

Mining Ashes: The Emerging Global Demand for Ash Mining and Beneficiation Technologies

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EP Power Minerals

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Introduction





Power Minerals - UK Sales, Distribution & Finance team based at Drax Power Station in Yorkshire.

Ivan Skidmore

UK Sales & Technical Director, Power Minerals Limited (PML)

EP Power Minerals

 Part of the EP Power Minerals (EPPM) group, we are at the centre of an international network of experts in the management of power plant byproducts and blasting abrasives, along with industrial wastes.



Board Member of European Coal Combustion Products Association (ECOBA)
 +10yrs, President from 2015-2019.



 Executive and Technical Committee Member of UK Quality Ash Association (UKQAA) +14yrs, Chair from 2012-2017.



EP Power Minerals group







Germany













France & Benelux







United Kingdom

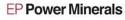


Eastern Europe (Poland und Czech Republic)

EP Energo Mineral EP Resources

Middle East and Asia







Iceland

Power Minerals Iceland ehf.

How do you talk about climate change?



Unavoidable disaster or something we can master?

Crisis

Mass Extinction

Extreme Weather Destruction

Combat

Urgent Action

Fight

Target

Reductions

Net Zero

Roadmap

Tackling

Journey

Decarbonisation

EPPM

In a panic or systematic?

The UK has acted to end coal fired power generation



Press release. UK Government:

End to coal power brought forward to October 2024

The deadline to phase out coal from Great Britain's energy system has been brought forward by a whole year, highlighting the UK's leadership to go further in driving down emissions and tackling climate change.

Published 30 June 2021

Climate change is the greatest risk facing us all.





No more coal power means no more coal ash!

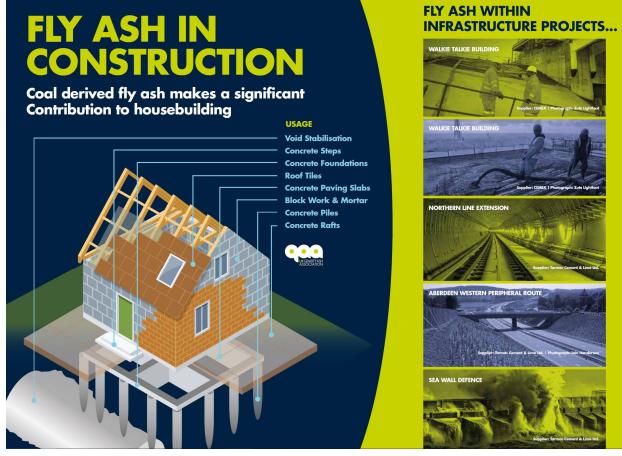


Long history of beneficial use of ash (since Roman times!)

- Engineering / Technical
- Economical / Abundant
- Environmentally friendly / Sustainable

The future will see an increased demand

- Building back better!
- Growth in infrastructure, construction and housing
- Decarbonisation essential for cement, concrete and building products





Source: UKQAA

UK Concrete and Cement Industry Roadmap to Beyond Net Zero



Increased use of pozzolanic ashes in low carbon cements and concretes is a vital technology lever

