

A written submission to:

**THE SENATE
ENVIRONMENT AND COMMUNICATIONS REFERENCES COMMITTEE**

Inquiry into the rehabilitation of mining and resources projects and
power station ash dams as it relates to Commonwealth responsibilities.

prepared and submitted by

NU-ROCK AUSTRALIA PTY LTD

18th April 2018

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EXECUTIVE SUMMARY

Nu-Rock is a unique and Australian technology that aims to reduce Australia's stockpiles of ash waste and other waste streams coming out of power generation and steel manufacturing and non ferrous metal smelters.

Nu-Rock Technology converts industrial waste into superior building materials for residential, commercial and civil engineering projects. Nu-Rock products are made up of up to 95% of waste materials.

Nu-Rock technology has been successfully trialled in South Africa and Australia and has been rigorously tested by leading scientific institutions.

Nu-Rock Technology has won two major Australian awards for sustainable building products and waste site remediation.

Nu-Rock Technology involves the construction of manufacturing plants on site at waste sites with each plant capable of processing up to 250,000 tonnes of ash (and other waste materials e.g. tailing and fines) per annum.

Nu-Rock is ready to play a major role in remediating ash dams and ash repositories that pose risks to human health and natural environments.

Nu-Rock is attracting considerable interest from USA Power Utilities as well as UK based Power producers.

Nu-Rock is currently operating a pilot plant at the Mt.Piper Power Plant in NSW.

Nu-Rock offers the Federal Government with the opportunity to bring jobs creating solutions to areas where ash dams and repositories are based e.g. Port Augusta.

Nu-Rock products out perform traditional building products on all performance measures.

Nu-Rock technology can be used to cap ash dams with the very ash it is capping by Rock-Creting the ash pile. This process keeps the ash stable and removes the risks of ash clouds and heavy metal leeching.

Nu-Rock Australia represents a genuine world first solution for the Australian Government.

Nu-Rock will deliver an economic boost for local communities via job creation and an environmental friendly solution for waste producers.

AN INTRODUCTION TO NU-ROCK TECHNOLOGY

Unique Australian Technology

- Developed by Maroun Rahme in the mid 1990's Nu-Rock technology is inspired by the natural forces that occur to produce solid rock.
- Combining naturally occurring chemical binders with power station fly ash as well as steel mill and non ferrous metal smelter waste creates superior Nu-Rock products for the building, civil engineering and agricultural industries.
- Nu-Rock technical processes work effectively with a wide range of ash types including the Pond Ash which is too coarse for use in traditional cement making.
- Fly Ash has been used in cement construction projects since the 1960's, however, Nu-Rock is 'game changing' technology, given that it can contain up to 95% of Ash, whereas the use of Ash in traditional cement manufacturing is classified as a supplementary cementitious material (SCM) and can only be used in much lower ratios of Fine Fly Ash.
- Nu-Rock technology is generating domestic and international interest in the commercial and academic communities

A Genuine Environmental Solution

- Over 650 million tonnes of Fly Ash sits in NSW ash dams or repositories posing a significant threat to natural environments, water tables and neighbouring communities.
- Over 7.9 million tonnes of fly ash produced by 5 Power Stations in NSW each year. The problem is compounding.
- Finite natural resources such as [gas, clay and sand] are not required to produce Nu-Rock products.
- Nu-Rock products cure at low temperatures negating the need for gas fired ovens.
- The production of one tonne of clay bricks produces one tonne of carbon whereas a Nu-Rock Block has only 1.5% of the embodied energy of an equivalently sized Cement Block.
- Nu-Rock blocks and bricks deliver superior insulating capabilities reducing the consumption of electrical and gas powered heating

