



ABR Process Development

- ABR (Australian Bio-Refining) is an Australian based company headquartered in Brisbane, Queensland.
- ABR specializes in water remediation technologies for the removal & recovery of chemicals from processed wastewater.
- ABR has manufacturing & lab facilities in Brisbane and Melbourne, Victoria, plus has been operating in North America since late 2014.



Water Remediation Solutions

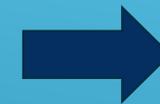
Contaminated & Toxic
Water



ABR Processes



Reusable
Chemicals



Recovered
Solids

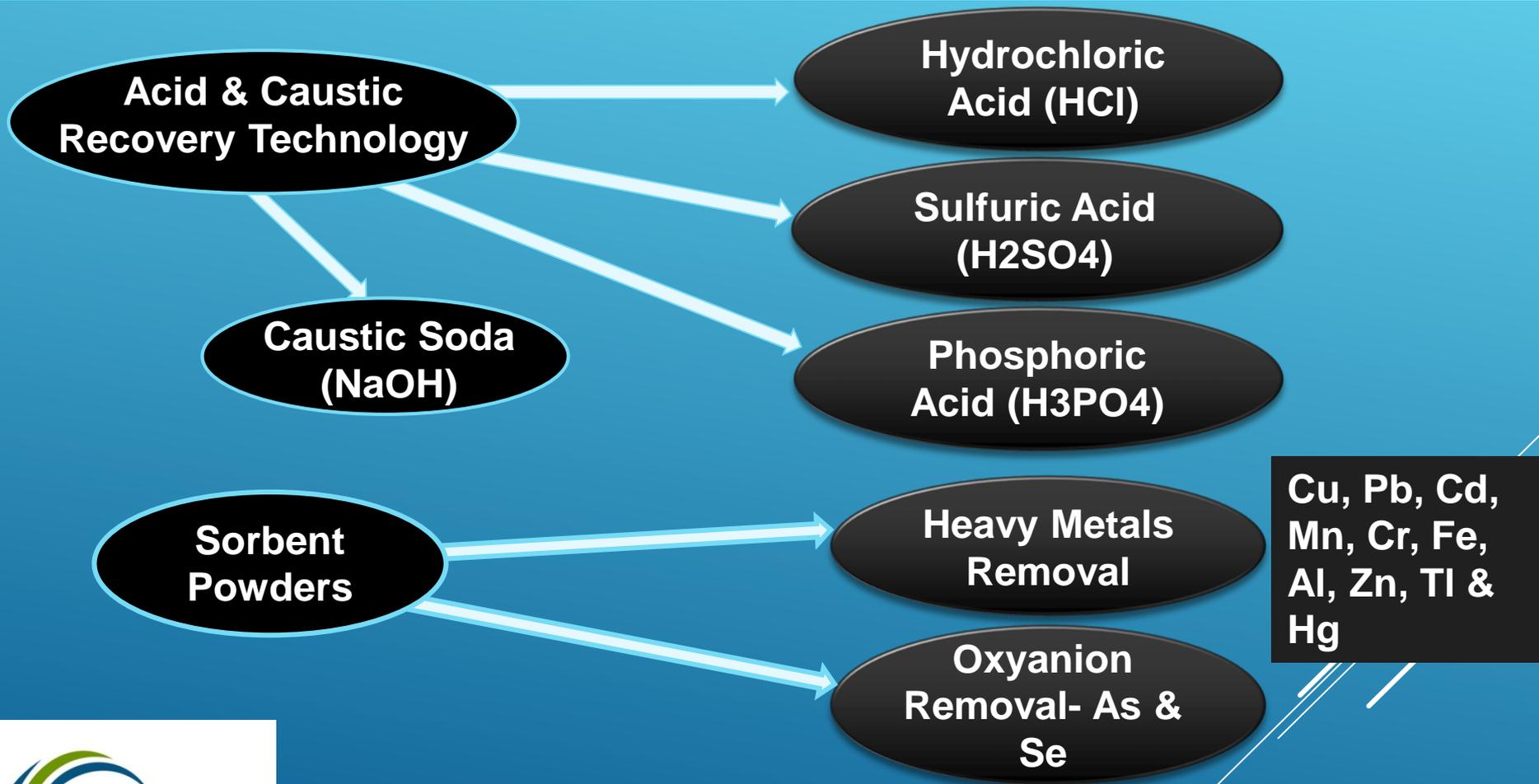


IX Regen Acid Brine
RO Wastewater
Hydraulic Fracturing
Spent Pickle Liquor- Steel
Pregnant Leach Solutions- Mining
Landfill Leachates/Toxic Ponds

