussed on the by-product from this flue gas clean up and how that is perceived; along with how it can be treated positively and used to mitigate carbon and use of

virgin raw materials in the construction industry. O.C.O believe it is important that those considering WtE in Victoria understand and appreciate that the residues can and are used in a socially and environmentally positive way. APCr should not be considered as a 'toxic' by-product, but something that can be promoted as a positive 'circular economy' outcome from the WtE process.

Allowing by-product recovery through internationally recognised treatment and processes will be a crucial part of the economics of the WtE facilities. Landfill is not sustainable, is costly and is certainly not promoting the circular economy. Indeed, in Victoria, by the time WtE is developed there will be no permitted landfill that can except this waste.

APCr is considered hazardous, mainly due to its high pH (lime) and some elevated free moving heavy metal content. It is comparable, however, to cement which is socially accepted as it is a product, not a waste. However, APCr is often labelled 'toxic', consequently it has been used by those opposed to WtE as one reason to avoid the use of WtE as a waste management tool.

End of Waste

Under UK and European law, a manufacturer of a product made from a waste can apply for 'End of Waste'. This is essentially an application to the regulators which allows an assessment of the proposed product allowing the regulator to provide an opinion that the product is no longer to be defined as waste, even though it was manufactured from waste.

O.C.O achieved this status for M-LS in the UK from the Environment Agency in 2011, and from the Basque Regional Government in Spain in 2024.

Our facility in the Southwest of the UK was pleased to welcome a visit from Sir James Bevan, the Chief Executive Officer of the Environment Agency in the UK. He was keen to see a process that had been given 'End of Waste" status and to find out more about O.C.O. We would draw your attention to the quote from Sir Bevan following his visit about our process and facility:

"The Environment Agency's 'End of Waste' approval is rare and well deserved".

https://oco.co.uk/environment-agency-ceo-visits-o-c-os-avonmouth-facility/

(also reproduced at the end of this submission)

We are proud to have received this endorsement from the head of the regulatory authority in the UK and believe this provides further credibility and endorsement to our process and product.

We are about to start the end of waste application process in Queensland having had a very positive initial meeting with DETSI. We anticipate submitting our application this year, ready for the development of the City of Gold Coast's ARRC.

End of Waste (or similar status) is important, as it allows the M-LS product to be sold into a market with confidence of that market and it allows investment into innovative technologies.

Issues impeding recovery of waste by products

It is understandable that the waste framework in Victoria does not specifically refer to the recovery of APCr or indeed IBA. The materials were not understood or perhaps even known at the time the framework was drafted, and even if they were, their recovery routes were not appreciated.

Initially in Victoria we were told that our M-LS product could be assessed and under a 'Designation' which essentially would define our M-LS product as an 'industrial waste' rather than a 'Reportable Priority Waste' or Hazardous waste. After consideration of the Designation application, EPA Vic advised us that this route was not suitable. Instead, they suggested an A16 Permit.

An A16 permit would label our M-LS product as a 'Reportable Priority Waste'. The consequence of this is that despite the M-LS not being hazardous it would remain carrying the 'hazardous' label. This would be commercially unacceptable, making recovery virtually impossible. The construction industry is very conservative, and any new product is met with suspicion. It is therefore an industry that applies caution to any new product, especially a manufactured product. Having the product then labelled as 'hazardous' would mean it would be impossible to sell or even give away.

In this framework pathway process the waste definition in the Environmental Protection Act 2017 was considered. This states:

waste includes any of the following—

> *(a) matter, including solid, liquid, gaseous or radioactive matter, that is deposited, discharged, emitted or disposed of into the environment in a manner that alters the environment;*
> *(b) a greenhouse gas substance emitted or discharged into the environment;*
> *(c) matter that is discarded, rejected, abandoned, unwanted or surplus, irrespective of any potential use or value;*
> *(d) matter prescribed to be waste;*
> *(e) matter or a greenhouse gas substance referred to in paragraph (a), (b), (c) or (d) that is intended for, or is undergoing, resource recovery;*

Clearly from this a non-hazardous manufactured product, despite having one ingredient as a recovered or treated waste, does not fit the definition if it is manufactured for a specific market and can be sold and used.

First hurdle in the regulations is that such matters and definitions are simply not clear. They require interpretation and as such open to legal challenge or scrutiny. Equally regulators tend to be cautious, which ends up with the route of least resistance being taken.

This is where the waste framework is lacking, there is nothing allowing a product to gain 'End of Waste' status such as in the UK, Europe and in Queensland. Logically there should be a specified route for such situations in Victoria. We would urge the Inquiry to consider a review of the framework to include 'end of waste' as an option to deliver resource recovery. Such a framework adjustment would provide

the regulators, industry, customers and the public with comfort that the products with 'end of waste' have been verified not to cause harm to human health or the environment.

Conclusions

First, we support a positive outcome for the WtE industry from this review. Waste to Energy is a safe and effective tool in managing waste and avoiding landfill. It can also be 100% landfill free if regulation allows.

