Cubic QED Pty Ltd

ACN 111 943 036

Mobile: [redacted] Email: [redacted] Web: www.cubicqed.com

Committee Secretary

Senate Standing Committees on Rural and Regional Affairs and Transport

PO Box 6100

Parliament House

Canberra ACT 2600

Steel Industry Review– Supplementary Environmental Opportunities

Introduction

Please note that this document is supplementary to Cubic two-page submission by East West Line Parks (EWLP) direct application to the Senate Joint Standing Committee. East West Line Parks Pty Ltd proposal for a steel export infrastructure project includes rail and special ship design for 2-way cargoes. Cubic signed a Letter of Intent in 2019 with EWLP to deploy its technology in carbon utilization to assist EWLP process CO2 into mineral carbonates and green chemicals.

The document therefore also seeks to identify opportunities in other industry sectors for additional applications of the technology as per the request of Richard Hopkins who is preparing information for the Senate standing Committee.

Cubic seeks to therefore show the relevance of its process route technology for other potential industries as per the above request that may be applicable for multiple by product industry development in other industry settings and locations. The industries that may find application could be gas production, mining relating to seaborne emissions and the coal generation sector. They typically relate to high water usage and high emissions. Other applications relevant to heavy industry emitters may include aluminium smelting, cement, and the chemicals industries generally.

Hydrogen production is part of the generic mix in Cubic process route as electrolysis forms part of the original mineral extraction and hydrogen generation process. Green hydrogen export is not part of East West Line Parks steel production but is beneficial to enable EWLP to utilize nitrogen from its air separation unit needed for oxygen for

steel making. The air separation unit emits nitrogen as a waste gas which can then be used with hydrogen from Cubic to produce ammonia. Green Hydrogen is to be initially developed from electrolysis of desalination water and used with capture of nitrogen off the steel making oxygen process and deployed in the production of ammonia which in turn consumes large volumes of CO2 off the steel plant to make urea for fertilizer.

Overcoming East West Line Parks Environmental Risks

Concentrated brine discharge from reverse osmosis desalination is considered an environmental hazard to sea grasses and marine life. This would be a risk to EWLP Abbott Point site for the Great Barrier Reef if runoff etc went via river flows to ocean. Cubic however will not discharge desalination concentrated brines to the ocean. Cubic will take steel plant CO2 and react it with mineral ions recovered from the concentrated brine waste stream in a process known as Zero discharge desalination. The process has been successfully tested at small scale for economic recovery of the key minerals.

Zero discharge means that if water needs to be discharged to the Great Barrier Reef the water will be lower in salt content than seawater salt concentration. Post steel plant water is further treated to ensure water is cleaned to the required standard for reuse. The major minerals of sodium, magnesium, calcium, and potassium have been previously captured and used in by products leaving diluted salts and lower salinity. This water is further treated and proposed for algal production that again uses CO2 in a land-based process to produce biochar for carbon soil remediation to farm areas.

CO2 converted into mineral carbonates and chemicals as described later become precursor materials for industry in which it is anticipated that the embedded carbon will remain in the products for at least twenty years by which time new technologies are expected to recycle these valuable materials for another reuse.

Overview of Embedded Emissions related to Australia's Export Markets

Australia supplies most of the seaborne natural gas, iron ore and coal for steel making globally, some responsibility rests with Australian coking coal and steel makers to reduce carbon emissions or face carbon penalties in export markets. Carbon penalties are an emerging reality and may damage the competitiveness for Australian mineral exports.

Possible exports may include other minerals such as bauxite, lithium, tin, monazite, copper etc. The coking coal sector is a major export for Australia and needs to identify technology approaches to remove or transform CO2 prior to export. CO2 capture is possible for many industries and Cubic process is applicable to most. CO2 captured and transformed in Australia will accomplish its goal to comply with COP22

undertakings to the global community and may expand export of finished steel by existing steelmakers.

Australia is highly reliant on its mineral and agricultural exports, and both are coming under international scrutiny for emissions as well as continuation of supply of energy products such as coal and gas.

The Financial Review 20/10/22 reported the Prime Minister of Japan is to visit Australia to ensure Australian “energy nationalism” does not damage supply of coal and gas as critical energy materials for Japan.

Australia might use such supply concerns to negotiate investment from these countries to help us produce green products that they also want and are reliant on to clean up their own COP22 agreements. Importing countries needing our minerals are the best source for local investment as our national investment market comes nowhere near the requirement.