Clean
Water

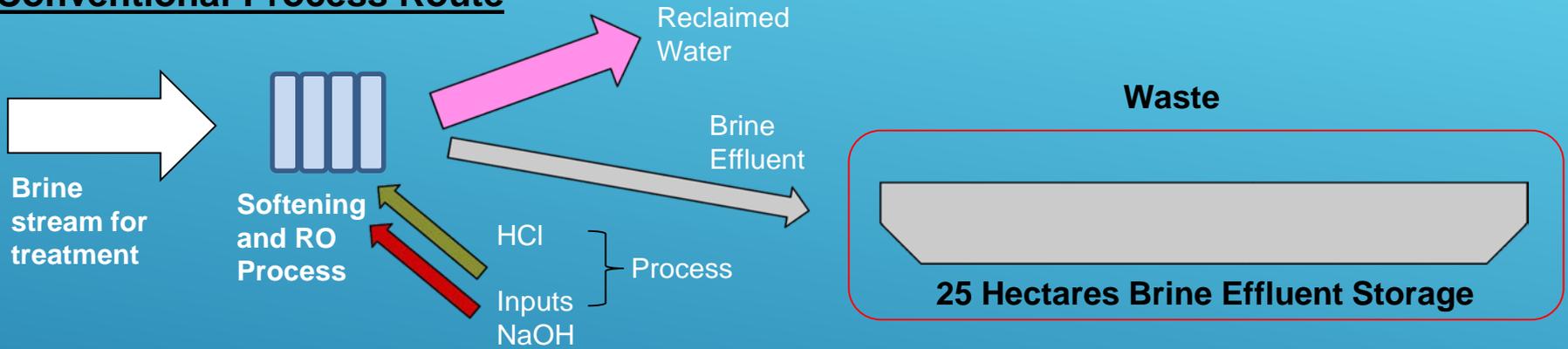


ABR Technologies

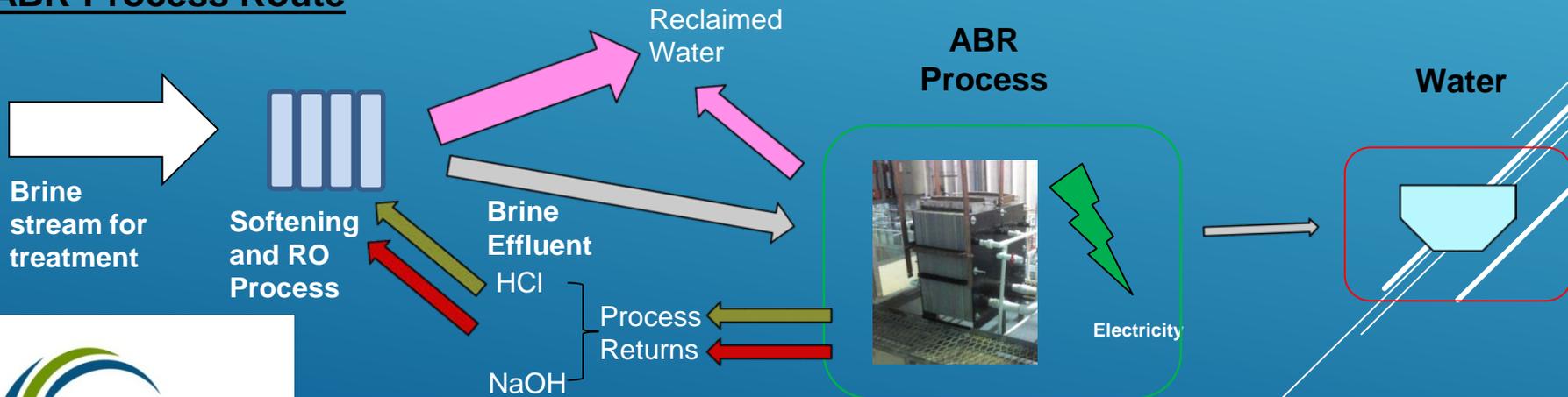


