Greater South East Net Zero Hub

CREMATORIA DECARBONISATION TOOLKIT

www.gsenetzerohub.org.uk

Published August 2025

Contents

Legal Disclaimer

Introduction

The toolkit provides practical guidance for the public sector on reducing carbon emissions from crematoria by utilising currently available technologies and promoting the adoption of energy efficiency measures. Decarbonising the public sector estate presents a unique set of challenges due to the diversity, age, and operational requirements of its facilities. Within this context, crematoria are often among the highest carbon-emitting assets in local authority estates, primarily due to their energy-intensive operations and reliance on fossil fuels.

Recognising this, the toolkit has been developed to consolidate existing guidance, resources, and case studies into a single, accessible resource. It highlights the real-world experiences of crematoria actively working towards decarbonisation, including the technical, financial, and regulatory challenges they have encountered along the way. By sharing these insights, the toolkit aims to support local authorities and other public sector bodies in reducing the environmental impact of their crematoria while maintaining service quality and compliance with regulatory obligations.

Hemel Hempstead Crematorium[1]

[1] West Herts Crematorium. *New Crematorium Project Overview*. Accessed July 2025. https://westhertscrem.org/new-crematorium/

Background

The UK bereavement industry is valued at approximately £2.5 billion annually, with cremation accounting for around 78% of all funerals [2]. As of 2024, there are 334 crematoria in operation across the United Kingdom [3], collectively processing over 550,000 cremations each year. Currently, over 99% of cremators in the UK are powered by gas, primarily natural gas or liquified petroleum gas (LPG) with only a few capable of using both gas and liquid fuels. A standard gas-powered cremation in the UK is estimated to produce approximately 126 kg of carbon dioxide equivalent (CO_2e) emissions per cremation [4].

In response to rising climate concerns and the UK's legally binding net zero targets, there is growing interest in low-carbon alternatives to traditional gas cremation. Electric cremators, which can be powered by renewable energy sources, offer the potential for significantly lower operational emissions. A small number have been installed in the UK, typically as part of pilot projects or facility upgrades. Other emerging technologies include bio-LPG, hydrogen fuel, and resomation (alkaline hydrolysis), although these remain at early stages of adoption and are subject to regulatory, infrastructure, and public acceptance challenges. As local authorities and operators plan for long-term sustainability, transitioning to low-carbon technologies will play a key role in reducing the environmental impact of cremation services.

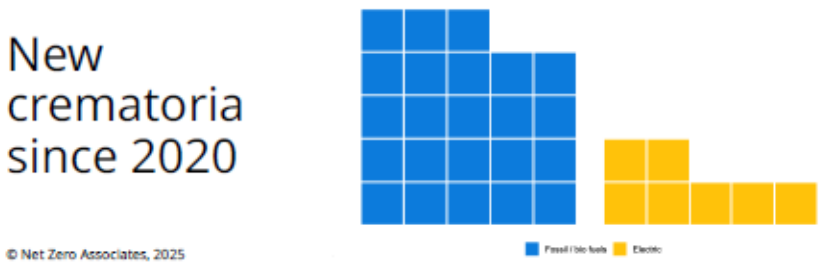

Fig 1: Through Net Zero Associates, indicates a push towards more sustainable or environmentally friendly alternatives in cremation practices

Environmental and Operational Impacts of Gas Cremators

Gas cremation relies on the combustion of natural gas at temperatures exceeding 800°C around 13 times higher than a domestic boiler. This results in substantial energy demands just to reach and maintain operating temperature [5] [4]. Each 75-minute gas cremation emits an estimated 245 kg of CO_2 and 500 g of NOx, primarily from the combustion of natural gas [4].

[2] Environmental Stewardship Group. *Guidelines for Sustainable Design in Public Infrastructure*. 2021.
[3] The Cremation Society, 2024. Annual statistics report 2024
[4] Copeland, B. (2021). A comparison of gas and electric cremator emissions in the UK. 60c8c37551b02416cc429fa2_7637173_Dissertation.pdf
[5] DFW Europe B.V. (2025). *Electric cremator*. https://dfweurope.com/electric-cremator/

Gas cremators require both gas and electricity per cremation. At the start of each operating day, significant energy is needed to reach the Required Cremation Temperature (RCT). Notably, operational data from crematoria in the UK and Germany show that up to one-third of total fuel use may be spent reheating the cremator after overnight cooling particularly at the beginning of the week. This heat loss increases emissions, especially when scheduling is inefficient or utilisation is low.

It's important to distinguish combustion fuel emissions from emissions generated by the cadaver and coffin. For example, cremating the coffin and body emits around 14.3 kg of CO_2, compared to 12.6 kg from the natural gas itself [4]. In the UK, around 95% of coffins are made from chipboard or medium-density fibreboard (MDF), which are high in nitrogen due to adhesives [6]. When combusted, these materials contribute significantly to NOx emissions.

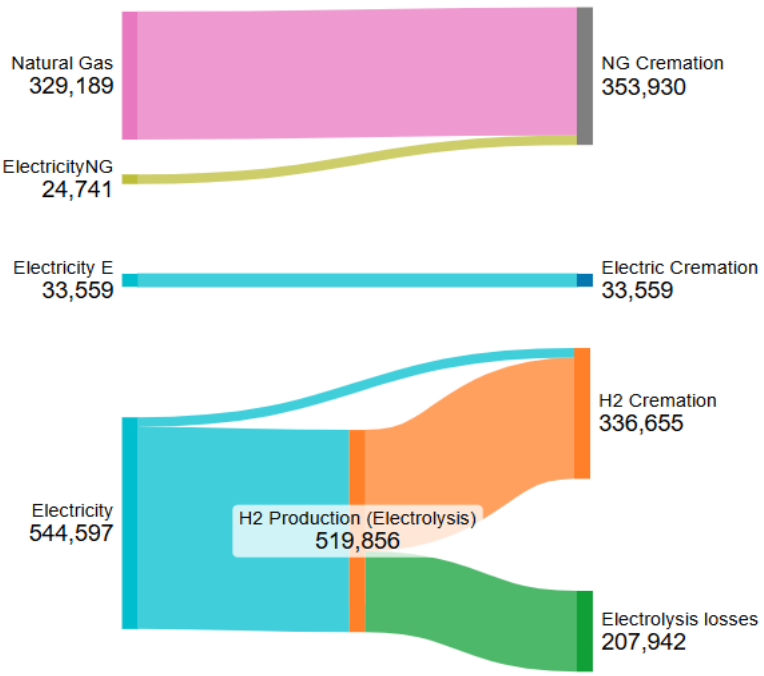

Fig 2: Comparing Energy Inputs for Cremation Technologies - Natural Gas, Electric, and Hydrogen [7]

