HALLETT GROUP

# Harvesting “salt water sluiced” flyash in SA

## our experience thus far…

Presenter : Massimo Capasso
GM Sustainability & Product Innovation

# Decarbonisation Pathways

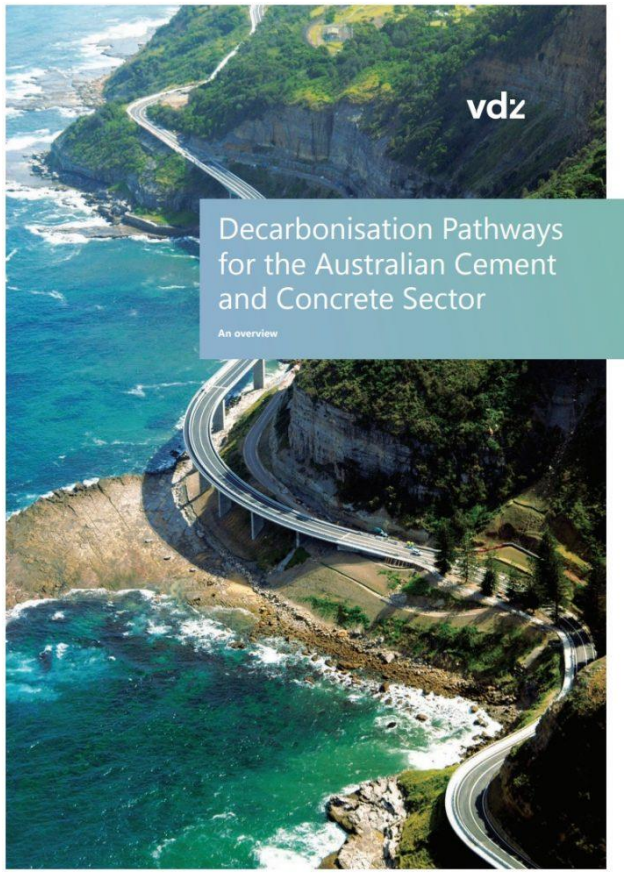
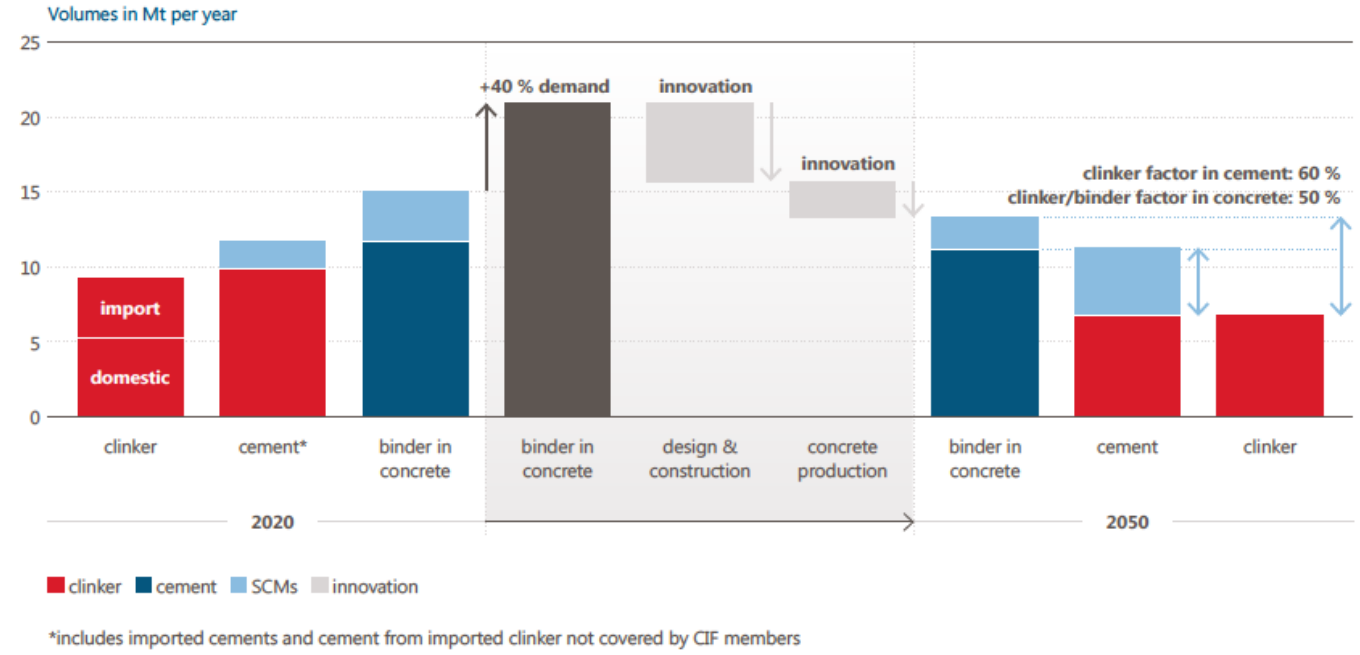