Overview - Cubic Technology

Desalination concentrated waste brine stream is typically 50% of the intake water which contains major mineral ions comprising sodium, magnesium, calcium, and potassium. The major seawater mineral ions are captured and separated through a process of electrolysis and electrodialysis, reacted with CO2 in a process called aqueous phase mineral carbonation to form mineral carbonates. They can similarly be recovered as hydroxides and dried to oxides.

The treated CO2 is more rapidly adsorbed into mineral solution of ions than the process of mineral carbonation deployed in various locations around the world where absorption is done into calcium/magnesium rock formations containing salt water where CO2 can be adsorbed but is a long-term process.

In summary CO2 is captured and chemically modified using seawater chemicals in lieu of fossil fuel sources to create green chemicals and materials that create multi-product revenues from by products to offset cost of water and hydrogen.

Breakdown of Multiple by Products

1. **Mineral Carbonation of brines**

Mineral carbonation is known as a potential permanent store of carbon. The conventional form of mineral carbonation is delivery of CO2 into rock formations containing magnesium and calcium where over time the CO2 reacts with the minerals to form carbonate rock. Mineral carbonation occurs over long periods of time and is the process used by natural gas companies to bury CO2 in the ocean floor.

Seawater is also a host of magnesium and calcium as chloride salts along with sodium and potassium forming the bulk of salts in the ocean. Sodium chloride is the

most common mineral as ion in seawater. Cubic utilizes a common process known as electrolysis to convert sodium chloride to sodium hydroxide. Sodium hydroxide can be used to precipitate magnesium hydroxide as well as calcium and potassium to hydroxides. Once dried they become materials of commerce.

In Cubic process supercritical CO2 is reacted rapidly in solution with the mineral ions of sodium, magnesium, calcium, and potassium. The minerals in seawater do not have other mineral inclusions that are typical to mined ores. This means they are pure without need for further processing.

Cubic has a proprietary process to make magnesium metal. The oxide is injected as dried and agglomerated material with calcium and aluminium or ferro silicon direct to a DC arc furnace in a continuous process to make highly pure magnesium metal in a lower energy process to carbothermic processes. Mg metal is a designated strategic material by the US Government and Australia is a supplier under the Australia US Free Trade Agreement.

2. Chemical carbon streams from industry

Major By Products off oxyfuel combustion:

- Formic acid - CO + H2O > HCOOH
- Methanol - CO + 2H2 > CH3OH
- Acetic acid - CO+ CH30H > CH3COOH
- Ammonia - 3H2 + N2 > 2NH3
- Urea - 2NH3 + C02 > NH2CONH2 +H2O

Blending these with Cubic by products gives additional
By products by combining steel plant CO2:

- Magnesium hydroxide -Mg (OH)2 + MgO > 3Mg (Mg Metal)
- Sodium hydroxide - NaOH + CH3COONa > CH4 + Na2CO3 to sodium carbonate
- Calcium hydroxide - CaOH + CO2 > CaCO3 to calcium carbonate
- Potassium hydroxide - KOH + CO2 > KCO3 to Potassium carbonate

Combining both stream of minerals and CO2:

- CH3COONA + NaOH - CH4 + Na2CO3
- Ethane / ethanol - CH4 + H2 > C2H6
- Ethene to Polyethylene - C2H4 (precursor plastics)

A total of 23 potential by products have been identified

The Market for Green by Products

A vast new market for green technology is emerging. We propose up to 23 by products can come from a desalination / Heavy industry hybrid process route. The rest of the advanced economies are at the same starting gate but have the edge over Australia with many existing heavy industries and installed ammonia and chemicals infrastructure facilities ready to instal catalyst and nitrogen plants.

The problem for Australia is that hydrogen scale up infrastructure does not exist, apart from State run desalination plants. There is no large-scale infrastructure ready to engage in the global hydrogen race to secure markets. An international market study identified large scale shipment to Japan and Korea as Australia's hydrogen key target markets.

Distance to export markets means there is a vast new market emerging for powering the vessels that service iron ore, coal and natural gas to markets that will soon extend to hydrogen beyond Asia. Shipping fuel infrastructure is not available in SE Asia or Oceania for the emerging low carbon shipping fuels.

Utilizing a proportion of the large-scale assets capacity to produce hydrogen would give Australia a lead position in the production of carbon neutral shipping fuel. These assets are the State funded and if deployed could help Australia secure permanent markets.

Hydrogen markets are still not factoring in how to transport hydrogen effectively and the distance to market of compressed or liquified hydrogen is already deemed uneconomic.

Transporting hydrogen however has problems as it needs to be either liquified or compressed which are both expensive infrastructures or as with Japanese and Korean markets blended with ammonia for safer shipment.