Conventional vs ABR Process

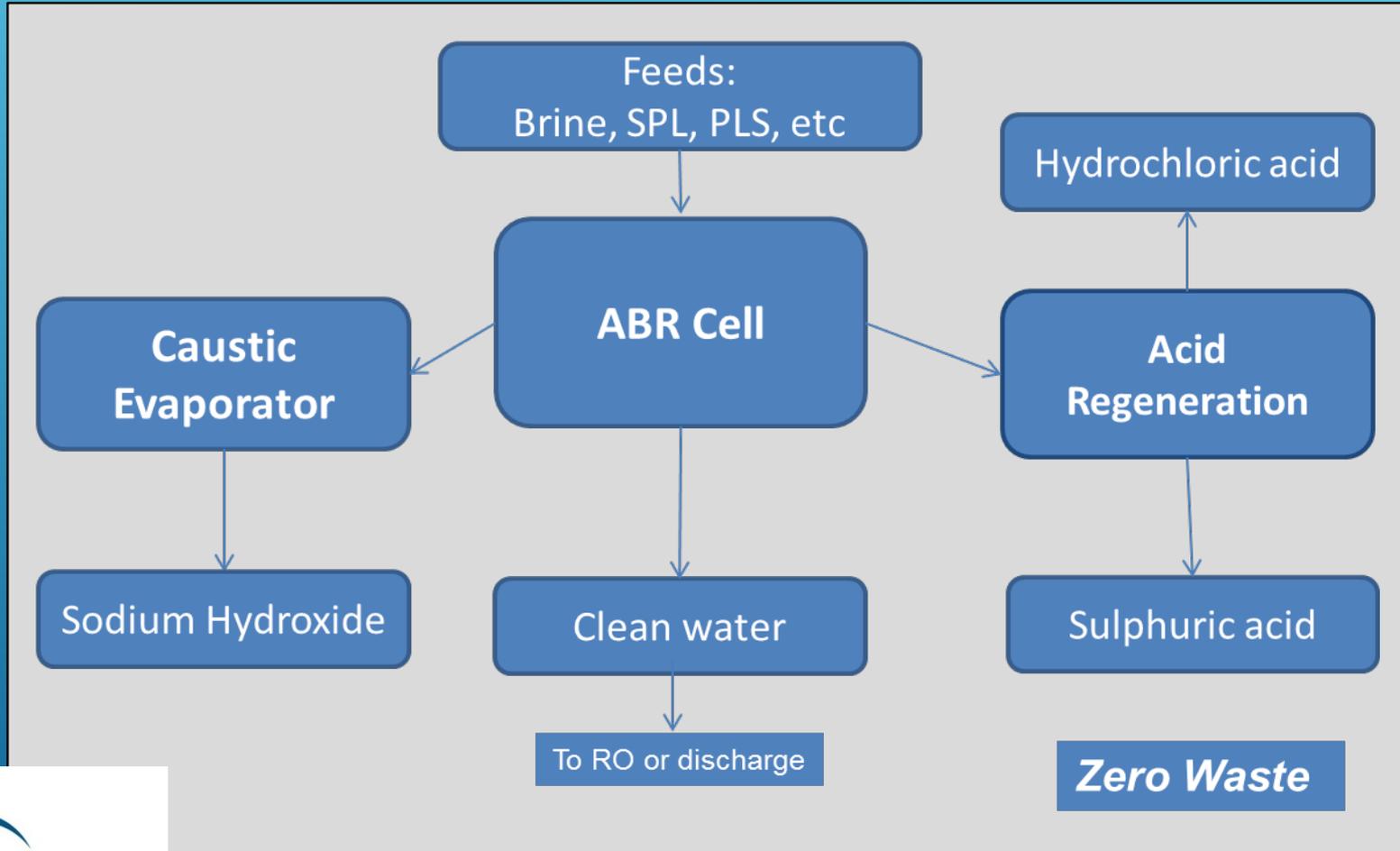
Conventional Process Route



ABR Process Route