Secondly, we would urge the Inquiry to initiate a review of the Waste Framework to incorporate an 'End of Waste' concept, allowing processes that use waste in their manufacturing process to be able to market their product, once found by the EPA to be sound and acceptable in terms of risk and use.

If the Victorian Government is serious about the circular economy and encouraging re-use and the reduction in use of raw virgin materials, this is an easy win and shows a commitment to opening pathways for re-use, in a structured and regulated fashion.

Kind Regards

Andrew Short
Director of Project Development ANZ
[redacted]

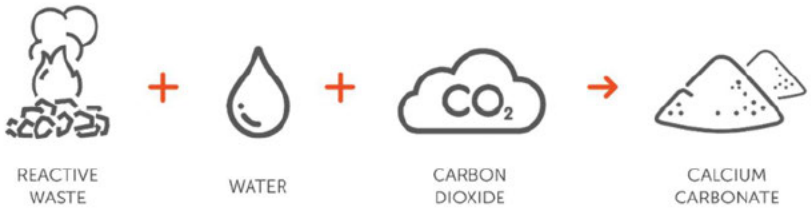
Supplementary Information

O.C.O's APCr Treatment Process

The following is provided simply to illustrate to the Inquiry the processes involved in recovery of the APCr and the benefits it provides socially, economically and in delivering the circular economy.

ACT is a genuine Carbon Capture and Utilisation (CCU) technology, allowing significant volumes of carbon dioxide to be permanently captured as stable carbonates. The ACT process allows industrial wastes such as APCr to be treated creating a carbon negative aggregate that can then be used in the construction industry.

The basic reaction within the ACT is shown in figure 1 below.



F[redacted]e ACT process

C[redacted]acilities in the UK, which combined have a processing capacity o[redacted]ste, in turn able to manufacture up to 750,000 tonnes of n[redacted] each year, resulting in a reduced need to quarry virgin aggregates, a true circular economy and recycling solution for difficult to handle residues.

The process for converting waste residues into M-LS contains multiple stages. Typically, the delivered APCr is pumped into a reception silo. The APCr is extracted from the storage silos and conveyed to a specialist mixer, where it is initially homogenised and then reacted under positive [redacted] and water. The CO_2 reacts with lime (calcium oxide or calcium hydroxide) and other salts in the residues to form calcium carbonate commonly known as limestone.

The carbonated waste is then blended with binders and fillers to produce the correct mix for pelletising into our sustainable aggregate, known as Manufactured LimeStone (M-LS). The process is illustrated in the schematic at Figure 2 below.

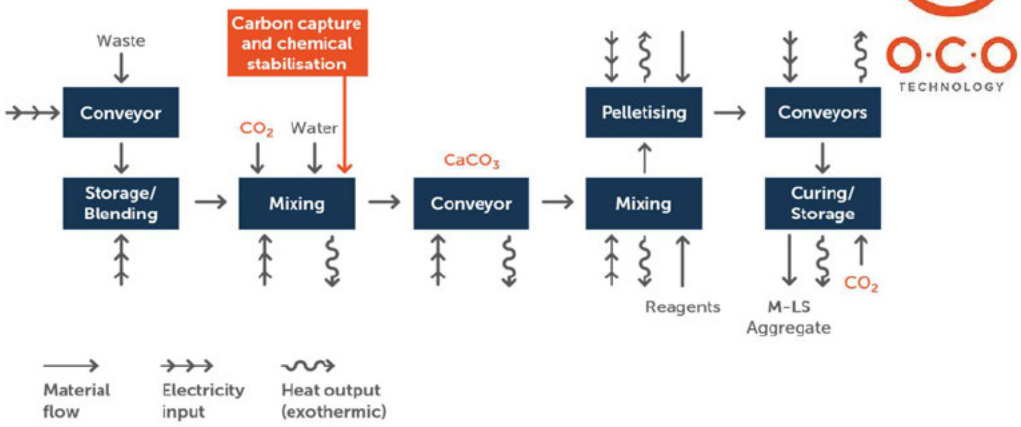


Figure 2 - Schematic of the ACT process

No wastes or by-products are generated from the manufacture of M-LS. 100% of the APCr accepted into our facilities is recycled and diverted from landfill and all process water is absorbed within the aggregate resulting in no contaminated waters being discharged to sewer or requiring additional treatment or disposal.

The energy, raw materials, waste and transport emissions are all taken into account in our approved life cycle assessment and Environmental Product Declaration (EPD) calculations.

These calculations for 2024 show that for every tonne of aggregate we produce in the UK there is a global warming potential value of negative 54kg CO_2e, the World's first carbon negative aggregate. This means that the process of manufacture emits less CO_2 than is absorbed during the aggregate's formation.

