



# ASX Announcement

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## PARKWAY MINERALS ACQUIRES iBC™ BRINE PRETREATMENT TECHNOLOGY TO TARGET CSG SECTOR

### Highlights

#### The acquisition of the integrated Brine Causticization (iBC™) technology:

- Provides Parkway Minerals with a highly complementary process technology, well placed to assist in the processing of high carbonate/bicarbonate brines, common in the coal seam gas (CSG) sector.
- The iBC™ technology purifies typical CSG sector brines and effectively integrates with the aMES™ technology, enabling the subsequent production of saleable products from these pre-treated waste brine streams.
- The processing and disposal of CSG brines and salts, particularly in Queensland, represent significant challenges to the ongoing operations and potential expansion of the CSG industry.
- The iBC™ acquisition includes:
  - Patented technology, iBC™ pilot plant and associated intellectual property.
  - Mr. John Worsley, the inventor of the iBC™ technology, has been engaged in a consulting capacity, to assist Parkway Minerals commercialise the technology.
- Parkway Minerals will immediately proceed to relocate the iBC™ pilot plant to Victoria University, where a detailed technology optimisation and integration program will be undertaken to support ongoing business development in the CSG sector and assist in the commercialisation of the technology.

Parkway Minerals NL (ASX: **PWN**) (“**Parkway Minerals**” or the “**Company**”) is pleased to provide the following update.

## The Opportunity

The rapid emergence of the coal-seam gas (CSG) industry in Australia, in recent years has resulted in substantial volumes of associated wastewater being produced from these operations. The industry continues to experience growth, with Shell and PetroChina announcing in April 2020, that Arrow Energy was proceeding with the development of a \$10 billion CSG project in the Surat Basin in Queensland. Prior to the Arrow Energy investment decision, it was estimated that 60 GL of associated water is produced annually in Queensland, with approximately 1,700 GL expected to be produced during the life of these projects (1). Additional projects are also under consideration elsewhere in Australia, highlighting the significant and growing scale of the wastewater related challenges facing the CSG sector.

In order to manage the associated wastewater, a range of conventional water treatment technologies, predominantly reverse osmosis (RO) based desalination plants have been constructed, to recover fresh water. During the desalination process, the recovery of freshwater, results in the production of substantial quantities of concentrated reject brine (refer *Fig. 1*), representing significant ongoing storage and disposal related challenges. Whilst the regulatory environment favours the beneficial use of the contained salts (estimated at 5,500,000 tonnes), the production of saleable salts from the reject brine streams to date has proven to be uneconomic due to the high costs of conventional brine evaporation and crystallization technologies. In addition, the long-term storage of concentrated brines and salts requires storage in regulated waste facilities (RWF), which have significant costs and liabilities associated with the storage of these wastes and also face significant community concerns.

### Challenges with processing CSG-RO waste brine

The waste brines from the CSG sector typically contain sodium chloride, carbonate and bicarbonate, as well as a range of impurities including calcium, magnesium and silica, which are often problematic during the RO treatment and subsequent processing of these brines, as they result in the derating of key process equipment through the process of fouling and scaling.

### Opportunities for the iBC™ technology

Through a patented causticization process, the iBC™ technology simultaneously removes many of the impurities including >80% of the silica from the waste brine streams and converts the sodium carbonates and bicarbonates, into a more soluble sodium hydroxide stream. Through this important processing step, the iBC™ technology essentially produces a clean brine suitable for downstream processing with the aMES™ technology and enables the production of saleable products, as opposed to mixed salts, which incur disposal related costs.