This Sankey diagram, provided by Net Zero Associates, visualises the comparative energy input requirements for three cremation technologies: traditional **natural gas (NG)** cremation, **electric (E)**

[6] Piekarski, C. M., de Francisco, A. C., da Luz, L. M., Kovaleski, J. L., & Silva, D. A. L. (2017). Life cycle assessment of medium-density fiberboard (MDF) manufacturing process in Brazil. *Science of the Total Environment, 575*, 103–111. https://doi.org/10.1016/j.scitotenv.2016.09.190
[7] Shared by Abigail Dombey (Net Zero Associates Ltd.)

cremation, and **hydrogen (H_2)**-powered cremation. The width of each flow represents the relative amount of energy needed to complete a single cremation cycle.

- **Natural gas cremators** are currently the standard but have high direct CO_2 emissions and only moderate thermal efficiency. The gas cremation energy consumption has been found to be the highest on a Monday as the cremator has been idle over the weekend, the electricity consumption during cremation is typically 15kWh/hr, whereas at rest it is 1.75kWh/hr [4] [5].
- **Electric cremators** show improved energy efficiency, particularly when powered by low-carbon or renewable electricity. They require less total energy per cremation and have lower operational emissions.
- **Hydrogen cremators** offer zero emissions at the point of use, but the overall energy demand is significantly higher—primarily due to the electrolysis process used to produce green hydrogen. Electrolysis typically requires 3 to 4 times more input electricity compared to direct electric heating for cremation, due to conversion losses in splitting water into hydrogen and oxygen, followed by combustion.

This comparison underlines the need to assess the **whole energy system**, not just tailpipe emissions, when planning for low-carbon cremation technologies.

Variable	Natural Gas	Electric	Hydrogen
Real Data			
*Average duration of cremation (hours) **	2.6	2.0	2.5 ***
*Gas Consumption (kWh/year) **	2,363,550	N/A	2,239,510 ***
*Electricity Consumption (kWh/year) ***	225,230	152,270	225,230
Total Energy Consumption (kWh/year)	2,588,780	152,270	2,464,740
Design Conditions (supplied by DFW)			
Average duration of cremation (hours)	1.5	2.0	1.4 ***
Natural Gas Consumption (kWh/year)	1,965,830	N/A	1,862,670 ***
Electricity Consumption (kWh/year)	100,160	289,080	100,160
Total Energy Consumption (kWh/year)	2,065,990	289,080	1,962,823

** Refer to the Efficiency of Current Operations report for further details on NG cremations*

*** Electrical consumption was not independently logged during the hydrogen cremations, therefore real electrical data from NG cremations has been used.*

**** On average, hydrogen cremations are 4% faster and result in approximately 6% fuel savings due to combustion characteristics, based on real data. For further details, refer to the Hydrogen Efficiency Assessment Report.*

Table 1: Performance metrics for NG, E and H2 cremators (Adjusted for 3,523 cremations/year) [7]

Due to the lower initial cost of a gas cremator and lower running costs (up to 867 cremations per year), gas cremators are currently the most cost-efficient option. However, other factors such as cremator maintenance must also be considered. The fluctuating temperatures of gas cremators compared to the

electric cremators causes considerably more damage to the interior lining of the gas cremator. A typical gas cremator costs c. £12per cremation to reline as the re-lining is done periodically and the hearth costs c. £3,000 to replace after 2,000 cremations [4].

UK Crematoriums Using Electric Cremation Technology

Huntingdon Crematorium

Huntingdon Crematorium, operated by the Huntingdon Town Council, stands out as one first purpose-built, environmentally friendly crematoria, featuring two state-of-the-art electric cremators powered entirely by green energy tariffs. (electricity paid for is matched, in part or fully by energy produced from renewable sources). This design enables an extraordinary 90–95% reduction in carbon emissions per cremation compared to traditional gas-fired systems.

Each electric cremator is equipped with modern abatement systems to capture mercury and other emissions, ensuring compliance with environmental standards and enhancing local air quality. As a council-run facility, Huntingdon Crematorium has also pioneered software innovation in cremation management, partnering with *PlotBox* in 2022 to introduce a digital scheduling and prepayment system that streamlines operations and improves service accessibility.

Address: Sapley Road, Kings Ripton, Huntingdon, PE28 2NX

Supporting information:

- Crematorium & Cemeteries | Huntingdon Town Council
- Work is under way at new Huntingdon crematorium | The Hunts Post
- https://www.apse.org.uk/index.cfm/apse/news/articles/2022/pre-need-cremation-plans-for-huntingdon-as-they-partner-with-plotbox/

Hambleton Crematorium

In 2020, Hambleton District Council made a forward-thinking decision to install an electric cremator as part of its plan to build a new crematorium designed with sustainability at its core. The result was Maple Park Crematorium, situated near Thirsk, which officially opened in March 2022. This modern facility was designed to minimise carbon emissions from the outset, and features a single fully electric cremator that significantly reduces CO_2 output compared to traditional gas cremators. The choice of an electric system was driven by the council's commitment to climate responsibility and long-term environmental performance. Located within a peaceful 22-acre site, Maple Park incorporates energy-efficient infrastructure, including intelligent heat management systems that repurpose excess heat from the cremator to support the facility's overall comfort and energy use.

The cremator is supported by modern emission control systems, including mercury abatement, ensuring the site meets current air quality and environmental compliance standards. Although specific technical details of the cremator model remain undisclosed, Maple Park stands as a benchmark for new-build, low-

carbon crematoria across the UK. The project, constructed by Willmott Dixon and operated by the local authority, reflects a growing national shift toward electrification in funeral services.

Address: Hambleton Crematorium Maple Park, Skipton Bridge, Thirsk, YO7 4SA

Supporting information:

- Crematorium Maple Parc Hambleton Unique Asset In The UK
- Maple Park – Maple Park Crematorium

Rushcliffe Oaks

Rushcliffe Oaks is a purpose-built, environmentally conscious crematorium located between Nottingham and the Vale of Belvoir, set within nine acres of open countryside. As one of the first crematoria in the UK to fully embrace all-electric cremation technology, it serves as a model for carbon-neutral end-of-life care. The site operates under a Renewable Energy Guarantee of Origin (REGO) supply tariff and has been awarded the GGFS Trusted Crematorium Bronze Award for its dedication to sustainable practices and community-focused design.

