REPORT ON PROCEEDINGS BEFORE PUBLIC WORKS COMMITTEE

COSTS FOR REMEDIATION OF SITES CONTAINING COAL ASH REPOSITORIES

Answers to Questions on Notice

Answers provided by Mark Ramsey, Vecor Technologies Pty Limited

6 November 2020

1. ***What is the cost difference between using those other alternative aggregates versus coal ash?***

The pre-mixed concrete industry in NSW uses approximately 6.65m tonnes of sand and 11.4m tonnes of aggregate each year, comprising 29% and 50% of the total weight of concrete made in this State. Virtually all this sand and aggregate is mined – from beaches, riverbeds, and quarries. The average cost per tonne of sand is $35 and of aggregate is $45 per tonne (estimates are net of transport, administration and distribution expenses). Notably, there is no environmental expense associated with mining sand and aggregate, despite its adverse impacts.

Part of Vecor Technologies' recommendation to this Inquiry is for a detailed study of the likely costs and benefits from utilizing fly ash in various manufactured materials. The largest potential use for fly ash is in making engineered sand and aggregates, principally for use in making ready mixed concrete.

Engineered sand and aggregate granules are made from aluminium silicates derived from coal ash and other industrial solid wastes. They have high crush resistance, controlled roundness, and controlled density. The density of each granule can be controlled to make low-density, high-strength aggregates and sands, and to tailor characteristics such as water absorption, hardness, density, and colour.

Engineered sand and aggregates have a ~8% lower specific gravity than natural rock and sand. Their unique characteristics allow for the manufacture of light weight concrete mixes with increased strength and tailorable characteristics compared to concrete made from quarried river sand and quarried rock aggregate. Other products such as foamed concrete (light in weight but still strong) can also be made utilizing these materials.

It should be emphasised that engineered sand and aggregates are not a direct substitute for quarried sand and aggregates, as the concrete made using these materials will have higher strength, lower weight and other desirable characteristics compared to concrete made from traditional materials.

To create engineered sand and aggregates from fly ash would require the establishment of facility incorporating a mill, sieving process and a high temperature, high capacity kiln at the site of the fly ash. Although we are not in a position to provide a definitive estimate of the capital or energy costs associated with constructing and operating such a facility, we believe the cost to manufacture engineered sand and aggregates would be competitive with the cost of mined sand and quarried aggregate, bearing in mind the superior characteristics and environmental benefits of the manufactured substitutes.

A true like-for-like comparison requires a cost/benefit analysis which would take into account not only the different characteristics of engineered versus quarried sand and aggregates, but also the externality costs associated with using non-renewable raw materials (with associated environmental degradation) when an alternative is available which produces a superior product, improves the environment by utilizing a toxic waste product and creates new jobs and industries. While we expect the actual direct cost of production of engineered sand and aggregates to be competitive with mined equivalents, when environmental considerations and job creation opportunities are taken into account the "cost difference" massively favours the use of fly ash rather than quarried raw materials.

Mr Ramsey, you mentioned in your opening statement that there is the prospect of hundreds of jobs being created. Why do you say that?

Based on our experience operating a tile factory in Zibo, China, using fly ash as the primary raw material, approximately 150 staff would be required to manufacture, distribute and market 7,500 square meters of porcelain grade tiles or engineered stone per day. The Zibo factory was a first version industrial scale plant. A full-scale plant would produce upwards of 45,000 square meters of tiles and engineered stone per day, but with reduced staffing on a per square meter basis. Our estimate for the permanent staffing of an industrial scale plant would be between 350 and 450 workers including production, distribution, transport, marketing and administrative staff. A facility producing more tiles would require a proportionately greater number of permanent employees.

A facility producing engineered sand and aggregates would be less intensive (and less value adding) than a tile factory but would utilize significantly more fly ash. Preliminary estimates indicate that 500,000 tonnes pa of fly ash would be utilized for each sand or aggregate plant, with permanent staff of not less than 100 people.