### Opportunities for the aMES™ technology

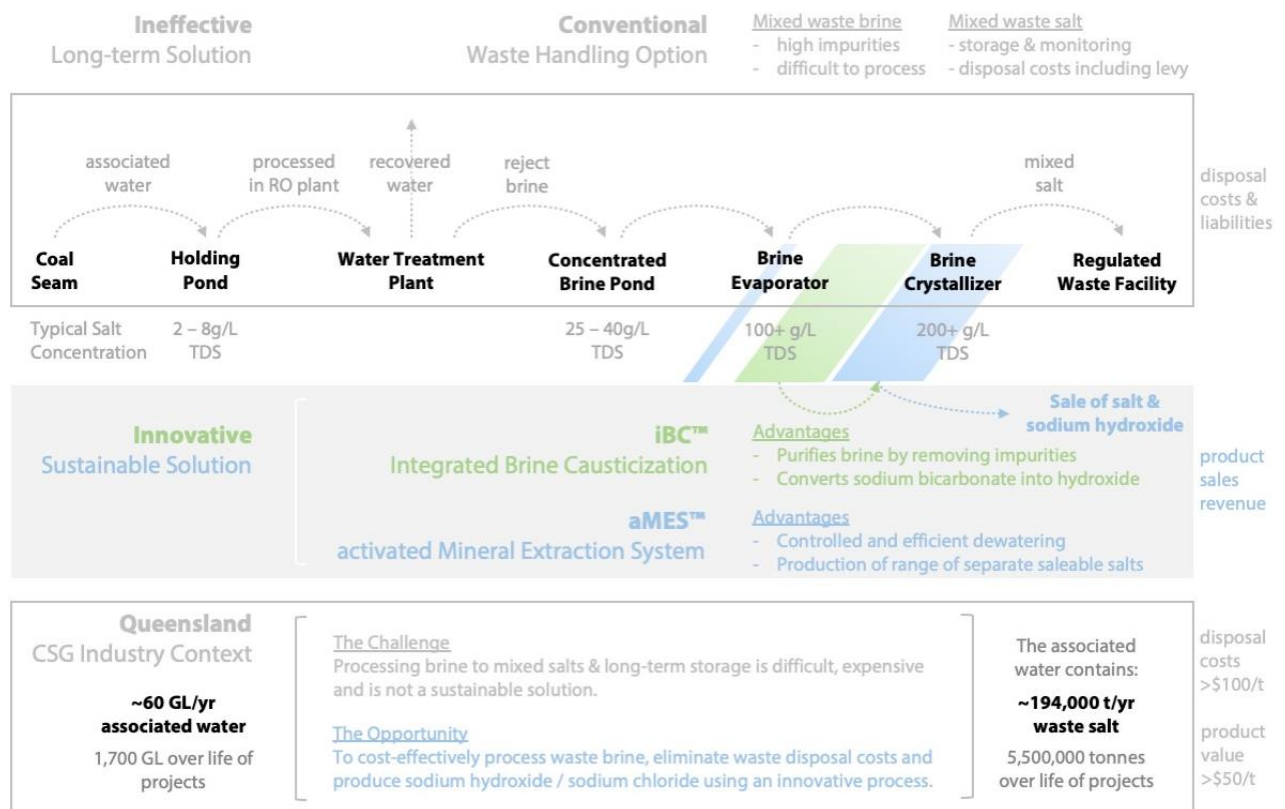
Pre-treatment of the waste brine streams with the iBC™ technology, enables the processing of the purified brine with the aMES™ technology, in order to further concentrate the brine and produce a technical grade (50%) sodium hydroxide solution and crystalline sodium chloride product. In addition to material revenue generation through the sale of these previously unrecoverable products, the avoidance of significant waste disposal and monitoring related costs, represent significant cost savings and reductions in environmental liabilities.

### iBC™ + aMES™ - an integrated solution

The integrated technology solution presents an attractive opportunity for the CSG sector.

(1) Underchultz J.R. et al., 2018, *Coal seam gas associated water production in Queensland: Actual vs predicted*, Journal of Natural Gas Science and Engineering.

**Fig. 1: CSG Sector – Application Opportunities for the iBC™ and aMES™ technology**



Generalised schematic, based on Parkway Minerals estimates. Incorporates Queensland brine and salt data from: *Coal seam gas associated water production in Queensland: Actual vs predicted* (Journal of Natural Gas Science & Engineering, Feb 2018).

## Acquisition Details

The acquisition of the iBC™ technology portfolio, provides Parkway Minerals with a strong platform of complementary technologies, to target high value applications in the CSG sector and other related industries where similar wastewater streams are present.

The iBC™ technology has undergone significant process development including experimental validation, pilot plant operations and preliminary techno-economic modelling to support the value proposition for the intended primary application (CSG brine treatment).

### iBC™ technology portfolio consists of:

- Standard Patent granted by IP Australia on 10 September 2015 (Patent No. 2014203695).
- Pilot plant based on the iBC™ technology and associated equipment (refer *fig.2*).
- Research reports based on iBC™ technology, including detailed QUT study demonstrating 97% conversion efficiency of brine from a major CSG project operator.