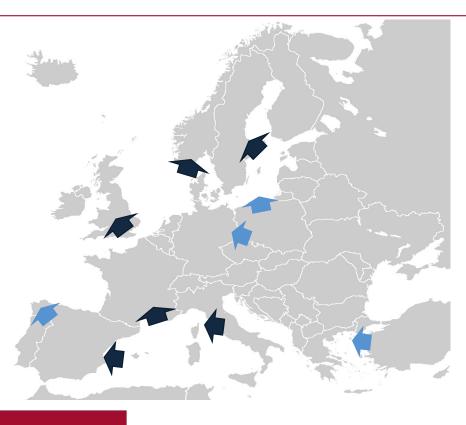
Indirect emissions from decarbonised electricity	Transport	Low carbon cements and concretes	Fuel switching	Carbon capture, usage and storage (CCUS)	Carbonation	Thermal mass
Saving	Saving	Saving	Saving	Saving		
27.05 kgCO ₂ /t	44.45 kgCO ₂ /t	76.28 kgCO ₂ /t	99.45 kgCO ₂ /t	390.97 kgCO ₂ /t		
-4%	-7%	-12%	-16%	-61%	-12%	-44%
CO ₂ reduction	CO ₂ reduction	CO ₂ reduction	CO ₂ reduction	CO ₂ reduction	Further CO ₂ reduction	Further CO ₂ reduction
Decarbonising the electricity grid encourages he electrification of the ndustry. Decarbonising echnologies that require electricity include plasma energy and CCUS. Using echnologies such as these could increase electricity is see by 80% to 130%. Advanced manufacturing echniques, such as utilificate intelligence (Al) and automation, will believe efficiencies in the operation of concrete and dement plants.	Decarbonising delivery transport is realised through a move away from petrol and diesel. Investment in new fleet and reducing road transport miles reduces carbon emissions. Through investment in infrastructure, the industry has increased its use of rail freight, supporting a modal shift from road to rail and a reduction in transport emissions.	Innovations in concrete mix design, to utilise lower emission constituents, are enabled by revisions to product and building standards. These low carbon products are adopted and used increasingly in our built environment. Research and development in clinker content, alternative binders and cement formulations reduce carbon emissions.	The availability of biomass wastes is sufficient to generate over 70% of the heat used for cement production. UK investment in hydrogen production, delivery networks and successful industry research enables the use of hydrogen, plasma or other new heating technologies.	UK investment in infrastructure and successful industry research enables the use of CCUS technologies. This transformative technology represents the most significant and technically disruptive investment in the roadmap. The CO ₂ reduction of 61% enables the industry to achieve net zero manufacture by 2050. The use of CCUS and biomass have the potential to make a greater contribution to the roadmap and achieve net negative emissions.	Carbonation, the process where concrete absorbs CO ₂ from the atmosphere throughout its lifetime, is recognised in UK accounting of greenhouse gases. When the global average carbonation rate of 23% is applied to the UK this means that it can contribute to a further 12% CO ₂ reduction. By 2050, techniques to optimise and accelerate carbonation could be used to increase its contribution.	Thermal mass is a propert of heavyweight materials like concrete and masonry where heat can be absorb stored and released, reduct the energy needed to hea and cool buildings. The us of lifecycle assessment an post-occupancy evaluatio demonstrate the carbon a energy savings from smar thermal mass contributing to the demand side respoit to climate change. The cumulative deployme of concrete's thermal mass produces a building stock which has an estimated
• • • •	0	TIMITI	F			14% saving of 2050 UK electricity consumption from avoided heating and cooling. This equates to 4 of 2018 concrete and cem emissions levels.





So, where are we going to get the ash from? Imports?





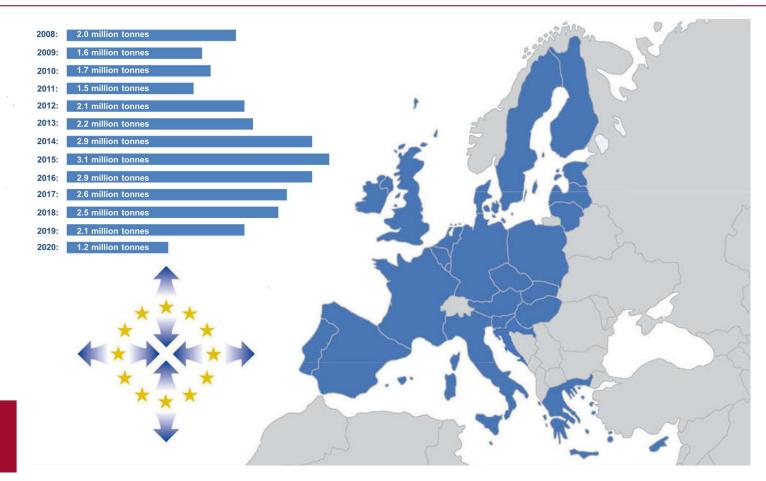
Europe is also facing major challenges in the supply of ash due to coal phase out

- UK has supplemented reduced local production of dry cementitious fly ash with imports from Europe in recent years
- · Im- and export relations are changing
- Increase of imports currently limited by 2021 extreme sea freight conditions
- Lacking import infrastructure