To achieve large scale hydrogen production, it may be a successful strategy to seek to focus on the methanol shipping market as the priority rather than the current focus on direct hydrogen shipments or ammonia shipments.

An international study on market pricing for Australian hydrogen exports assumes export price viability to Japan and Korea as Australia's major export markets. Competition from Africa, Middle East hydrogen production is projected to be at lower prices than Australia for servicing European and Indian markets.

Australian 2030 hydrogen was modelled as affordable to Japan and Korean markets at projected prices between US $1.80 ~ $2.50/kg by 2030. The study assumed shipment in the form of ammonia. This costing assumes reduction in the cost of electrolyser technology and other technology improvements that were seen for the solar energy industry being similar which will also benefit Cubic's process. Cubic has already modelled large scale desalination off Sydney and Wonthaggi State operated assets and determined viable hydrogen pricing within this range.

Desalination Seawater Mineral Ions – A Process Route for Green Chemicals

Australia has been slipping in the global ranking of economic complexity with declining secondary manufacturing. Mined products where our economic advantage exists needs support for conversion of mining into semi-finished or finished metals such as magnesium light metal manufacturing.

Extension of technology into semi manufactured items such as Mg ingots and chemicals and other materials. For example, magnesium is being used in metal organic framework for CO2 capture and for direct production of formic acid. Carbon chains which emanate from methane are the building blocks of many industries.

Cubic originally developed and patented a process in 2009 to utilize reverse osmosis desalination wastewater mineral ions, converted from chlorides which are then combined with carbon dioxide in solution for rapid mineral carbonation to assist coal fired generation reduce its emissions.

Recently mineral carbonation has started to be seen as an essential part of the suite of technologies to solve global warming under the banner of Carbon capture and utilization or CCU, which has recently been formally acknowledged by The US Government Carbon Reduction Plan with an appropriate US$90 billion funding package.

Utilization of Large-Scale Infrastructure – Underutilized Desalination in the Race to H2 exports

In the race to secure hydrogen markets we propose that capex cost for green hydrogen to methanol can be greatly reduced by accessing underutilized high purity water from Australian large scale desalination plants located in each state and deployed for hydrogen production that are often not in operation due to high operating cost from high energy use.

The current three year La Nina event, that has impacted many Australian states, has dam storage levels at near 100% capacity. Desalination plants typically are only required to operate when dam levels drop lower than 60 percent. Currently Sydney desalination plant is processing muddy water from floods to purify dam waters but once the 3rd La Nina finishes a long dry spell may find little or no requirement for these assets for an extended period.

Alternatives to Desalination - Direct Seawater Processing to Hydrogen

Cubic is currently looking at straight seawater processing to avoid the high capital cost of large-scale desalination plants. There exists a technical possibility, but extraction times are doubled, and mineral recoveries are halved making the economics more difficult and therefore more costly.

Several major existing desalination plants are already located in cities close to industrial areas could be developed into hydrogen hubs. Some of these are Wonthaggi, Perth, Sydney, and Adelaide.

Most desalination plants only operate when dam levels go below 60 percent capacity. Based on care and maintenance figures from public reports Cubic operations at Sydney's plant could pay for all the C&M and return profits to the plant investors.

Coal fired power generation for backup supply to the main renewable energy grid might consider the benefits of multi by products if located close to seawater location with oxy fired CO2 capture process like the Callide test project in Queensland.

Callide oxy fuel process produced ultra clean CO2 which is a benefit to Cubic process. As an example of possible projects, the ideally located Vales Point plant on Lake Macquarie was recently acquired by Sev.en Group who own energy assets in the Czech Republic, UK, and USA.

Sev.en Group purchased Vales Point with the objective of developing innovation to upgrade the plant. Its location has the advantage of saltwater location and adequate land to develop Cubic low carbon solutions and by products to offset cost and provide reliable back up to the solar energy grid network. CO2 from the plant could be converted to by-products by deploying the Callide oxy fuel and ASU process and develop CO2 products with Cubic process using Lake Macquarie.

Hydrogen as ammonia, urea, or methanol – The Fastest Route to Large Scale

Utilization of whatever assets Australia has is important in the race to secure markets. Which brings us to the question of which pathway introduces Australia into the export market most rapidly. Infrastructure for transporting hydrogen is not available, except at small scale and many participants will use dam and river water or WWTP water that create efficiency problems.