A 4 STEP ANSWER TO GROWING ENVIRONMENTAL CONCERNS

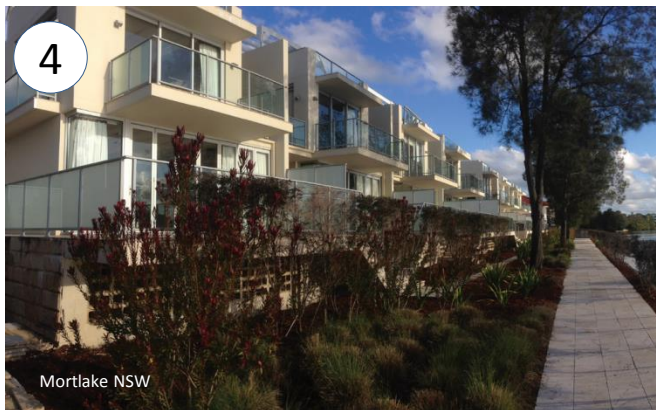
The answer to growing environmental concerns Nu-Rock is the world's first and only proven solution to the industrial by-product dilemma. Nu-Rock's breakthrough nu-cement technology converts all waste from coal-fired power stations, steel mills, non-ferrous smelters and alumina smelters into a range of unique and superior masonry products for the building, construction and civil engineering sectors as well as superior agricultural fertiliser. Each Nu-Rock plant will utilize over 250,000 tons of Fly Ash each year.



Nu-Rock utilises waste from coal fired power stations



Nu-Rock plants are built on site at near the ash dams and each plant processes 250,000 tonnes per annum.



Sydney waterfront apartments and town houses were built with Nu-Rock blocks.



A range of Nu-Rock building blocks manufactured on site.

PROVEN TECHNOLOGY

Housing Development – South Africa

In South Africa, a major housing development was constructed using Nu-Rock blocks produced on a full production line using Steel Mill waste (which is similar in composition to fly ash). The project saw **10,000 low cost houses constructed** in the year 2000. The use of the Nu-Rock blocks reduced the cost of the bricks by 50% (2 Rand per block compared to a market price of 4 Rand).

The Nu-Rock manufacturing line was a partnership with Iscor Steel Mills, (at which time, the largest steel producer in South Africa) and approximately 12 million blocks were produced over a period of 13 months. This consumed 85,000 tonnes of Steel Mill waste. The venture was terminated when Iscor became insolvent in Dec 2000 due to low international steel prices.

The housing developments are located in Newcastle and townships between Newcastle and Durban and Newcastle and Johannesburg and are functioning to specification.



These houses were built 380 km from Newcastle South Africa where the blocks were made and sold at 50% of market price to the South African Government, so as to allow the house to be 50% larger.



Nu-Rock Plant in Newcastle in South Africa



Affordable housing under construction using Nu-Rock Blocks in South Africa.

A LOGICAL SOLUTION TO A DIRE PROBLEM IN PORT AUGUSTA - case study

PROBLEM



Northern Power Station Port Augusta.

Over 26 million tonnes of Fly Ash sitting on the ground in unlined ash dams.

Surface Fly Ash is currently uncovered and susceptible to winds.

Capping with top soil has failed due to stop dust clouds and leaching of heavy metals into water table.

TWO TIERED SOLUTION



Use the ash to seal the ash dust. Rock-Creting the entire Ash Dam with will seal in the Fly Ash and ultimately remove air born dust issues. The ash dust will remain in a stable condition under a crust of Nu-Crete and will allow for directional draining of rain water. This will stop heavy metals from leaching into the local water table until ash is recycled into building products.



With the construction of Nu-Rock Manufacturing Plants on site, **the ash will be converted into superior and sustainable building products.** Employing locals to drive a long term solution to the economic hardships caused by the closure of the Northern Power Station and the health and environment issues caused by the unlined and poorly capped Ash Dam.

PROVEN TECHNOLOGY



Housing development – Mortlake NSW

In Australia, a complex of 22 apartments and 8 townhouses was built in 2009 at Mortlake, Sydney (close to Sydney Olympic Park).

Approximately 50,000 Nu-Rock blocks were used in the construction of the complex. The blocks were produced on the pilot line using a mix of limestone and rhyolite fines and bottom ash from the Mount Piper power station, which was trucked to the pilot line. The pilot line was manually operated and the blocks were produced over a period of 12 months.

Using the fly ash blocks delivered approximately \$500,000 savings in the construction cost of the complex. In the construction the blocks were erected using standard Portland cement and sand. Further savings could have been achieved if fly ash derived sand and cement from Nu-Rock utilised however, this was not available for this evaluation.

The complex is fully occupied by owners and tenants and is functioning to Australian building specifications.



In 2009 luxury waterfront apartments and townhouses were built with Nu-Rock blocks.