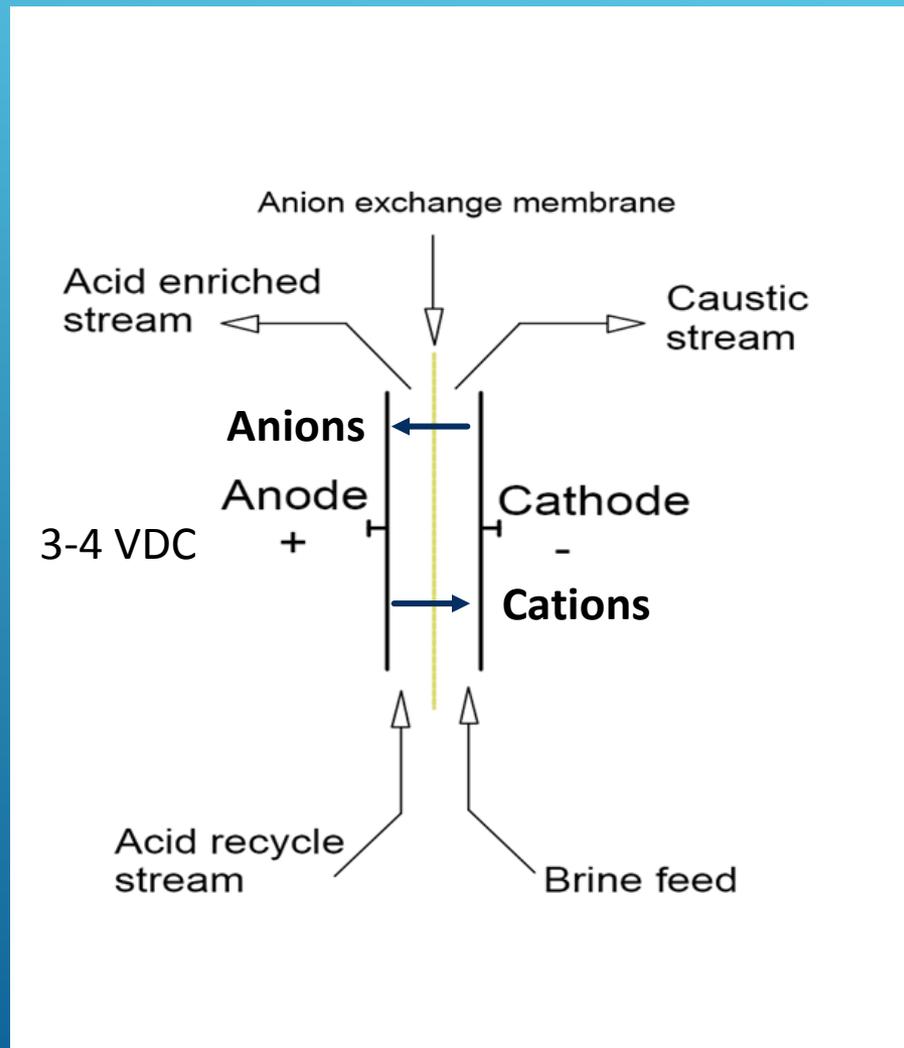
Regenerating Acids & Caustics



ABR Electrochemical Cell

Anolyte