Hydrogen is produced most efficiently from clean water. Water that comes from dams or other non-desalination water can increase water consumption from 9 litres per kg /H2 up to 20 to 40 litres per kg and still requires silt and chemical clean-up which adds extra cost.

Hydrogen made into ammonia and then combined with CO2 becomes urea and is a fertilizer that is in short supply as a commodity with world food production deemed to require a tripling of urea before 2050. Modelling shows the more by products that are produced the lower the unit cost of hydrogen as product revenues offset electricity cost.

The international shipping association has been instructed by the UN and other bodies who have signed up to COP 22, to initiate the process of transforming vessel emissions to zero with penalties set for continued use of high emission bunker fuel which is now banned in Europe and world markets.

Methanol is going to be important to Australia as Australia is further away from all major global markets than any other major trading partner. Methanol is made through catalytic process combining carbon monoxide with hydrogen.

Pyrolysis of biomass produces green carbon monoxide and the char produced can be used to improve soil while reprocessed algae pond water can be used for aquaponic applications and intensive horticulture.

Biomass in the form of saline tolerant plantation trees and pond-based algae form part of Cubic process route for utilizing the demineralised wastewater from the desalination process to extract minerals in Cubic process.

Methanol may be the fastest route to large scale hydrogen production. The international global shipping industry consumes 300 million tonne year of heavy fuel oil. At half the density of heavy fuel oil the market for methanol will be 600 million tonnes year. Australia being a long distance from foreign markets pays more for shipped goods.

Methane to Methanol - avoiding fossil fuel production from oil, gas, or coal

The oil industry takes a fractioning approach to develop multiple chemicals off principally the main building block for petroleum, plastics, and multiple carbon chain products. The main building block is methane or CH4. Methane is derived from coal, gas, and oil production. Cubic process produces methane from non-fossil fuel sources, straight from ocean mineral processing and can utilize either biomass sourced carbon monoxide or achieved by splitting CO2 with off the shelf equipment. The process route flow sheet is illustrated in the attachments.

Green Chemical Route - Methanol for International Shipping

Cubic seawater mineral process route does not emit any carbon. Cubic proposes to deploy catalysis for splitting CO2 into carbon monoxide and to produce carbon monoxide from pyrolysis of biomass where carbon monoxide is used in the production of methanol to satisfy RED II European regulations for synfuels. The char produced from pyrolysis is a separate product that has environmental benefits in agricultural land soil improvement.

The unique approach of Cubic process route is to utilize chemicals from the ocean to derive a green CH4. Some of the steps to this are understandably not disclosed as they are core IP. To enable the process some CO2 is required from industry for splitting into carbon monoxide which is reacted with ocean mineral ions to create a new clean source of methane.

Water and hydrogen will produce formic acid Hydrogen and carbon monoxide are combined in a known off the shelf process to form methanol. Additional processing using some other seawater minerals plus acetic acid. Acetic acid plus sodium hydroxide from earlier mineral separation of sodium chloride by electrolysis produces methane.

The chemical pathway to methane has always been developed from fossil fuels. Cubic takes all the ingredients for seawater methane from the ocean making it a totally green process route to all carbon chain products developed off the initial methane such as ethanol and ethene or ethane. These chemical chains are used as precursor chemicals for ethanol and ethylene.

Australian Fuel Security

The question is why we don't take advantage of these very expensive desalination assets and create rules to allow flexible access to their facilities as a potential solution to fuel security for Australia.

Australia has a 30-day fuel reserve for just in time service to the mainland market. Australia has only one refinery operating in Queensland that receives oil via refineries in Singapore. The defence security system for oil/fuel security was by Federal Government agreement with USA to hold a strategic reserve. That reserve has been depleted by the US Government and reduced to 30% of its previous level recently to assist Ukraine / Russian war

Green Methane produced using Biomass Pyrolysis

The carbon monoxide if taken from pyrolysis of biomass can deliver green carbon monoxide and is approved under RED II European market regulations regarding shipping and is considered a green source of carbon monoxide. CO2 captured and split into carbon monoxide is considered a blue solution even though fully consumed with green hydrogen and converted into fuel. This is a controllable and managed process to avoid emissions. The advantage of this is the avoidance of carbon penalties. International shipping globally is responsible for 3% of world emissions of CO2.

The key point here is that methane produced in this way is controlled in terms of flaring of CO2 that is emitted with natural gas. Flaring in natural gas production is a major leakage problem along with potential leakage through cracks developed by hydrogen in long steel pipelines.