**Figure 6: Clinker and cement volumes 2020 and 2050**




*includes imported cements and cement from imported clinker not covered by CIF members

*2020* – 5.7 Mt required

*2050* – 7.6 Mt required

**33 %**

Increase in volume required

***Courtesy : HBM Group***

# Australian Standards for Supplementary Cementitious Materials

Materials that compliment and improve cement/concrete properties,

- Most design specifications will request the addition of SCM's
- Technical and sustainability benefits

## Traditional SCM's

- ***AS 3582.1 Flyash*** ; Energy decarbonization, limited and dwindling resource in Australia
- ***AS 3582.2 Ground Granulated Blast Furnace slag*** – limited local supply, 1 local steelworks
- ***AS 3582.3 amorphous silica*** (very particular applications)

***100% of traditional SCM's (slag / flyash) used in South Australia are imported***

# Global and National pressure to reduce C02 has facilitated the fast tracking of a new Australian Standard for “Manufactured Pozzolans” AS 3582.4

Acceptance of a raft of new SCM materials into the AS suite for use in concrete;

Approved SCM Sources;

- Mineral processing (Cu / Ni / Fe Slags)
- Manufacturing (Lithium by-product, Waste Glass)
- Waste to energy (Incinerator Ash)
- Recovered resources (Dam Ash)
- Processed/calcined natural minerals (Calcined Kaolins)

Alternative South Australian produced waste materials will be covered by the new standard and the use of these materials will be strongly supported.

# New South Australian SCM Sources

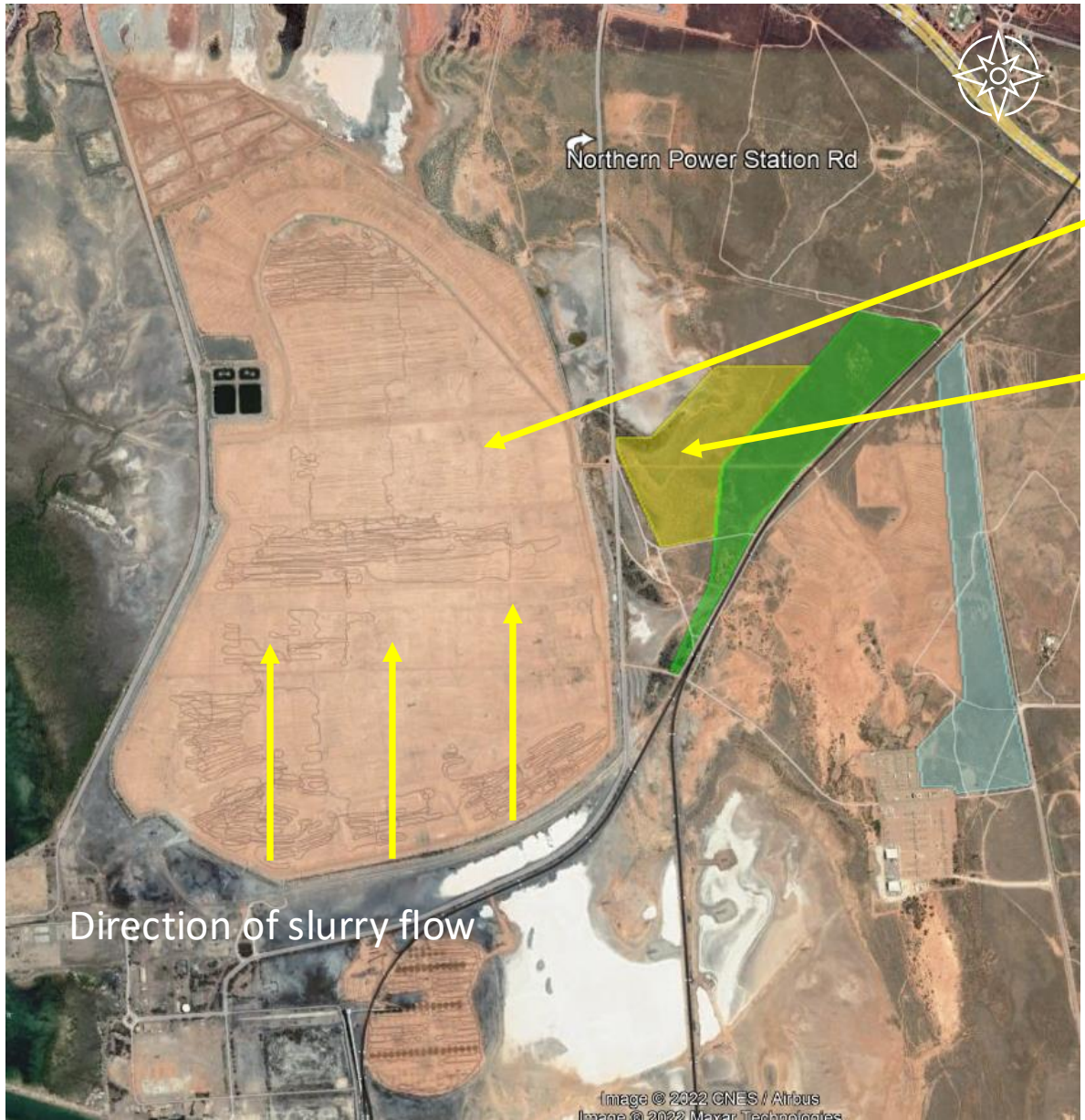
The South Australia's Upper Spencer gulf region is home to 2 significant stockpiles of industrial byproduct SCM feedstocks. The region is also home to the largest source of renewable energy available in the country.