AWARD WINNING TECHNOLOGY

Nu-Rock wins the CARE CRC Award on 15 September, 2015 at the Crown Conference Centre in Melbourne, Australia.

Nu-Rock was awarded the prestigious CARE CRC Award. The CARE Award recognises Nu-Rock's unique technical innovation in the area of contamination assessment and remediation of the environment.



On receiving the CARE award Maroun Rahme said: "This award means so much to our company. It is really motivating for me personally and it will bolster our commitment to furthering our efforts in developing and providing sustainable waste remediation solutions on a global scale."



(left to right) Senator Sean Edwards, Maroun Rahme, Paul Vogel (Chairman EPA WA) and Professor Ravi Naidu / CRC CARE

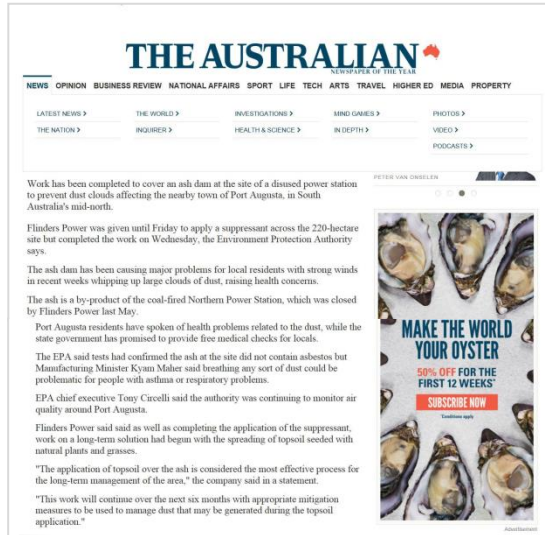
Nu-Rock voted Green Building Product of the year at 2015 Sustainability Awards.

The Sustainability Awards recognise and reward excellence in sustainable design and building. Borne out of the need to promote genuine progress in green building practice, it remains the industry's strongest independent program recognising environmentally sustainable building and design that go beyond the tick-a-box approach. The Sustainability Awards has grown to be one of the premier events on the industry calendar, attracting the highest calibre of entries and attendees to the prestigious annual awards night.



Green Building Product Category Winner, Maroun Rahme receiving his award from Kingspan's Tim Marlow

A LOGICAL SOLUTION TO A DIRE PROBLEM IN PORT AUGUSTA



The Nu-Rock Solution that excited the local community and captured the imagination of the national media failed to create any genuine consideration from the State Government.

In response to serious health issues caused by Ash Clouds hitting the town of Port Augusta, a Nu-Rock Technology based solution was presented to the Port Augusta council and community in early 2017. The Nu-Rock team, championed by Hon Nick Xenophon tabled a plan for Jobs creation, Ash dam dust suppression, Ash dam recycling and Environmental relief. The Nu-Rock submission was immediately rejected by the then SA Gov't. The SA Gov't and Flinders Power opted to engage traditional ash dam capping measures. A year on and more incidents of air born ash still occur due to an inadequate and expensive capping response. Nu-Rock Australia is still ready and willing to bring a complete solution to the site .

CURRENT STATUS OF NU-ROCK AUSTRALIA

Mt Piper Pilot Plant

Nu-Rock is currently operating a pilot plant on site at the Energy Australia owned Mt.Piper Power Station.

Following the completion of a comprehensive plant trialling process, Nu-Rock and Energy Australia are working towards the construction of (up to) 6 x fully automated 250k tonne plants on site at the Mt.Piper Power Station. It is expected that construction of the first 250k tonne plant will be commenced in late 2018.



Nu-Rock Australia aim to recycle in excess of one million tonnes of mixed ash per annum at Mt.Piper within 5 years of the first 250k tonne plant being commissioned.

Following an initial est. investment of AUS \$12m for the first 250k tonne plant, Nu-Rock Australia will fund all remaining plants via Revenue Based Financing.

The pilot plant is capable of manufacturing Nu-Rock blocks with scaled down plant & equipment capable of producing 1,000 blocks per day. Nu-Rock Australia is selling products to NSW home builders and developers.



NU-ROCK RESEARCH AND DEVELOPMENT



In 2016, Nu-Rock Australia commissioned **UWS** University of Western Sydney to undertake rigorous testing of Nu-Rock blocks, bricks and pavers.