Environmental Aspects of Cubic process Applied to Natural Gas for General Industry Extension

Capture of CO2 is not the main technical problem for reducing emissions, it is what to do with the captured CO2. Deep Sea burial of CO2 has not been successful for the natural gas industry. The failure of the Northwest Shelf CO2 burial project is exposed and under threat of penalties from WA Government having buried only 10% of the flows, they committed to manage. This was due to sand infiltration at the injection point stopping the CO2 injection process.

Cubic believes that the Northwest Shelf Natural Gas projects should consider the benefits of investing in a large-scale desalination plant for clean water for hydrogen production and town water but also for irrigation after the key minerals have been separated by Cubic process to deliver a suite of chemicals from processing CO2 off the gas reform process and making chemicals

Modelling for an Economic Outcome

For example, a spreadsheet developed for Sydney desalination plant at Botany showed that if only hydrogen was produced off 3% of the plant capacity of 250 ML / day or 10 megalitres /day it could develop a price of$3.50 per kg of hydrogen and earn revenues of $39 million year, producing 70,833 tonnes hydrogen only as the scale is too small for multiple by products off the small mineral recovery possible.

Japanese and Korean markets have priced in future Australian hydrogen as shipped ammonia in the range US $ 1.80/kg to US$2.50/kg by 2030 assuming electrolyser efficiency and scale are achieved over the next 8 years to 2030. Current international green hydrogen is priced between US $4.0/kg to $8.0/kg.

Opportunities for Innovation in the Coal Fired Generating Sector

The success of the Callide project has not been responsibly recorded in the media but did achieve its objectives for 100% capture and high purity CO2. The plant was fitted with an air separation plant to capture oxygen and a modified boiler. Coal was burned in oxygen and highly pure CO2 that is advantageous for chemical reactions, was driven off and captured. The problem was an approximate 30% increase in capex against an already lower cost of solar and wind making the economics difficult.

However, if coal fired plants could be developed close to seawater locations the advantages offered to the EWLP steel project could also possibly be demonstrated for renewed coal power generation shared with pure CO2 for combination with Nitrogen, hydrogen off water processing and multiple chemicals by products to offset the oxyfuel and the air separation unit (ASU) capex. The Callide oxyfuel solution combined with Cubic seawater mineral capture might offset the cost of clean CO2 and the cost increase for deploying CO2 capture through oxyfuel generation.

Electricity Cost

Cubic has modelled its electricity cost at $ 0.06 kwh (off grid) as a major cost in the process route. Both desalination itself and electrolysis to recover sodium and minerals plus catalytic conversion into hydrogen with catalysis of carbon dioxide to carbon monoxide are all high energy process steps. The price at the anticipated $0.03 /kwh from renewables over the next 8 years to 2030 would significantly improve hydrogen costings plus the anticipated cost reduction for electrolyser equipment.