Cross border transport of ashes in Europe 2008-2020





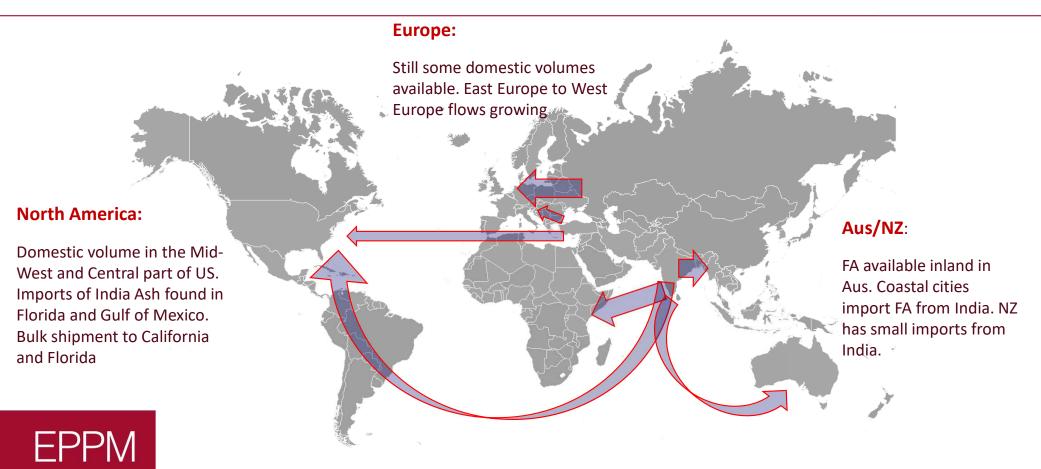




Source: ECOBA

Global Ash Flows





Long history of coal power has led to vast ash reserves in UK









Source: UKQAA

Safeguarding ash reserves is now recognised by UK GOV.



Minerals resources of local and national importance: Minerals which are necessary to meet society's needs, including aggregates, brickclay (especially Etruria Marl and fireclay), silica sand (including high grade silica sands), *coal derived fly ash in single use deposits*, cement raw materials, gypsum, salt, fluorspar, shallow and deep-mined coal, oil and gas (including conventional and unconventional hydrocarbons), tungsten, kaolin, ball clay, potash, polyhalite and local minerals of importance to heritage assets and local distinctiveness.

Source:

National Planning Policy Framework

From:

Ministry of Housing, Communities & Local Government
Published

27 March 2012 Last updated 20 July 2021





Greater than 100Mt of accessible reserves in the UK







Source: UKQAA

There's a huge opportunity for technology providers globally



US deposits of coal ash are in the region of 2 Billion cubic yards!

Landfill		Surface Impoundment		
Operating 767,976,569	Closure Likely 403,664,314		Closure in Process 767,590,386	Closure Likely 93,955,322
				Operating 66,738,375
	Closure in Process 36,342,459			Closed 37,406,871



Source: FirmoGraphs, LLC. www.firmographs.com

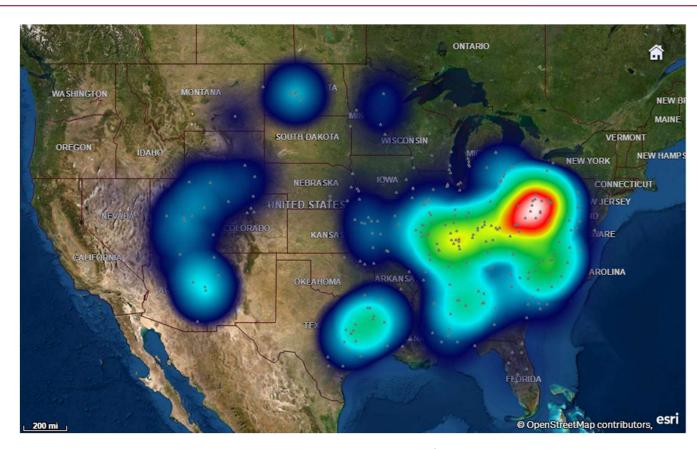
Majority of U.S 2 Billion cubic yards of deposits are in the East



U.S locations of landfilled and ponded coal combustion products

- Source: FirmoGraphs Ash Mart Data Analytics Tool
- EPA-regulated sites

Drive to harvest driven by regulation and also reductions in fresh coal ash production





Source: FirmoGraphs, LLC. www.firmographs.com

Global move away from coal, hence an emerging need to mine and beneficiate ashes around the world (eventually)



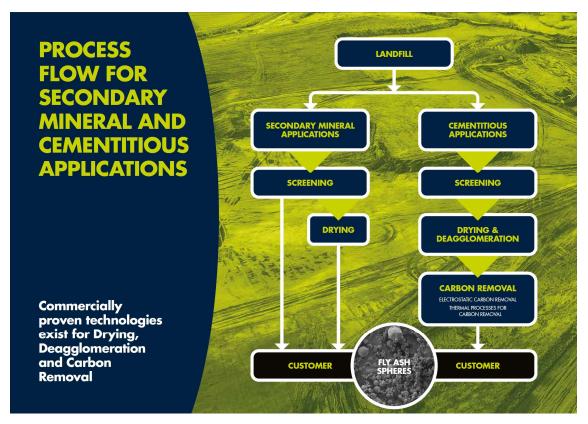




Innovations and investments needed in plant and technology



Source deposit characterisation (quality and quantities) will determine the level of processing required.





Source: UKQAA

Process steps in Ash Mining – Pick and Mix







The U.S are standardising Ash Mining and Beneficiation



- **ASTM E3183** the new "Standard Guide for Harvesting Coal Combustion Products Stored in Active and Inactive Storage Areas for Beneficial Use" has been finalized and will be officially published in approximately five weeks.
- A second ASTM standard entitled "New Standard Sampling and Analytical Methods Used in Characterization of CCPs in Storage Units for Beneficial Uses" is currently under development in the E50.03 subcommittee.