Areas of research included: Compression Strength, Three Point Bending and Water Absorption. The results indicated that Nu-Rock products comfortably exceed industry standards.

Prior to these tests Nu-Rock Australia has undertaken intensive scientific testing with the following institutions:

ACCI - The Australian Centre for Construction Innovation – University of NSW

MechLab - MechLab at University of NSW

CSIRO - CSIRO Division of Building Construction and Engineering at North Ryde

ANSTO - Australian Nuclear Science and Technology Organisation

Tests that have been undertaken include:

Compressive Strength

Salt attack Resistance

Water Absorption

Tensile Strength


Acoustics

Fire Resistance

Mortar bond test

Mortar Wrench test

Detailed testing results summary and analysis reports can be made available upon request.

**WESTERN SYDNEY
UNIVERSITY**

INSTITUTE FOR INFRASTRUCTURE ENGINEERING
STRUCTURAL TESTING LABORATORY

Testing of NU-ROCK Blocks, Bricks and Pavers

Test Report
STL-TR-16-01

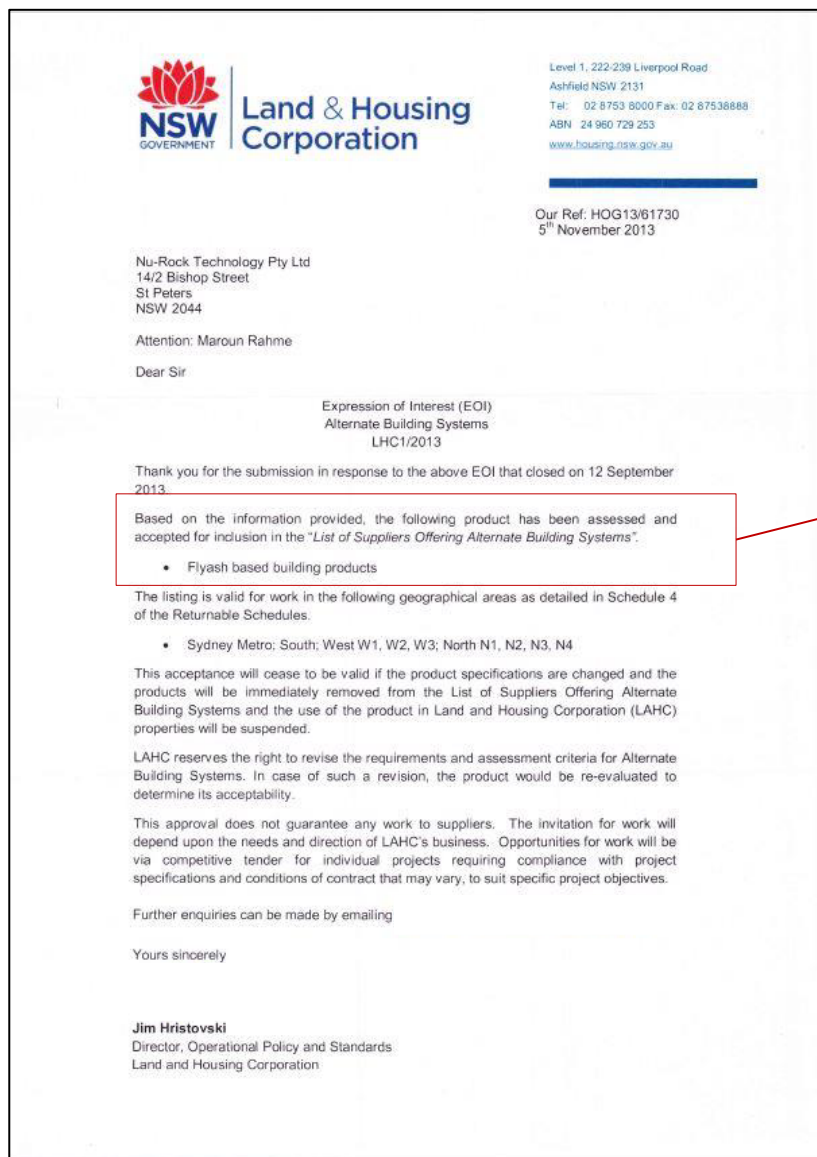
Project No: NRK-NRBT

05th April 2016

University of Western Sydney
ABN 53 014 069 881 CRICOS Provider No: 00917K
Locked Bag 1797 Penrith NSW 2751 Australia
westernsydney.edu.au