Third Party Review

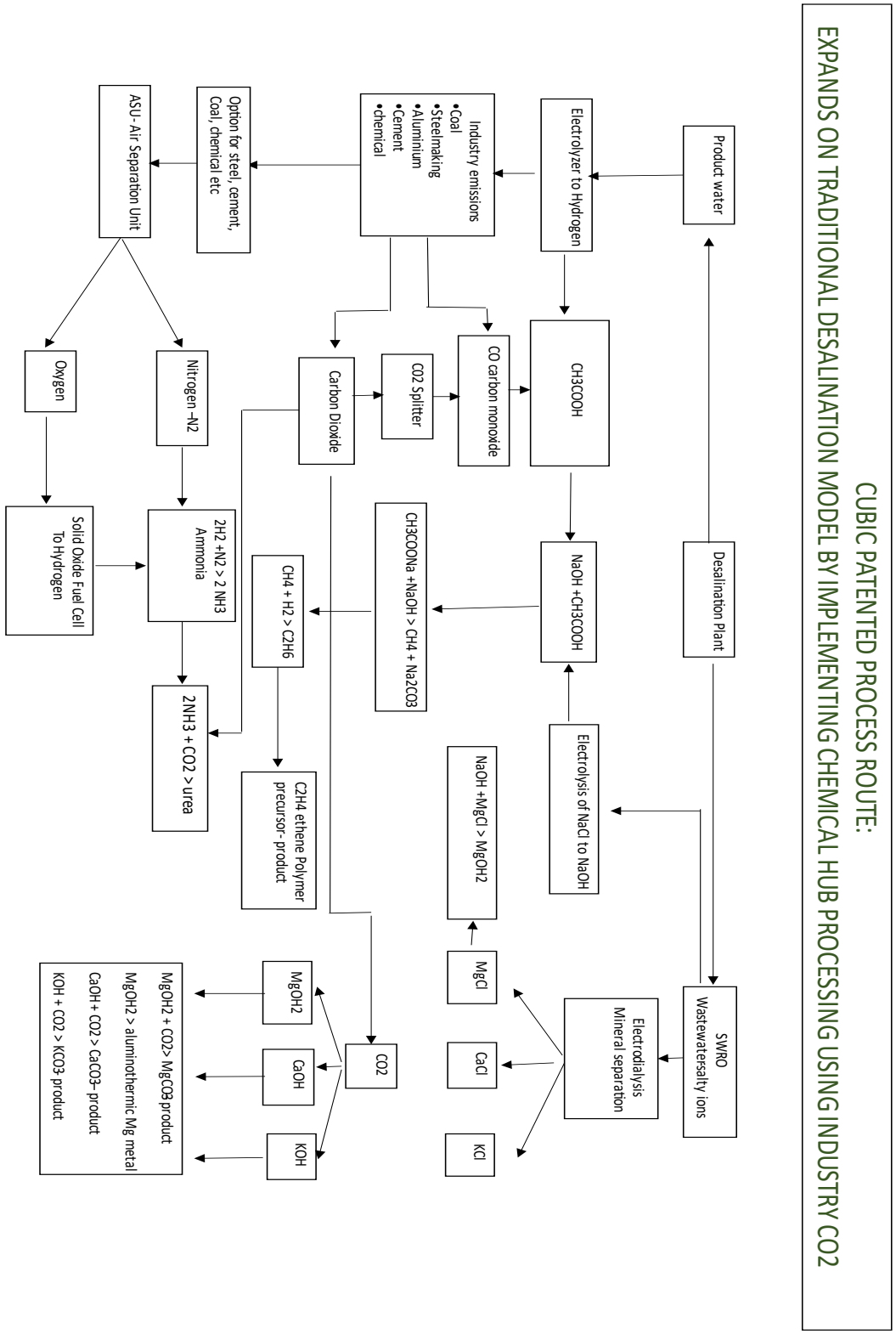
Cubic was selected as a semi-finalist in 2016 Australian Technology Competition (ATC). Cubic was invited to an industry workshop in August 2022, hosted by the NSW Government and the Australian Technology Competition for a session with the Indian Government who were conducting a review into Australian innovation for

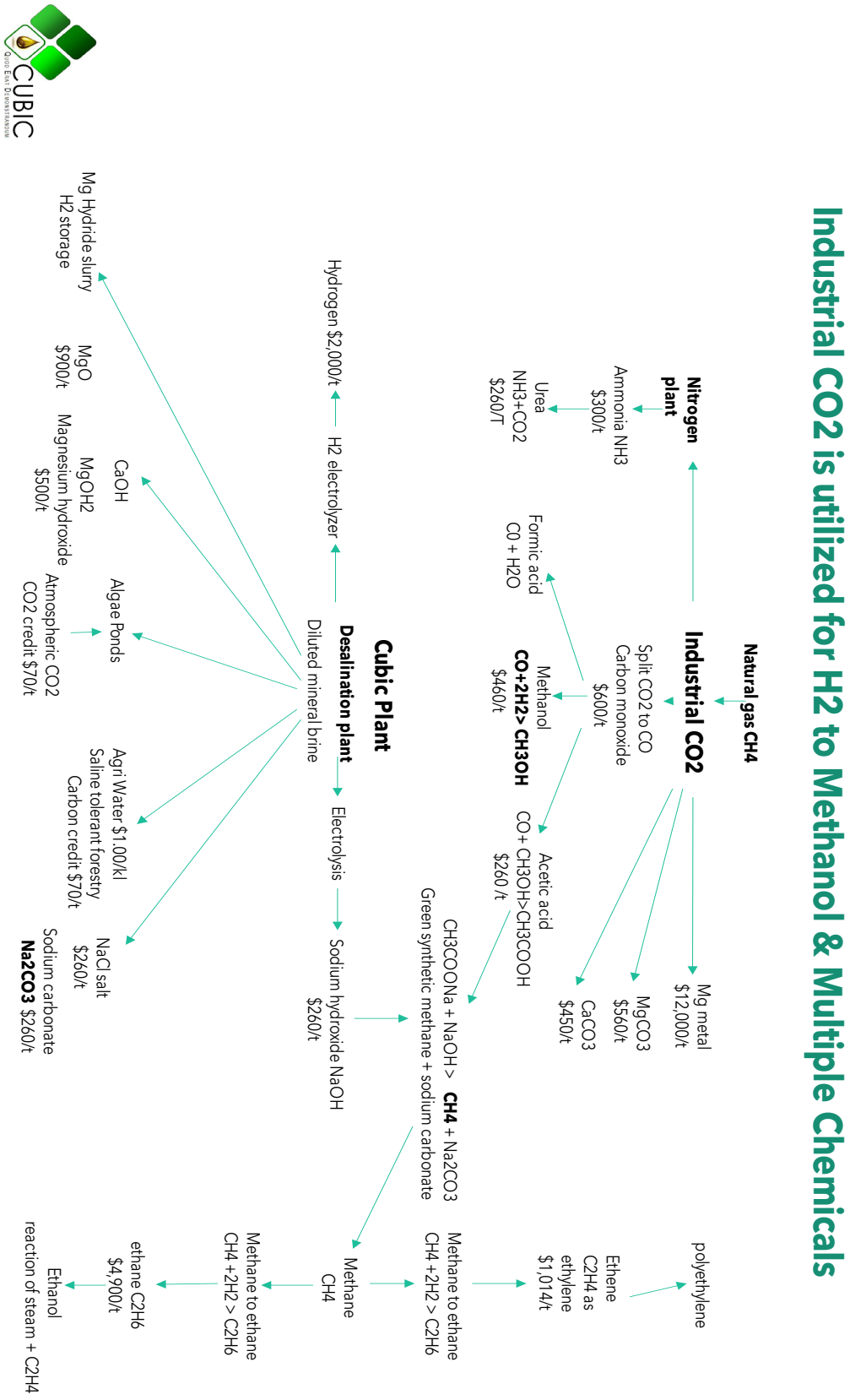
reduced carbon emissions. At the sum up of the workshop The Indian academic contingent commented that Cubic technology was in the top five climate solution objectives of the Indian Government. However, they commented that because a working pilot had not been developed, they were unable, under their rules of engagement to finance Cubic for a pilot project.