Holding Tank-
Closed Loop
System

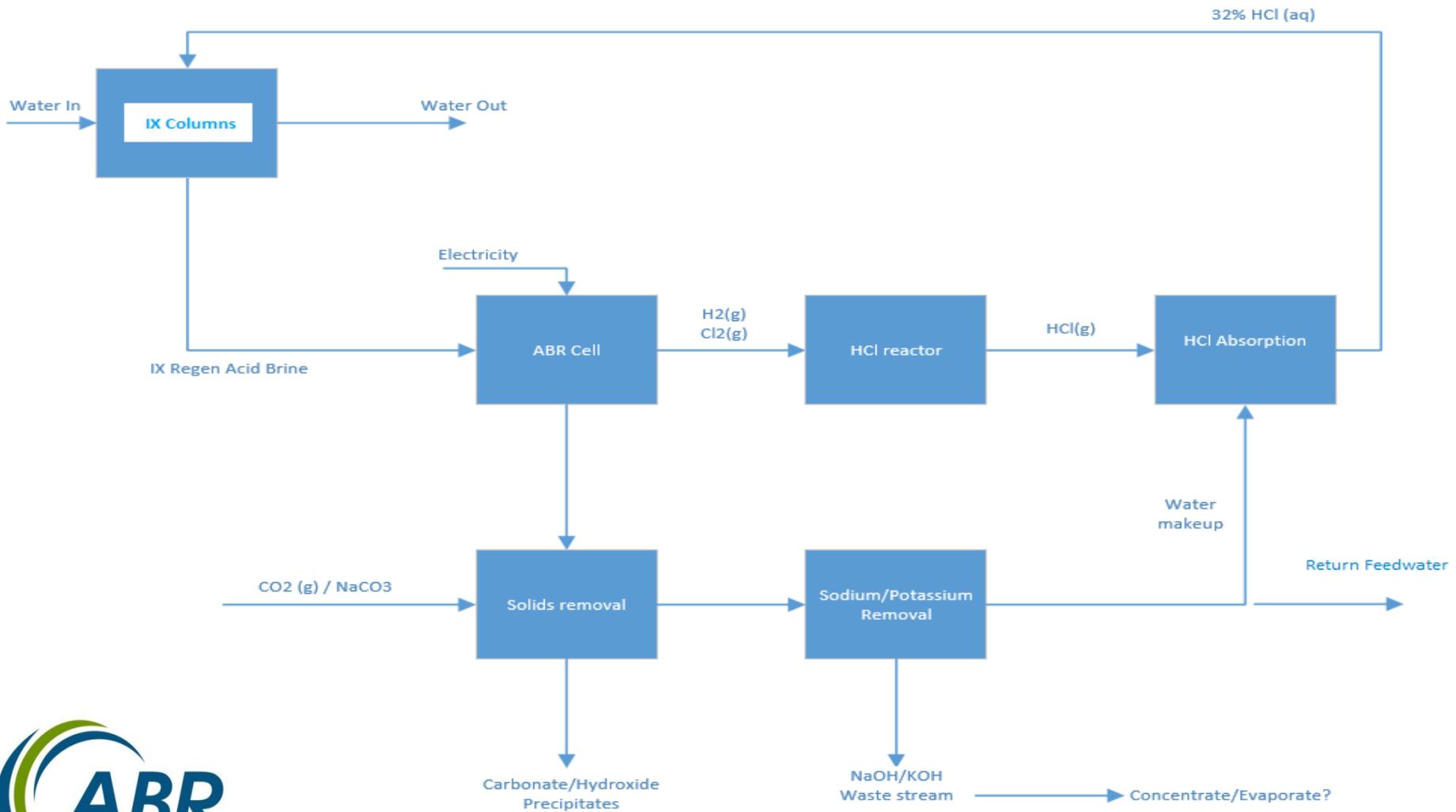
Initial Enriched
Solution (HCl or
H₂SO₄)