The Ceremony Hall seats up to 128 people in its standard configuration and accommodates up to six services per day, each lasting approximately 60 minutes. A flexible lobby area can be opened to create a larger space capable of hosting over 200 guests. Additional amenities include a family room with live service streaming, a tranquil Flower Court, and a viewing lobby into the Crematory Hall for families requesting witnessed charges (up to 20 attendees).

Electric Cremator and Energy Management

Rushcliffe Oaks has installed a fully electric cremator, reducing CO_2 emissions by up to 85% compared to traditional gas cremators. The cremator operates on electricity sourced via a REGO-certified green tariff, with the site's electrical infrastructure bolstered by a new substation, funded as part of the grid reinforcement needed for the electric system. Waste heat from the cremation process is captured and reused to heat both the building and its water supply, enhancing overall energy efficiency. To ensure clean air and environmental compliance, the crematorium is equipped with a **mercury abatement system**, significantly reducing harmful emissions.

Renewables and Infrastructure

The facility integrates multiple renewable technologies, including a 25kW photovoltaic (PV) solar panel array that generates electricity year-round. All lighting is LED-based, with intelligent light sensors that adjust usage based on natural daylight and automatically shut off by 20.00 hours. The crematorium has an EV charging infrastructure in place and plans to expand it further to support green transport for both staff and visitors.

Sustainable Construction and Memorial Design

The crematorium building meets high environmental design standards and features a sedum green roof, which supports biodiversity and regulates building temperature. Over 30 bird species have been identified

on site, supported by the natural landscaping and habitat areas. Memorial structures throughout the grounds use locally sourced materials, such as Stanton Moor sandstone, reducing the carbon footprint associated with imported granite or marble.

Fig 3: Combined Hubs visit to the Rushcliffe Oaks crematorium in February 2025

Address: Main Road, Stragglethorpe, Nottingham, NG12 2PY

Supporting information: Rushcliffe Oaks Crematorium

Stonefall Crematorium

Stonefall Crematorium in Harrogate is notable as one of the earliest electric crematoria in the UK, having opened on 8 February 1937 and using electric cremation technology from the outset, an innovation that sets it apart from traditional gas-fired sites Although specific details about the current cremator model aren't publicly disclosed, the facility has retained its commitment to electric systems for over eighty years, highlighting an enduring operational preference for electricity over gas. This approach aligns with modern sustainability principles, as exemplified by providers like DFW Europe, whose electric cremators use approximately 85% less energy than gas units and ensure lower emissions, quieter operation, reduced thermal shock to brickwork, and potential for heat recovery. Stonefall operates over 1,650 cremations annually, maintaining continuous cremator readiness and efficient throughput in line with its historic electric

operations. Though newer electric systems offer enhanced metrics, Stonefall's long-standing electric legacy underscores a consistent commitment to clean, energy-efficient service.

Address: Stonefall Cemetery Wetherby Road, Harrogate HG3 1DE

Supporting information:

- Stonefall Crematorium in Harrogate | North Yorkshire Council
- https://www.northyorks.gov.uk/births-deaths-marriages/death/crematoria-and-cemeteries/stonefall-crematorium-harrogate

Lambeth Crematoriums

Lambeth Crematorium and Garden of Remembrance, established in May 1958, is located adjacent to Lambeth Cemetery and spans ten acres of landscaped, green spaces. It forms a core part of Lambeth Bereavement Services, which is widely recognised for its commitment to high-quality, dignified funeral and memorial services.

The crematorium holds **Silver accreditation for burial services** and **Gold for cremation services** under the ICCM (Institute of Cemetery and Crematorium Management) Charter for the Bereaved. In 2023, the team also won **Best Service Team for a Cemetery and Crematorium Service** at the APSE (Association for Public Service Excellence) Annual Service Awards.

Electric Cremator Installation and Transition

Lambeth Crematorium now operates a single electric cremator, supplied by DFW Europe, following the decommissioning of their previous gas cremator. The transition forms part of the Borough's commitment to sustainability and reducing emissions. Retrofitting the cremator involved substantial structural modifications, including access through the roof and installation of a new boiler and abatement system. The site was closed for three months during this installation, and all cremation services during this period were redirected to West Norwood Crematorium and an additional alternate facility. The electric cremator installation also required reconfiguration of internal layouts to accommodate the additional space needs of the system.

Technical Specification and Operation

The cremation process begins in the primary chamber, which reaches temperatures of 800–1000°C, where the coffin and body are initially cremated. Gases and particulates then move into a secondary (post-combustion) chamber, which operates at higher temperatures of 1,000–1,200°C, breaking down emissions and pollutants to meet stringent environmental compliance standards. Once complete, the remains are processed in the cremulator, which mechanically reduces the bone fragments to ash. The system is kept at a standby temperature of 650–700°C, allowing for rapid readiness and avoiding long daily warm-up times required by gas cremators (which typically needed 2 hours each morning).

On average, 5 to 6 cremations are carried out daily. The system includes a backup generator, ensuring that cremation services can continue without interruption in the event of a power failure. Maintenance is

provided by Combustion Solutions, with filter changes and servicing required approximately every 1,800 cremations. Unlike gas cremators, which often need full-system replacements after 40–50 years, electric cremators allow for modular maintenance. Individual components like the boiler, brickwork, and filters can be replaced separately, significantly extending the equipment's useful life and reducing operational disruption. The cremator is designed to handle a wide range of case types; however, cremations involving medical conditions such as tumours may require an additional 45 minutes in the electric system (compared to 20 extra minutes with gas systems), due to the different airflow and heat dispersion characteristics.

Automation, Monitoring, and Control

The cremator is operated via DFW's Operational Monitoring and Reporting (OMR) system, which features a modern touchscreen interface, remote temperature control, and real-time diagnostics. It allows for live monitoring and support from DFW's technical team in the Netherlands, minimising downtime and enhancing operational safety. Unlike gas cremators, which required constant manual monitoring and adjustments, the electric system's automation dramatically reduces the need for hands-on intervention and lowers the risk of user error. The automation system also helps maintain temperature stability, reducing material stress caused by thermal shock.