Maersk the global shipping company, in 2020 studied and confirmed our process route using existing desalination plants as the best most efficient route to large-scale methanol for international shipping. Maersk recently placed orders with Hyundai Heavy Engineering in Korea the construction of 6 new methanol powered vessels to add to their fleet.

Shipping accounts for 2% of global CO2 emissions. When established with existing heavy industry for CO2 capture 23 by products are possible as per our role to capture CO2 and waste nitrogen from the Iron Boomerang steel project.

See Attached process flow diagrams


CUBIC PATENTED PROCESS ROUTE:
EXPANDS ON TRADITIONAL DESALINATION MODEL BY IMPLEMENTING CHEMICAL HUB PROCESSING USING INDUSTRY CO2
Product water
Electrolyzer to Hydrogen
Industry emissions
•Coal
•Steelmaking
•Aluminium
•Cement
•chemical
Option for steel, cement, Coal, chemical etc
ASU - Air Separation Unit
Desalination Plant
CH3COOH
CO carbon monoxide
CO2 Splitter
Carbon Dioxide
Oxygen
Nitrogen -N2
NaOH +CH3COOH
CH3COONa +NaOH > CH4 + Na2CO3
CH4 + H2 > C2H6
2H2 +N2 > 2 NH3 Ammonia
Solid Oxide Fuel Cell To Hydrogen
2NH3 + CO2 > urea
Electrolysis of NaCl to NaOH
NaOH +MgCl > MgOH2
C2H4 ethene Polymer precursor- product
SWRO Wastewatesalty ions
Electrodialysis Mineral separation
MgCl
CaCl
KCl
CO2
MgOH2
CaOH
KOH
MgOH2 + CO2> MgCO3 product
MgOH2 > aluminothermic Mg metal
CaOH + CO2 > CaCO3- product
KOH + CO2 > KCO3 product


Industrial CO2 is utilized for H2 to Methanol & Multiple Chemicals
Natural gas CH4
Industrial CO2
Nitrogen plant
Ammonia NH3 $300/t
Urea NH3+CO2 $260/T
Split CO2 to CO Carbon monoxide $600/t
Formic acid C0 + H2O
Methanol CO+2H2> CH3OH $460/t
Acetic acid CO+ CH3OH>CH3COOH $260 /t
Mg metal $12,000/t
MgCO3 $560/t
CaCO3 $450/t
polyethylene
Ethene C2H4 as ethylene $1,014/t
Methane to ethane CH4 +2H2 > C2H6
Methane CH4
Methane to ethane CH4 +2H2 > C2H6
ethane C2H6 $4,900/t
Ethanol reaction of steam + C2H4
CH3COONa + NaOH > CH4 + Na2CO3
Green synthetic methane + sodium carbonate
Sodium hydroxide NaOH $260/t
Electrolysis
Cubic Plant
Desalination plant
Diluted mineral brine
Hydrogen $2,000/t
H2 electrolyzer
Mg Hydride slurry H2 storage
MgO $900/t
Magnesium hydroxide $500/t
MgOH2
CaOH
Atmospheric CO2 CO2 credit $70/t
Algae Ponds
Agri Water $1.00/kl
Saline tolerant forestry
Carbon credit $70/t
NaCl salt $260/t
Sodium carbonate Na2CO3 $260/t