Catholyte
Holding Tank-
Brine or
Wastewater

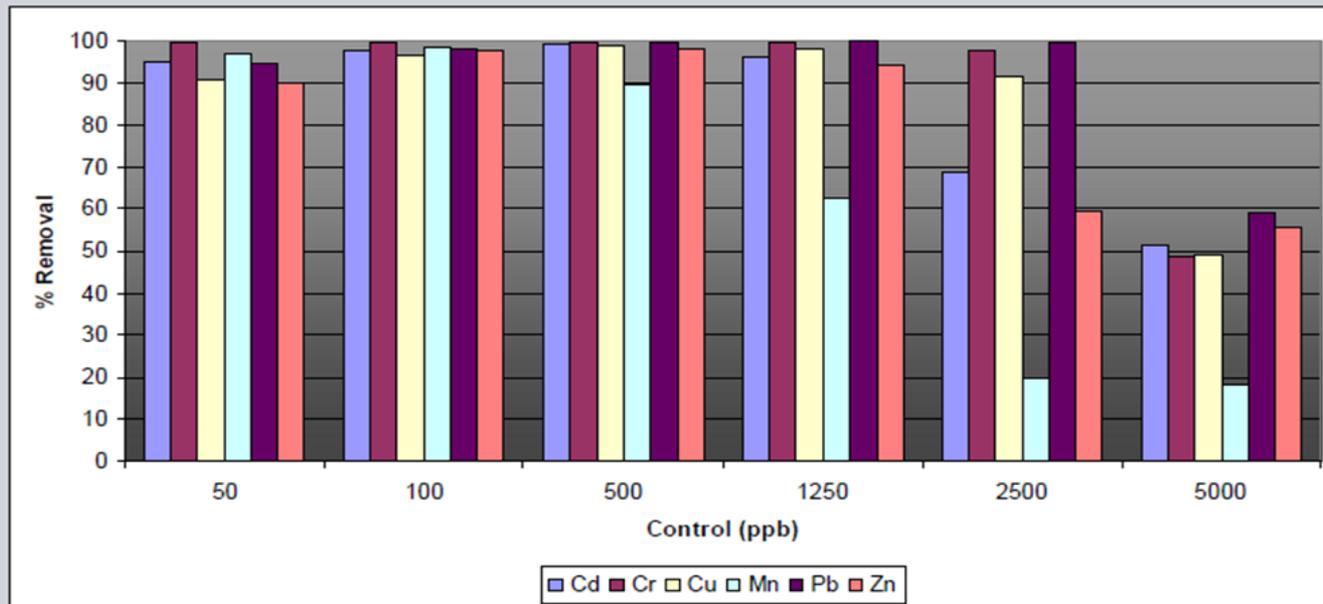
AX Membrane
Only, So Metals
PPTN At Cathode

ABR Process Block Diagram for HCl



Sorbent Powder for Metals- Results

ABR Media – Cation Removal Capacity Testing



- Jar tests with 0.25 g/L media in tap water for 1 week
- Cations at different concentration as per SOP
- $\text{Cd}(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$, $\text{K}_2\text{Cr}_2\text{O}_7$, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, $\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$, $\text{Pb}(\text{NO}_3)_2$, and $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$ as sources

Advantages

- ABR's patented technologies do not have any direct competitors providing full recovery of acid, plus the ability to re-use the acid.
- Some environmental clean-up firms can remove the IX regenerated dirty acid by neutralizing & disposing of it. Some competitors can partially recover the acid.
- ABR's technologies are 99% reliable based on basic maintenance. The lifespan of the ABR cell is 5-10 years & the anion exchange membranes are 18 to 24 months.