Using O.C.O's solution, the WtE industry has the option to recycle its residues, in an operation which is carbon negative and that produces a sustainable aggregate for the [redacted]try. With all the initiatives O.C.O [redacted]duce their own carbon footprint, we have been awarded and recognised by several organisations. These include, winning RoSPA's *International Dilmun Environmental Award, The Carbon Capture and Storage Award* at the UK National Sustainability Awards and one of our proudest accolades is achieving the King's Award for Enterprise in the category of Sustainable Development in 2024.

Founder and CEO of O.C.O Steve Greig meets King Charles III at awards presentation

The King's Award for Enterprise is an awards programme for British businesses and other organisations who excel at international trade, innovation, sustainable development or promoting opportunity through social mobility. They are the highest official UK awards for British businesses. The scheme was established as The Queen's Award to Industry by a royal warrant of 30 November 1965, and awards are given for outstanding achievement in each category.

Carbon and M-LS Benefit

M-LS can be used as a substitute for natural aggregate in a wide variety of applications. The aggregate is predominantly used in masonry, earthworks, pavements, concrete, and asphalt.

Successful trials have been undertaken using our M-LS material by two National Australian block makers, as well as with recycled aggregate producers and an asphalt producer.

M-LS offers a number of universal benefits:

- Carbon capture. M-LS is certified as carbon negative with a global warming potential value of minus 54kg CO_2e/tonne. This has been calculated according to the methodology defined in BS EN 15804 and ISO14064; verified by an accredited third party (EPD Hub).
- Preservation of natural resources. Each tonne of M-LS negates the need to extract 1.4 tonnes of natural limestone.
- Diverting waste from landfill. M-LS valorises thermal residues from industrial processes, which would otherwise be sent to landfill.
- Consistency. M-LS is manufactured to an exact standard, and product performance is constantly maintained.
- Adaptability. The properties (strength, density, particle size) of M-LS can be adapted to suit specific applications.
- Lightweight. M-LS is around 25% lighter than natural limestone, which helps to reduce haulage and improve yield without impacted product strength.

ENVIRONMENT AGENCY CEO VISITS O.C.O'S AVONMOUTH FACILITY

22nd August 2022

Sir James Bevan, Chief Executive Officer of the Environment Agency, visited O.C.O Technology's Avonmouth facility on Wednesday (August 17).

The two-hour visit gave him the chance to see the company's world-leading Accelerated Carbonation Technology (ACT) in action and talk to its experts about future developments in the fight against climate change.

O.C.O's ACT uses carbon dioxide gas to treat and valorise a wide range of wastes, including Air Pollution Control residues (APCr) from the Energy from Waste sector, turning it into carbon negative aggregate – called Manufactured Limestone (M-LS).

Because more CO_2 is permanently captured than is used in the manufacturing process, it has been recognised as the world's first carbon negative aggregate and is increasingly sought after as a sustainable building material.

Speaking afterwards, Sir James said: "What O.C.O Technology delivers as a company is truly innovative: a technique of capturing carbon that turns hazardous waste into a non-hazardous resource in a process that is net carbon negative.

"The Environment Agency's 'End of Waste' approval is rare and well deserved. I look forward to developing our relationship further to support the delivery of UK Net Zero targets."

O.C.O's Managing Director, Steve Greig, hosted the visit alongside fellow directors Clayton Sullivan-Webb (also Managing Director of Grundon Waste Management) and Non-Executive Director Stephen Roscoe.

Steve said: "We were very pleased to welcome Sir James and his EA sustainability team colleagues to Avonmouth.

"It was an opportunity for them to see first-hand how our innovative processes turn hazardous waste materials, which would otherwise have been sent to landfill, into an award-winning carbon negative aggregate, with the power to make significant CO_2 savings versus more traditional building materials.

"We had a number of wide-ranging discussions on topics including the potential for using M-LS in future EA projects, O.C.O's ongoing development plans, and our trials of new materials.

"We already have a very positive working relationship with the EA, further strengthened by this visit, and we thank Sir James for his encouraging comments."

Last year (2021), a project involving O.C.O's M-LS earned top honours in the Towards Net Zero category of the Environment Agency Flood & Coastal Excellence Awards.

The M-LS was a key component in a groundbreaking low carbon asphalt mix used in the construction of a low carbon cycle path, built for Birmingham City Council as part of the Bromford Flood Alleviation Scheme.

O.C.O was one of a number of supply chain partners brought together by Jackson Civil Engineering on the building project for the Environment Agency. At the time, the award judges said the use of carbon negative aggregate on the flood defence cycle scheme was "a great step forward in the right direction and could be transformational if applied to flood schemes more extensively in the future".

Estimates showed that the 2.5km new low carbon foamed asphalt path could deliver CO_2 savings of more than 70 tonnes – equal to a 90% reduction – compared with using a traditional hot AC20 asphalt mix.

Pictured left is Sir James Bevan, CEO of the Environment Agency, taking a closer look at O.C.O Technology's world-leading carbon negative aggregate. Alongside him is O.C.O's Lee Thompson, Health, Safety, Environment and Quality (HSEQ) Manager.