Staffing and Operational Roles

Thanks to the cremator's automation, staffing requirements during each cremation are minimal. Typically, one to two staff members are involved in each service: one to load the coffin using a manual trolley, and another to monitor the process via the OMR system after loading. The reduced need for constant supervision means more efficient use of staff time and lower fatigue risk, while still maintaining dignity and safety in each procedure. The cremator's design also reduces thermal shock, leading to less wear on internal brickwork compared to older gas models, which experienced significant daily temperature spikes requiring frequent manual intervention.

Fig 4: The GSENZH and DESNZ conducted a site visit to Lambeth crematorium in April 2025

Address: 29, Blackshaw Road, London SW17 0DH

Doncaster & South Yorkshire Memorial Park and Crematorium

Located off Armthorpe Lane in Barnby Dun, the Doncaster & South Yorkshire Memorial Park & Crematorium stands as the UK's first crematorium to operate with an electric cremator powered by renewable energy. Opened in 2023 and operated by Memoria Ltd, this state-of-the-art facility marks a major shift toward environmentally responsible bereavement services. The electric cremator emits up to 95% less carbon dioxide compared to traditional gas-fired models, offering a sustainable alternative in line with national carbon-reduction goals.

Developed to alleviate growing demand on Doncaster's older Rose Hill Crematorium, the new site provides a modern chapel with seating for over 100 guests, advanced audio-visual capabilities for live-streaming, and access to the extensive Obitus music library. The cremator, manufactured by DFW Europe, includes a high-efficiency filtration system that significantly reduces airborne emissions, enhancing both environmental and local air quality standards.

Address: Armthorpe Lane, Barnby Dun, Doncaster, DN3 1DL, United Kingdom.
Phone: +441302456880

Supporting information:

- Memoria Doncaster
- https://www.memoria.org.uk/new-doncaster-crematorium-will-ease-pressure-on-current-funeral-services/
- New modern crematorium powered by renewable energy nears completion
- https://dfweurope.com/references/doncaster-crematory/

Worcester Crematorium

Worcester Crematorium, located within Astwood Cemetery on Tintern Avenue, is set to become one of the most environmentally advanced cremation facilities in the West Midlands Region. As part of a major £1.49 million refurbishment project, the existing three gas-powered cremators will be replaced with two modern electric cremators, making Worcester the first local authority in the region to implement electric cremation technology. A planning application for this transition was submitted in February 2025, with construction scheduled to begin in August 2025 and last approximately nine months. Key features of the upgrade include the installation of a heat recovery system, which will reuse energy generated from the cremation process to heat the building, replacing the current gas boiler. In addition, the crematorium will benefit from a new thermally efficient roof, EV charging points in two parking bays, and associated structural works to support the upgraded equipment. Photovoltaic solar panels are also part of the project, contributing further to carbon reduction. Backed by a Public Sector Decarbonisation Scheme grant, the refurbishment aligns with Worcester City Council's broader climate action goals. Once complete, Worcester Crematorium is expected to be the greenest crematorium in the West Midlands and a model for future low-carbon cremation facilities in the UK.

Address: Worcester Crematorium, Astwood Cemetery, Tintern Avenue, Worcester, WR3 8HA
Phone: 01905 22633

Supporting information:

- Exciting News in Worcester - The CDS Group
- 'Greenest crematorium in West Midlands' is planned for Worcester - Worcester City Council
- https://www.worcester.gov.uk/news/planning-permission-approved-for-greenest-crematorium-in-the-west-midlands
- Application for planning works of Worcester Crematorium

North Oxfordshire Crematorium

North Oxfordshire Crematorium & Memorial Park, operated by Memoria Ltd, introduced the UK's first purpose-built, fully electric cremator powered by nearly 100% renewable energy when it opened in October 2020 near Tackley, Bicester. This state-of-the-art system cuts carbon emissions by approximately 95% compared to traditional gas crematoria. The electric cremator also incorporates advanced mercury abatement filtration, a technology Memoria pioneered in 2005. Future plans include heat recovery systems to redirect surplus thermal energy to warm the chapel and adjacent facilities.

Address: North Oxfordshire Crematorium & Memorial Park, Tackley, Kidlington, Oxfordshire, OX5 3ER

Supporting information:

- Bicester funeral firm wants an environmentally-friendly approach to cremations – North Oxfordshire Crematorium and Memorial Park
- North Oxfordshire Crematorium and Memorial Park – Distinguished Service in a Beautiful Setting

Hydrogen-fuelled Cremators

Case Study: Worthing Crematorium – The HyCrem Project

Worthing Crematorium, located in West Sussex, is one of the busiest in the UK, carrying out between 2,500–3,000 cremations annually across its three cremators. It is also the largest single source of CO_2 emissions for Adur and Worthing Councils. In response, the HyCrem Project, a Department for Energy Security and Net Zero (DESNZ)-funded trial (2023–2025) was launched to explore hydrogen-fuelled cremation as a route to decarbonisation.

Project Details

Hydrogen Trial Setup

One of the three cremators was fully disconnected from natural gas and retrofitted to operate on hydrogen via a low-pressure hydrogen pipeline and pressure reducing station. The remaining two cremators continued to operate on natural gas for comparison.

Project Partners

Lead: FT Pipeline Systems

Other partners: Worthing Borough Council, DFW Europe, Net Zero Associates, Ricardo-AEA, PJ Combustion Solutions, Abbott Risk Consulting, Safety Monitors, GeoPura

Academic support: University of Brighton (air quality monitoring)

Trial Objectives

- Demonstrate a hydrogen-fuelled cremator in normal operation
- Assess emissions vs. natural gas cremation
- Evaluate economic viability and refuelling logistics at scale

Fig 5: Cremator 3 was completely disconnected from Natural Gas for the duration of the trail. The two NG burners were replaced by hydrogen burners (as sees above). These were then connected to a low pressure hydrogen pipeline, through the pressure reducing station (top right) [7]