Cubic QED Pty Ltd

ACN 1 1 1 943 036

Office: [redacted] Email: [redacted] Web: www.cubicqed.oom

Mr Shane Condon 30 April 2019

Chairman

East West Line Parks Pty Ltd

Letter of Intent

Preamble:

East West Line Parks Pty Ltd (EWLP)

are developing a rail and industrial Park project named Project Iron Boomerang (PIB) that proposes to construct a rail link between Port Headland and Abbot Point for delivering coking coal to Port Headland and Iron ore to Abbot Point for use in international steel producers joint venture production of steel slabs that will lower the cost of steel in export markets.

EWLP has an objective to deliver "Green Steel" products in accordance with low emission steel as mandated under the IPCC requirements for reducing carbon emissions, EWLP also will require significant water supply on a 24 / 7 basis for steel plant operations within the EWLP industrial park housing substantial steel production,

Cubic QED Pty Ltd

is a technology company and Australian Technology Competition 2016 semi-finalist that has developed a process that integrates desalination with mineral carbonation to lower cost of water and utilize industrial C02 from steel production by combining the waste minerals of desalination with C02 to make commercial minerals which are sold into industry reducing the cost of water.

Cubic also is undertaking research via its R&D unit', Innovative Materials Technology (EMT) Pty Ltd for potential hydrogen production using both solar energy and biomass for transport fuel and urea respectively from production that involves both water splitting and C02 splitting.

The combining of hydrogen treatment with steel plant off gas emissions may provide further options to EWLP that enhance the production of "green steel", This is proposed via interaction with research groups and technology licensing, this may lead to creation of new potential by-products. The initiative is to help future proof EWLP park design and enable a pathway for steelmaking technology to meet future impending EPCC global emission regulations for the steel industry,

Intention of the Parties

Cubic proposes to collaborate with EWLP in providing infrastructure in the form of desalination and carbon capture / transformation plant and equipment and services to the EWLP project,

EWLP proposes to deliver carbon dioxide to Cubic plant for mineral carbonation and to take Cubic desalinated water at agreed discounted water prices on a long term take and pay agreement,

EWLP will benefit from lower water costs and delivery of a constant water supply that is at risk from climate change water variability from rainfall, C02 reduction proposed by Cubic for the steel operations are targeted to meet 2050 IPCC objectives,

Cubic will collaborate through IMT with EWLP to assist in researching, assessing hydrogen technology that can meet steel industry requirements for use in providing energy in conjunction with EWLP clean energy programme and reviewed to provide economic and efficient motive power for rail and ship transport,

Collaboration

EWLP and Cubic share common interest and willingness to assist the recovery of Australian manufacturing and technology that can utilize new material science for products that have global market reach and propose to examine and test new opportunities in materials delivered by both entities in efficient transport, metals and minerals production and innovations and water which are all products of the EWLP and Cubic venture,

The collaborations are still to be funded but are broad based and include:

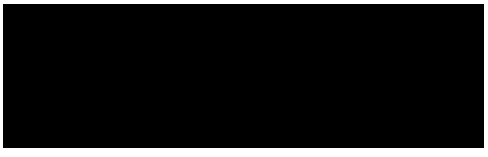
- Mutual assistance in delivering investment to the EWLP project
- Structured and coordinated meetings with steel groups sponsored by EWLP
- Long term technology improvement programmes
- Joint presentation to Government and International groups on green steel
- To promote local steel fabrication projects
- To develop water-based projects in aquaculture and horticulture for the local area
- Involvement in downstream manufacturing and mineral development: via Cubic process
- Sponsorship of R & D projects that may arise from mineral transformation in areas of alternative energy, building materials, transport fuel and alternative motive power.

For East West Line Parks Pty Ltd

Name

Shane Condon

Signature



Date 22-05-2019

For Cubic QED /IMT

Name

David McMurran Signature  Date 22 May, 2019