SEFA 'STAR' System – Winyah Station, South Carolina



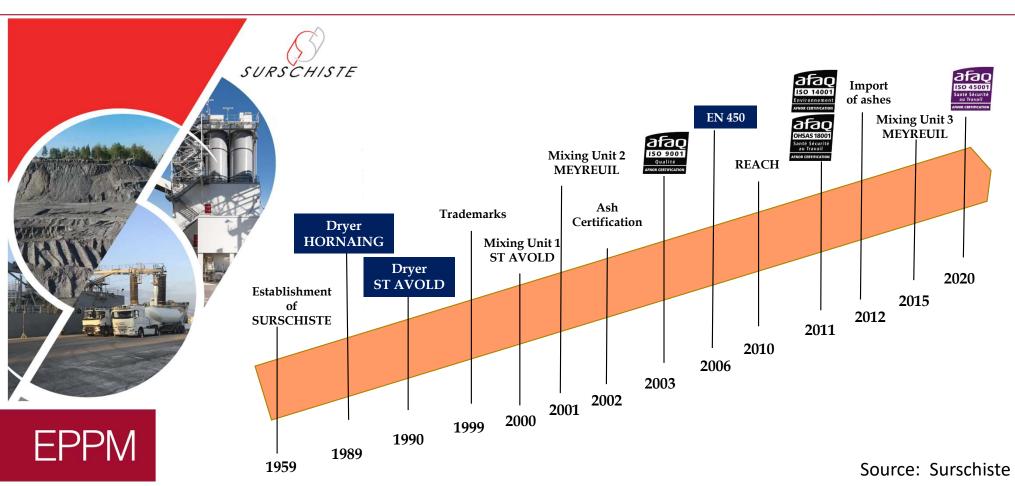
Boral Dry Stack Harvesting – Washingtonville, Pennsylvania

Source: American Coal Ash Association (ACAA)



Long history of Ash Mining and Beneficiation in France





Long history of Coal Ash Mining and Beneficiation in France







75 tons/hour 2 Silos 430 m³

Mixing Unit-2:2001

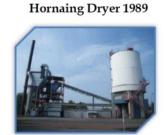


15 tons/hour 2 Silos 2 500 m3 Capacity for an important construction site

Mixing Unit-3: 2016



80 tons/hour 3 Silos 2 500 m3 Capacity for an important construction site



50 tons/hour + 120 000 Tons/year Silo 1 400 m3

Carling Dryer 1990



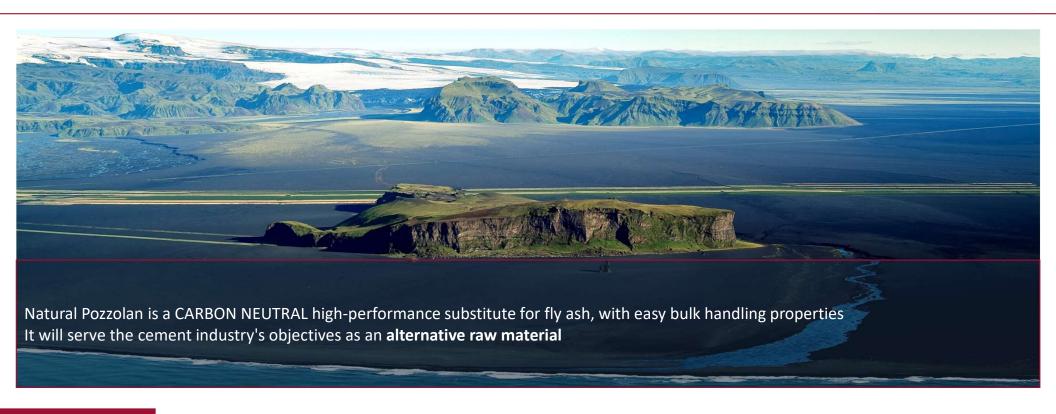
80 tons/hour + 150 000 Tons/year Silo 5 000 m3



Source: Surschiste

It's not just about coal ash - natural pozzolans emerging







In Summary



- Fresh coal ash availability in decline in future, albeit at a different pace around the globe.
 - driven by action to reduce green house gases and combat climate change.
- Demand for coal ash (and similar pozzolans) will remain and increase.
 - driven by action to reduce green house gases and combat climate change!
- Demand for innovative technologies in mining and beneficiation will therefore increase.
- Ongoing demand for Storage, logistics and global shipping of ashes to balance supply from sources to demand points.





Thank you for your attention. Any questions?

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