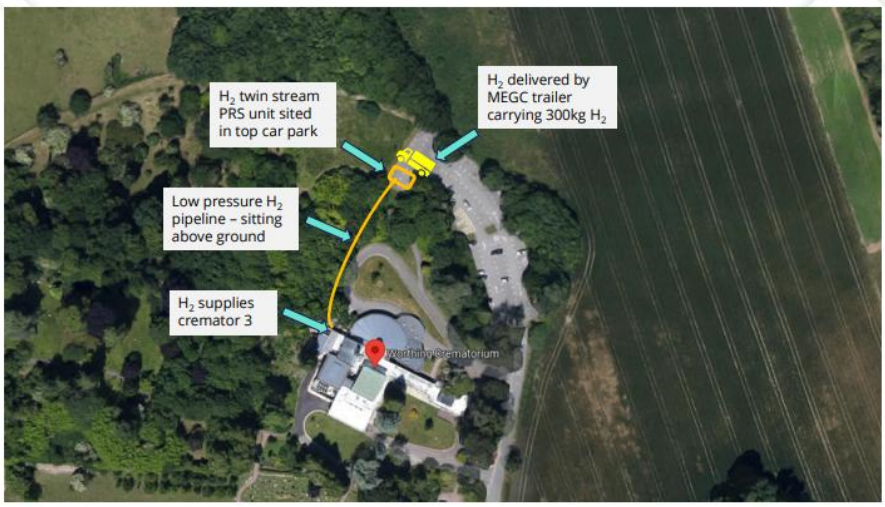

Fig 6: HyCrem Site Layout [7]

Key Findings:

Technical Feasibility: Hydrogen cremation is technically viable at commercial scale. Burn durations were comparable to natural gas.

Emissions: Hydrogen reduced carbon emissions, but NO_x emissions increased. In contrast, electric cremation significantly reduced all emissions and showed the best carbon and cost performance.

Economic Insights

- Hydrogen cost: **50–75p/kWh (2024)**, projected to drop to **42–68p/kWh (2030)**
- Natural gas cost: **4.7p/kWh**
- Hydrogen cremation required 3 deliveries/week via HGV tube trailers, occupying over 15 parking spaces
- Additional safety requirements: on-site hydrogen engineer and risk mitigation infrastructure
- Electric cremation emerged as a more scalable, lower-risk, and cost-effective option.

Electric Cremator Investigation

Due to hydrogen's challenges, Worthing is exploring electric cremators, collaborating with Lambeth Crematorium. Benefits include:

- No hydrogen-related health & safety risks
- Lower operating costs
- Improved energy efficiency
- Faster grid connection upgrades (500kVA substation planned)

Policy Recommendations for Sector-Wide Decarbonisation

1. **Ban new fossil fuel cremators -** Prevent long-term carbon lock-in due to 15–20 year equipment lifespan [7].
2. **Support electricity grid upgrades** - Back DNO infrastructure improvements to accommodate electrification demand [7].
3. **Rebalance energy taxes/levies** - Level the economic playing field between electricity and natural gas [7].

Address: Horsham Road, Worthing BN14 0RG

Supporting information:

- HyCrem project
- Decarbonisation | FT Gas | Worthing Crematorium | Hydrogen
- Net Zero Go platform - News - Adur & Worthing Councils

Alkaline Hydrolysis (Resomation or Water Cremation)

Alkaline hydrolysis also known as Resomation, water cremation, green cremation, or liquid cremation, is a progressive and environmentally conscious alternative to traditional flame-based cremation and burial. The process involves placing the deceased in a biodegradable container (e.g. made of corn starch) inside a sealed chamber. A solution comprising 95% heated water and 5% alkaline (potassium hydroxide, sodium

hydroxide, or a mixture of both) is then circulated. The system operates under pressure at a temperature of approximately 160°C, mimicking the natural decomposition that occurs after burial but accelerating the process significantly. While a conventional burial may take 8–12 years to fully decompose a body, alkaline hydrolysis completes the process in around four hours.

The resulting liquid is sterile, cooled, and safely treated before being discharged into the wastewater system, eventually returning to the natural water cycle. What remains of the body, mainly bone ash is dried and returned to the family in a similar manner to traditional cremation ashes.

Variable	Result
Capital Cost (Average)	A single system cost is - £350k , a dual system cost is £550k
Maintenance Costs (Average)	Unknown
Lifetime	Unknown
Cremation Time	3-3.5 hours (180-210 minutes)
Lead times from purchase	Unknown
Manufacturers	Resomation, Aquamation
Process	The process uses 1200 litres per cycle
Installation Experience	Currently only operating in the USA commercially

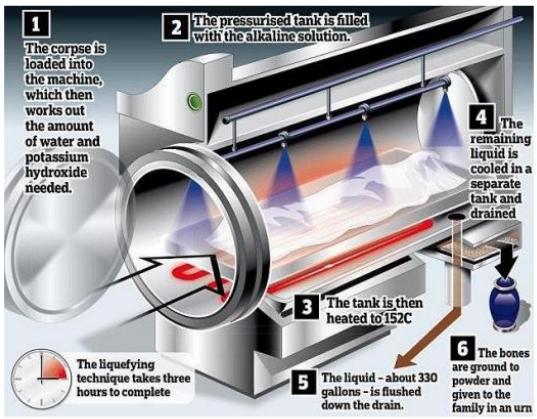

Fig 7: Alkaline Hydrolysis process [8]

Plans for the UK's first Resomation facility in the Midlands are currently being looked into pending further guidance over how the waste water will be recycled. Although as yet there is no green cremation facility up and running in the UK, Resomation Ltd, has been developing the alternative cremation technology in Leeds.

Water cremation is legally permitted in the UK, subject to health, safety, and environmental regulations. However, as of mid-2025, **alkaline hydrolysis (resomation)** is not yet in operational use due to regulatory uncertainty—particularly around effluent discharge. The Environment Agency has not issued formal guidance, and wastewater consent processes do not currently support the method. Wider adoption will depend on regulatory alignment with water companies and public health bodies.

Supporting information:

- A Need For Change - Resomation
- Alkaline Hydrolysis | A Guide to Water Cremation | Funeral Guide

[8]Smith, J. (2021, November). *Decarbonisation in the bereavement sector. APSE Southern Parks and Open Spaces Seminar.* https://www.apse.org.uk/sites/apse/assets/File/%233%20Justin%20Smith%20Presentation%20-%20CDS.pdf

- Kindly Earth – Return to nature

BioLPG Cremation

BioLPG (biopropane) is a co-product of biodiesel production and a renewable, low-carbon version of liquefied petroleum gas (LPG) that is produced from renewable biomass sources such as waste oils, plant materials, and agricultural residues. During manufacturing, the feedstocks undergo hydrogenolysis—a process that combines them with hydrogen to separate and purify their energy content [9]. For every tonne of biodiesel produced, approximately 50 kg of BioLPG is generated as a co-product from the gas stream, which is then purified to match conventional propane [9] [10].