- ***Port Augusta Flyash Dam*** – 20 million tonne legacy stockpile of Flyash
- ***Nyrstar Port Pirie Polymetallic Smelter*** – 3 million tonne stockpile of fume slag

# Port Adelaide Green Cement Distribution Hub


- cement storage dome, twin drive through weighbridges, inbuilt 100 tph dial a blend

# Port Augusta SCM Processing Hub




260Ha Ash Dam

Hallett - 15Ha Leased Area

Sub-bituminous coal (Leigh Creek)
2016 Closure – Northern Power Station
Playford station ash also available

Flyash ex:station ; low LOI, high % passing 45um & excellent pozzolanic activity

# Port Augusta SCM Processing Hub

**R&D Program Objectives - Flyash characterisation across deposit**

- Drillhole campaign 130+ sites across dam , 0.5m increments to natural
- Targeted program based on ;
  - sluicing history , power plant intel
  - Preferred “commencement” offtake locations with respect to processing facility
  - Best fine grade ash cut, lowest soluble salt content available in preferred zone

3D Deposit profiles developed based on ; Moisture content ,Particle Size distribution , Total Dissolved Solids, Chloride Content , Loss on Ignition

# Port Augusta SCM Processing Hub

**R&D Program Objectives**

- Cement mill and Flyash processing Pilot Plant trials
  - 1:10 scale

  ***washing – dehydration- drying – deagglomeration-classification***

  Invaluable in assessing ;

  - Differing flyash properties and processing flexibility (rheology, PSD)
  - Equipment selection
  - Optimisation capability
  - Scalebility
  - Bulk production of “upscaled” representative samples for large scale laboratory and field concrete programs

# Port Augusta SCM Processing Hub

Ball Mill pilot plant

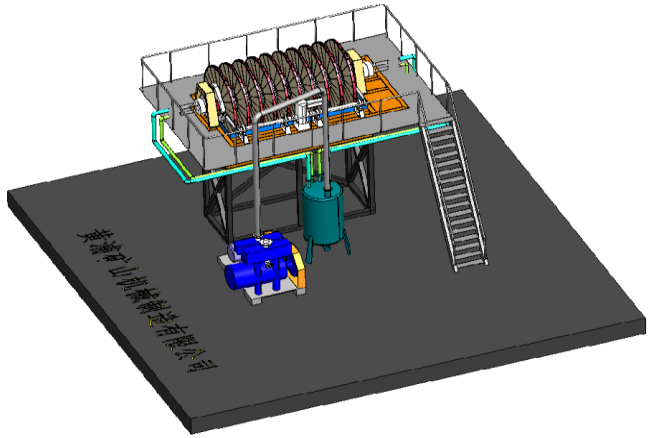
Flyash Drying & Classification pilot plant