Design Model for Coal Seam Gas

Nominal Brine Concentrate:

400 m³ per hour

~16,000 ppm Cl

~15,000 ppm Na

~13,000 ppm Carbonate hardness

TDS ~ 45,000 ppm

Outputs:

~ 160 t/d HCl (32%)

~ 275 t/d NaOH (45%)

~ 9 ML per day recovered water
(TDS < 500 ppm)

Market Imports:

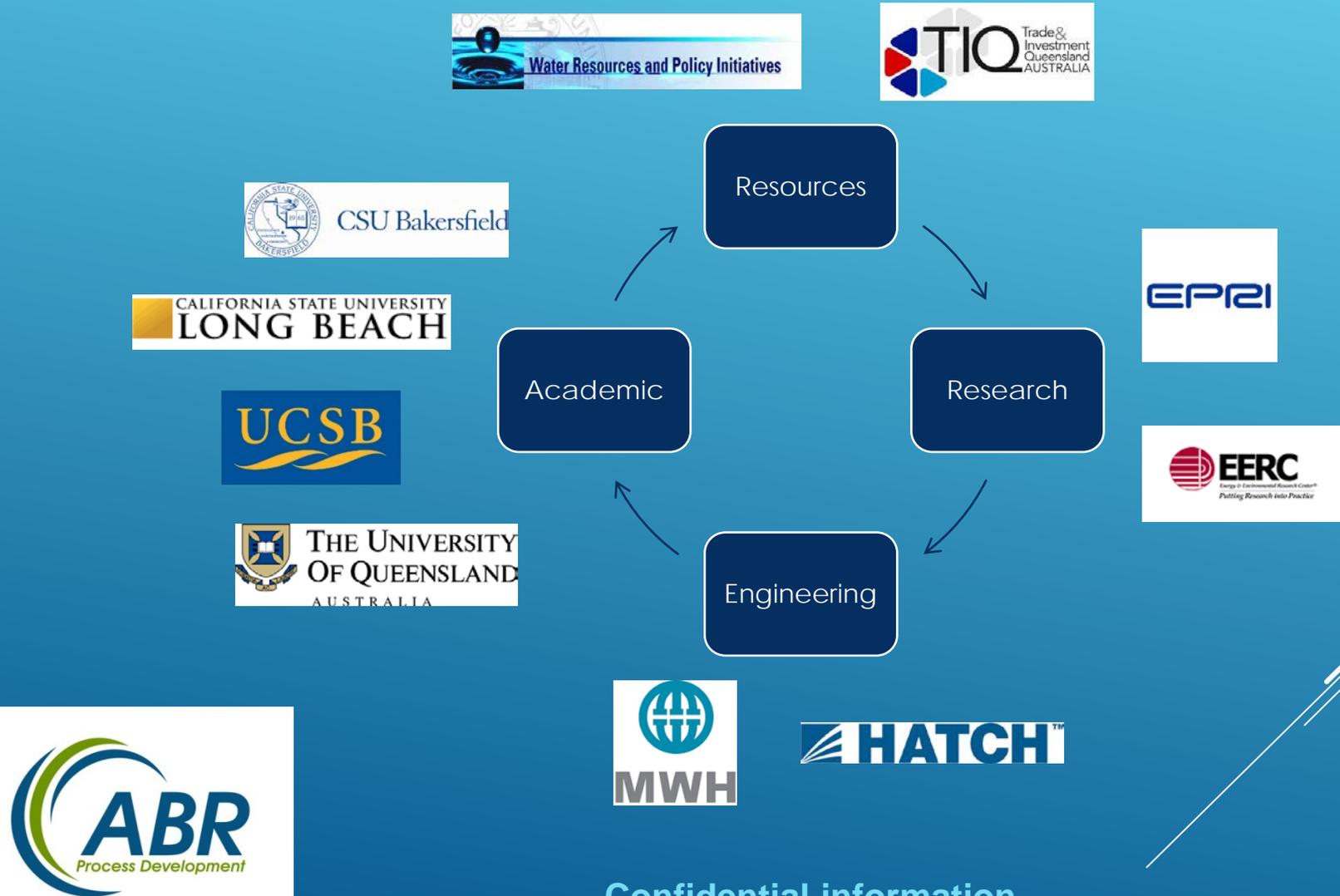
4.74 million Tons NaOH (45%)

~ \$1.01B

4,216 Tons HCl (32%)



NORTH AMERICAN NETWORK



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