The potential for using BioLPG in cremation processes has attracted interest due to its ability to reduce carbon emissions and offer a transitional solution where electric cremation may not be feasible. On a local scale, BioLPG may serve as a green alternative to electricity, especially in locations with limited electrical infrastructure. However, its use requires on-site storage of large LPG tanks—occupying roughly 70 sqm for every 1,500 cremations—which must adhere to strict health and safety regulations [11].

Despite its promise, no crematoria in the UK currently use BioLPG. Furthermore, the feasibility of national-scale adoption is limited due to land constraints and the potential environmental impacts of large-scale biomass cultivation, including biodiversity loss and overseas offsetting [9] [11].

Integrated Approaches to Crematoria Decarbonisation: Case Studies

Capturing and reusing waste heat from cremators can significantly improve energy efficiency and reduce carbon emissions. This heat can be redirected for purposes such as space heating within crematorium buildings or nearby facilities, helping to lower energy demand. However, due to the sensitive nature of cremation, it is essential that such initiatives are approached with transparency and care, ensuring respect for public sentiment and cultural considerations.

Below are a few examples within the country of crematoria that have implemented or are planning to

[9] SHV Energy. (n.d.). *BioLPG*. Retrieved August 5, 2025, from SHV Energy website
[10] Calor Gas. (n.d.). *BioLPG – sustainable fuel for homes and businesses*. Retrieved from Calor Gas website.
[11] Liquid Gas UK. (n.d.). *BioLPG: A drop-in renewable LPG solution.* https://committees.parliament.uk/writtenevidence/133821/pdf/

implement heat reuse systems as part of their decarbonisation efforts.

Location: Hemel Hempstead, Hertfordshire

The **Hemel Hempstead Crematorium** has been developed by the West Herts Joint Committee, which is made up of representatives from Dacorum, Hertsmere, Three Rivers, St Albans and Watford councils. The facility is a sister-site to the award-winning West Herts Crematorium in Garston and has been built to provide additional capacity for the west Hertfordshire region.

Fig 8: Hemel Hempstead Crematorium, located in Hemel Hempstead, HP3 8LL [1]

The facility features an extensive photovoltaic (PV) array and a specialised **heat recovery system** designed to capture waste heat from the cremation and mercury abatement processes.

This crematoria-specific system works by lowering the temperature of flue gases before they enter the mercury abatement filtration plant. A glycol/water solution circulates through a heat exchanger coil within the flues to extract thermal energy. The recovered heat is then stored in a thermal storage vessel, which serves as the primary source of space heating and domestic hot water for the building. A gas-fired boiler provides backup heating as needed, ensuring continuous operation.

Supporting Information:

- https://westhertscrem.org/new-crematorium/
- https://rhbpartnership.co.uk/news/state-of-the-art-hemel-hempstead-crematorium/

Location: Wokingham, Berkshire

Easthampstead Park Cemetery and Crematorium has taken notable steps toward decarbonisation. The facility operates two gas-fuelled cremators and has recently implemented a mercury abatement system, roof-mounted solar PV array above the cremator charging room, and upgraded internal lighting to energy-efficient LED bulbs.

The current PV system comprises 36 solar panels arranged in two strings, connected to a Solis 6.0 inverter housed in the nearby storeroom. The setup is integrated into the building's distribution board via a 20A three-phase circuit. Between late October 2022 and 2023, the system generated 3,224 kWh of electricity, with a recorded peak output of 3.6 kW.

Future Plans:

- Subject to planning and structural review, the crematorium aims to expand its PV capacity by utilising up to 250m² of additional roof space**.**
- A feasibility study has been completed to explore **heat recovery** from the cremators. This includes analysing heat reuse potential and additional PV installations at an adjacent golf course. However, findings suggested that electricity from the golf course was cost-prohibitive, and rooftop solar showed a longer payback period than anticipated.

Fig 9: Solar PV arrays at Easthampstead Crematorium in Wokingham

Supporting information:

- Easthampstead Park Cemetery and Crematorium environmental policy | Bracknell Forest Council

Location: Huntingdon, Cambridgeshire

In addition to having two all-electric cremators, consuming green energy tariffs, Huntingdon Crematorium is the UK's **second purpose-built environmentally friendly crematorium**, and the first crematorium to be operated directly by a Town Council.

Excess heat from cremation is recycled to **heat adjoining glasshouses**, where flower bedding plants are cultivated for town landscaping and the crematorium's own gardens. This reduces the need for conventional heating systems and supports local biodiversity. The facility includes an **eco-green composter** for floral tributes, grass clippings, and hedge trimmings. Compost produced is used across the crematorium's grounds and local flower beds. Rainwater is harvested onsite for irrigation in the glasshouse and gardens, creating a closed-loop system that supports energy and water conservation.

Electric vehicle charging points have been installed to support electric hearses and maintenance vehicles, further enhancing the site's environmental performance when combined with solar PV installations.

Fig 10: Huntingdon Crematorium, operating on green tariff

Supporting information:

- https://www.huntingdontown.gov.uk/council-services/crematorium-cemeteries/
- https://thecdsgroup.co.uk/huntingdon-crematorium-takes-shape/
- https://dfweurope.com/huntingdon-crematorium/

Location: Redditch, Worcestershire

Redditch Borough Council implemented an innovative waste heat recovery system that captures excess heat generated during cremations and repurposes it to heat the nearby Abbey Stadium Leisure Centre swimming pool. The system captures flue gas heat, cooled from approximately 800 °C to around 140 °C and transfers it via insulated underground pipework to the leisure centre.

This solution supplies approximately 40–42% of the pool's heating needs, significantly reducing the centre's reliance on gas boilers. The Council reports an annual saving of £14,560–£15,000 on gas bills.

Launched in summer 2013, the project received widespread recognition, including a Green Apple environmental award and praise in UK Parliament for its environmental innovation. While the sensitive nature of the heat source generated some initial public concern, the scheme ultimately gained strong community support and now stands as a model of creative, low-carbon energy use in public infrastructure.