# Port Augusta SCM Processing Hub

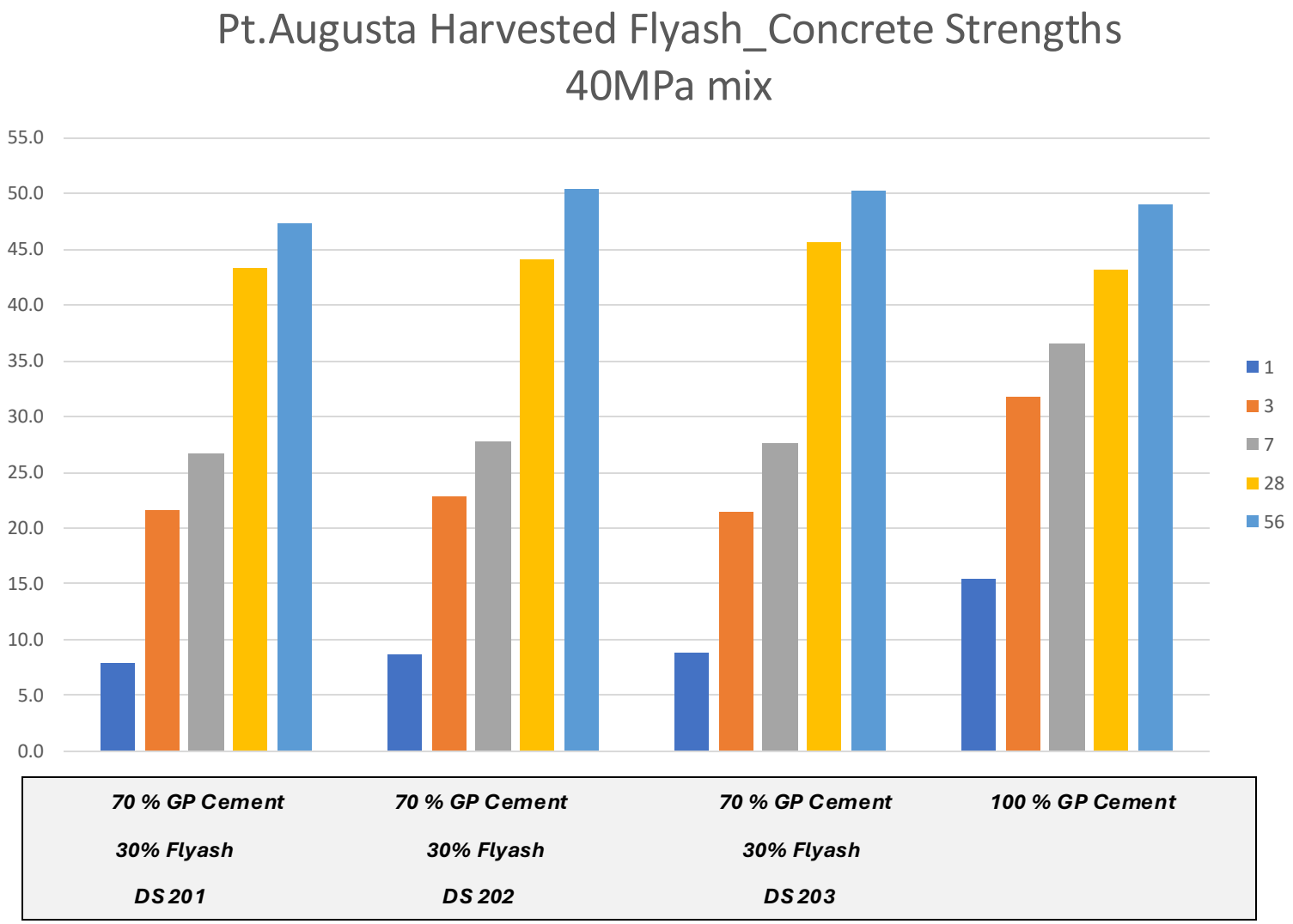
## Chloride Washout Methodologies

# Port Augusta SCM Processing Hub

## Chloride Washout Methodologies



# Port Augusta SCM Processing Hub



# Port Augusta SCM Processing Hub

**R&D Program Objectives - Brine Chemistry**

- NaCl ,Ca ,Mg, K
- Sulfates ,carbonates
- Heavy metals Pb, As, Cr, Hg, Cu

**Removal**

- Reducing solubility of HM , precipitation as hydroxides, sulfides
  Raising pH to 9-11 , precipitate out Cr,Pb,Cu
- Sulfide based precipitation for Hg,Cd and Pb
- Gypsum precipitation of sulfates
- High value Mg removal as a hydroxide

- Evaporation ponds , solids management

- Waste plant energy to distillation and re-use

# Port Augusta SCM Processing Hub

**R&D Program Objectives**

- Partnering with universities , local and interstate
- 2 x PhD students commenced projects
- Extensive “Concrete Test Program” commenced , expected to run for 2 years focussing on key technical aspects , plastic and hardened properties .

# Major learnings

- Extensive drilling campaign – understand your variability
- Implement a Pilot Plant – optimize to your own material characteristics, bulk material preparation
- Washing sequence and Dehydration efficiencies key to energy use and Chloride mitigation
- Brine chemistry modelling is important for process water management
- Must re-think the 0.1% /0.05% limits on chloride in SCM’s