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MEETING RIGOROUS GOVERNMENT STANDARDS



Based on the information provided the following Product has been assessed and accepted for inclusion in the **list of suppliers offering alternate building systems.**

MEETING RIGOROUS GOVERNMENT STANDARDS



PRESS RELEASE COPY

The NSW Government is backing Nu-Rock Australia, a Lithgow based company with world first technology that turns ash waste from coal-fired power stations into environmentally friendly building blocks and bricks.

Deputy Premier and Minister for Regional NSW and Small Business John Barilaro said the Government is supporting the company with a \$500,000 loan to build a factory at Energy Australia's Mount Piper Power Station, creating at least 21 new full time jobs over five years.

"This is a fantastic regional NSW company that ticks all the boxes with an innovative business idea that can create new business and jobs for the region and for the state.

"We're backing the company through Jobs for NSW with a \$500,000 interest free Regional Growth Loan, part of a suite of financial support products on offer.

"Our support is helping regional businesses with the greatest potential to overcome barriers to finance and get the support they need to grow and create jobs," he said.

Nu-Rock founder and managing director Maroun Rahme said the company's revolutionary technology was 20 years in the making.

"Our goal has been to take environmental waste from power stations and make bricks and blocks for the building industry that are stronger than concrete but can sell for a lot less. Nu-Rock's unique technology means our products are made using a fraction of the energy of a gas-fired brick.

"There is enough ash on the ground from coal-fired power plants in NSW to fill Sydney Harbour from the heads to Parramatta which we hope to use to reduce NSW's carbon footprint while providing a major boost to manufacturing.

Mr Rahme said Nu-Rock blocks and bricks are three times as strong as gas-fired bricks but use just two per cent of the energy to manufacture.

"We only started selling our blocks in the last three months but energy utilities are quickly realising we can turn their waste into a profit.

"Our technology was initially tested by the CSIRO and most recently by University of Western Sydney University NSW. Within two years we hope to have up to four full-size production plants in NSW and enough in five years to put a big dent in the waste stream.

Mr Rahme said Jobs for NSW had been an "incredible support" to the company.

"The loan has allowed us to upgrade our plant and gain strong credibility and we are now in negotiations with several energy utilities to build plants on their sites."

SUPERIOR BUILDING PRODUCTS

Lighter

Nu-Rock products are up to 50% lighter than cement based products and therefore easier to handle and transport. Lighter loads will reduce fuel consumption and reduce truck movements by adding transportable load volumes.

Greener

Nu-Rock products contain 1.5% of the carbon of an equivalently sized traditional masonry product. By manufacturing Nu-Rock products growing ash waste stockpiles will be reduced.

More affordable

Nu-Rock products are significantly cheaper to manufacture than traditional masonry building materials. Savings will be passed on to the end user to encourage trial and uptake of this environmentally friendlier option.

Stronger

Nu-Rock products are proven to be up to 100% stronger than conventional masonry building products reducing the volume of products required particularly in load bearing areas.



200 Series Hollow Block - 390L x 190W x 190H mm



Nu-Rock Brick: 230L x 110W x 76H mm

MARKET DEMAND

Annual Cement Block Consumption

| | |
|-----|---------------------|
| QLD | 200 million |
| NSW | 150 million |
| VIC | 100 million |
| | 500 million* |

*Conservative estimate based on information from Australian Source Bureau of Statistics and Building Commencement data



Annual Standard Brick Consumption

| | |
|-----|---------------------|
| QLD | 300 million |
| NSW | 300 million |
| VIC | 200 million |
| | 800 million* |

*Conservative estimate based on information from Australian Source Bureau of Statistics and Building Commencement data



As competition in the construction industry intensifies builders will seek products that offer them a competitive advantage. Whether that is price based, ease of handling or greater sustainability qualities. Nu-Rock is well positioned to capitalise on this market need. Nu-Rock has secured forward orders for over 7 million blocks from builders and developers in NSW.



Nu-Rock Australia would be pleased to participate in further discussions with the Federal Government to assist in reducing the economic, human and environmental risks posed by ash and waste streams.