Supporting information:

- Redditch Crematorium begins to heat town pool - BBC News
- Innovative Redditch crematorium energy project is unveiled | Redditch Advertiser

Crematory Classifications and Emissions Abatement

As crematoria across the UK transition toward lower-carbon, lower-emission operations, understanding the classifications of cremators and the technical requirements for emissions abatement is essential. The definitions and standards outlined below are drawn from the UK Government's draft revised guidance for crematoria, published in *Annex A: Proposed Draft New Crematoria Guidance* [12]. This updated guidance reflects evolving expectations around pollution control, including mercury, NO_x, particulate matter, and other emissions.

Cremator Definitions

- New Cremator: A cremator that enters into operation **on or after 1 January 2024**.
- Existing Cremator: Any cremator that was in operation **prior to 1 January 2024**.
- Stand-by Cremator: A cremator retained solely for occasional use, typically during maintenance or breakdown of main units. If not connected to flue gas treatment, its use must not exceed 100 hours per calendar year.
- Temporary Cremator: A cremator installed temporarily, often during refurbishment or replacement of a main cremator.
    - If unabated and used for more than 100 hours, a local air quality impact assessment is required as part of any permit variation.
    - From 1 January 2024, if installed for additional capacity or expected to operate for more than one year, the cremator must meet the same environmental performance standards as new cremators.
- Small-scale Cremator: A cremator designated exclusively for the cremation of stillbirths, neonatal remains, and foetal remains.

Flue Gas Treatment/Mercury Abatement Systems

Flue gas treatment—commonly referred to as abatement—was initially introduced to reduce airborne mercury emissions from dental amalgam. These systems also reduce:

- Particulate matter (PM)
- Acid gases
- Dioxins

How It Works:

- Reagents (typically sodium bicarbonate or lime, with activated carbon) are injected into the flue gas stream.
- Acid gases react with the alkaline reagent, while carbon absorbs mercury and dioxins.
- The resulting compounds are filtered out using bag or ceramic filters.

Alternative systems reverse the flow:

- Particulates are removed first via filtration, followed by a fixed bed of reagent and carbon to remove remaining pollutants.

[12] Department for Environment, Food & Rural Affairs (Defra). (n.d.). *Annex A:* Consultation document. Supporting documents to *Consultation on the review of the Crematoria Guidance (PGN 5/2)*. https://consult.defra.gov.uk/airquality/consultation-on-crematoria-guidance-review/supporting_documents/Annex%20A_Proposed%20Draft%20New%20Crematoria%20Guidance.pdf

Cremators without flue gas treatment are referred to as unabated cremators.

Fig 11: Abatement process

NO_x Abatement (Selective Non-Catalytic Reduction – SNCR)

While traditional abatement systems do not remove nitrogen oxides (NO_x), new technologies are emerging. The SNCR process reduces NO_x by injecting a reagent (commonly urea) into the flue gas at high temperatures. This technology, though still relatively new to the sector, is gaining adoption under the label of NO_x abatement or SNCR systems.

Regulatory Context

The UK Government, alongside devolved administrations in Scotland, Wales, and Northern Ireland, is currently reviewing the statutory guidance PG5/2(12). A new draft—outlined in Annex A of the 2023 consultation—proposes stronger emissions control requirements and formal definitions of cremator types. Key objectives include:

- Tightening limits on emissions of mercury, NO_x, particulate matter, dioxins, and acid gases
- Introducing Emission Limit Values (ELVs) for new and existing cremators
- Requiring monitoring, reporting, and accreditation of abatement performance
- Defining specific criteria for temporary and stand-by cremators

Case Study Reference:

Aldershot Crematorium – Part B Variation Application (Rushmoor Borough Council, 2024)

This technical report outlines proposed updates to Aldershot Crematorium under the Environmental Permitting (England and Wales) Regulations 2016. It includes details on cremator replacement, emissions abatement (including mercury and NO_x control), and operational considerations related to air quality. The document serves as a practical example of how crematoria can comply with evolving environmental standards while upgrading facilities [13]

Projects funded through the Public Sector Decarbonisation Scheme

Please note that in Public Sector Decarbonisation Scheme (PSDS) Phases 1, 2, and 3, installations listed as electric or biomass boilers may, in some cases, have actually involved electric cremators. This is because electric cremators were not specifically designated as an option on the application forms at the time, and applicants may have selected the closest matching category. From Phase 4 onwards, electric cremators were explicitly included in the list of eligible technologies.

[13] Rushmoor Borough Council. (2023). *Aldershot Crematorium: Part B variation application – https://www.rushmoor.gov.uk/media/l4qna5gh/aldershot-crematorium-variation-application-technical-information-accessible.pdf*

Phase 1: Hyndburn Borough Council has upgraded Hyndburn Leisure Centre, **Accrington Crematorium** and the council's head office at Scaitcliffe House under PSDS Phase 1. Air source heat pumps, solar panels, and LED lighting were installed across the sites.

Phase 3:

- Cheshire East Council has been awarded £6,863,805 for 2 projects to decarbonise 7 schools and 4 other sites within the Council's portfolio under PSDS Phase 3b. This includes the Lyceum Theatre, **Crewe Crematorium**, West Park Museum and Tatton Park. Air source heat pumps, solar panels, LED lighting, an electric boiler and roof insulation upgrades will be made across the sites.
- Worcester City Council has been awarded £1,497,237 to decarbonise **Astwood Crematorium** under the PSDS Phase 3c. The ageing gas cremators will be replaced with a biomass boiler alongside energy efficient fans.
- North East Lincolnshire Council has been awarded £4,766,440 to decarbonise 9 council buildings: Grimsby Leisure Centre, Immingham Swimming Pool, **Grimsby Crematorium**, Humber Seafood Institute, the Doughty Road maintenance depot, a residential care home and 3 council offices under PSDS Phase 3c . Air source heat pumps will be installed at most of the sites and solar panels will be fitted on 4 buildings. Additionally, an electric boiler will be installed at Grimsby Crematorium. An electric heater will be fitted in one of the council offices and a range of energy efficiency improvements will be made across all of the sites, through the installation of smart meters, energy efficient ventilation fans, variable speed drives, loft insulation and upgrades to the ventilation and building energy management systems.

Phase 4:

- Sunderland City Council has been awarded £1,052,387 to decarbonise **Bishopwearmouth Crematorium** by replacing gas-powered cremators with highly efficient electric models.
- Cambridge City Council has been awarded £297,528 to decarbonise **Cambridge Crematorium**, along with Trumpington Pavilion and Brown's Field, which both serve as community centres.

Stakeholder Engagement and Mapping

Effective stakeholder engagement is essential for the successful decarbonisation of crematoria in the UK. This transition involves not only technical upgrades and regulatory shifts but also the cooperation and alignment of a wide range of actors with varying interests and influence. From government bodies setting environmental standards to funeral directors managing on-the-ground practices, each stakeholder plays a critical role in ensuring progress toward lower emissions and more sustainable operations. Engaging stakeholders early and meaningfully helps build consensus, address concerns, secure funding, and accelerate the adoption of innovative technologies.

The map below categorises different groups based on their level of influence over the transition and their degree of interest in its outcome. It serves as a tool to help prioritise engagement strategies, for example, by identifying key stakeholders who require close collaboration and ongoing involvement.

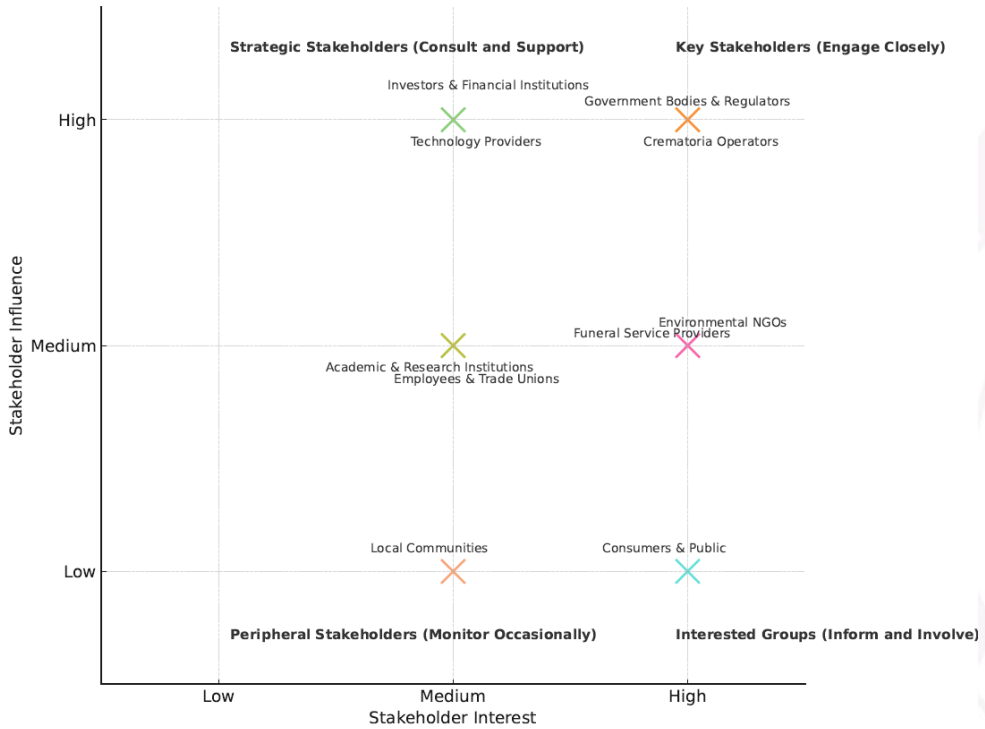

Fig 12: Stakeholder Mapping presenting a stakeholder interest-influence matrix

Reference Materials

1. **Ben Copeland's Thesis** – "A Comparison of Gas and Electric Cremator Emissions in the UK"

This academic dissertation (from April 2021), provides an in-depth comparison of emissions, costs, and energy consumption between gas and electric cremators.

Ben Copeland is now with CDS Group, which supports local authorities and private clients in designing innovative, sustainable crematoria (e.g. Worcester Crematorium) through a range of support services.

2. **Consultation on the review of Crematoria Guidance**

This government consultation document outlines proposed changes to existing crematoria guidance, including the expansion of mercury abatement technology requirements across all facilities. The guidance will inform future permitting and operational compliance.

3. **Environmental permitting technical guidance**

This draft technical guidance details the best available techniques (BAT) for crematoria, including recommendations for new installations and upgrades. It covers both gas and electric cremators, and those with or without emissions abatement - Annex A Proposed Draft New Crematoria Guidance.pdf

4. **Article – Heat Recovery Potential in UK Crematoria**

This peer-reviewed study explores how waste heat from cremation processes could be recovered and redirected to local heat networks, offering a novel decarbonisation pathway for crematoria while contributing to wider community heating infrastructure - The potential of crematoria as a recoverable waste heat resource for district heating in the UK

5. **Asset Surveillance – Gower Consultants & Tristan Campbell-Reynolds**

Presents emerging technology that integrates remote sensing and machine learning for real-time crematorium performance monitoring and carbon auditing. It offers a forward-looking approach to smarter emissions tracking and facility management.

6. **Institute of Cemetery and Crematorium Management (ICCM) – Directory of Crematoria (Feb 2025)**

Comprehensive directory lists all crematoria in the UK as of February 2025, serving as a key reference for local authorities, researchers, and project developers.

7. **Net Zero Go platform**

Crematoria Decarbonisation – Best Practice Guide (North West Net Zero Hub): Developed in partnership with Lancashire councils, this guide outlines technical and strategic considerations for transitioning crematoria to low-carbon operation. Key insights include necessary upgrades to electrical infrastructure for electric cremators - Crematoria Decarbonisation - Best Practice Guide.pdf

8. **Federation of Burial & Cremation Authorities (FBCA) – Future Energy Options for Cremators**

Provides expert insight into emerging cremator technologies, fuel switching options (e.g. electricity, hydrogen), and regulatory trends. (*Please note that this resource is only available to FBCA members).*

9. **Lancashire Crematoria Decarbonisation Working Group – Presentation**

Captures discussions and recommendations from a regional collaboration focused on decarbonising crematoria across Lancashire. It includes lessons learned, technical considerations, and partnership approaches.

10. **DFW Electric Cremation Furnace**

Offers details on how the electric furnace operates using electric heating elements instead of gas burners to reach high temperatures needed for cremation along with benefits such as lower emissions, quieter operation, and suitability for facilities aiming to reduce their carbon footprint.

11. **CDS Group – APSE Presentation Slides**

Delivered through the Association for Public Service Excellence (APSE), showcase recent projects and innovations led by CDS, including electric cremator feasibility and infrastructure planning.