### iBC™ acquisition includes:

- The patented technology, iBC™ pilot plant, all associated intellectual property and all relevant goodwill from the inventor of the technology, Mr. John Worsley.
- Mr. John Worsley has been engaged in a consulting capacity for an initial term of 6 months, to assist Parkway Minerals commercialise the iBC™ technology.

**Fig. 2: iBC™ Pilot Plant Acquired by Parkway Minerals**



## **Acquisition Terms**

### Upfront Consideration

- 8,000,000 fully paid ordinary shares in Parkway Minerals (escrowed for 12 months).
- \$4,500 +GST payment, as reimbursement for certain back-costs.

### Additional Consideration

- \$50,000 of fully paid ordinary shares in Parkway Minerals (based on the 10-day VWAP immediately prior to issuing shares) to be issued at the 12-month anniversary of the acquisition.

### Contingent Consideration

- Up to \$80,000 (2 x \$40,000) in fully paid ordinary shares in Parkway Minerals may also be payable, upon the satisfaction of certain iBC™ commercialisation related milestones.

### Licensing Fees

- In the event Parkway Minerals generates net licensing fees from the iBC™ technology, Parkway Minerals will pay the vendor (inventor) a fee equivalent to 5% of the net licensing fees for an initial 7-year period, after which time, the fee will reduce to the equivalent of 2.5% of the net licensing fees for a subsequent 7-year period. Parkway Minerals has been granted an option to acquire the right of the vendor to receive licensing fees, which may be exercised by Parkway Minerals at its sole discretion.

## **Next Steps**

Parkway Minerals will immediately proceed to relocate the iBC™ pilot plant to Victoria University, where a detailed technology optimisation and integration program will be undertaken to support ongoing business development activities in the CSG sector and assist in the commercialisation of the technology. Parkway Minerals has recently applied for a technology innovation related grant which is expected to cover a significant proportion of the planned near-term activities.

## Commentary

### **Parkway Minerals – Managing Director, Bahay Ozcakmak commented:**

*“During the last year or so, Parkway Minerals has been approached by a number of CSG industry participants, including project operators and parties involved in the execution of these large projects. Despite encouraging historical results in processing these types of brines by Parkway Minerals and our partners, to date, we have not actively pursued wastewater processing applications in the CSG sector, as we previously identified two key challenges, i) the pre-treatment (removal of impurities) of the brines appeared highly problematic, and ii) the business-case for recovering saleable products, and reducing disposal costs, appeared challenged.*

*More recently, since we identified the potential of the iBC™ technology, we’ve become increasingly optimistic about the potential of CSG brine related opportunities, as this innovative technology addresses both of the key challenges previously identified and seamlessly integrates with our own aMES™ technology, in a configuration where the need for complex and expensive downstream infrastructure such as brine evaporators can be reduced or eliminated altogether.*

*Given our recently established process engineering team, engineering & technical office co-located at Victoria University and our strategic partnership with Victoria University, we believe Parkway Minerals is well placed to commercialise the iBC™ technology on a stand-alone basis and to integrate with the aMES™ technology, where it makes sense to do so.*

*Our recent discussions with regulatory authorities, have confirmed the desire for industry to beneficially utilise the various CSG waste streams and adopt more sustainable long-term solutions. In time, with mounting ESG related pressures, we expect the regulatory requirements to become increasingly onerous for the CSG project operators and proponents. In this regard, the acquisition and the integration of the iBC™ technology, provides Parkway Minerals with an attractive opportunity to provide a high-value, technology-based solution to a significant challenge facing the CSG sector.*

*Based on our preliminary internal evaluations, we believe there is a \$20-50 million a year opportunity available, should waste brines be effectively processed, and the contained salts sold, compared to the current CSG industry standard of onsite storage and monitoring (and accumulated liabilities). Through the acquisition of the iBC™ technology package, we are seeking to play a significant role in assisting the CSG industry adopt a more sustainable long-term solution and share in the corresponding value creation, together with our partners”.*

Approved for release on behalf of Parkway Minerals NL, by Bahay Ozcakmak.

## Additional Information

For further information contact:

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## aMES™ Technology

The *activated Mineral Extraction System*, or **aMES™** is an innovative process technology that enables the treatment of concentrated brine solutions to recover a range of valuable minerals, reagents and fresh water. The technology utilises a proprietary multi-staged process incorporating novel membrane technology and is based on proprietary IP, incorporating patents, expertise and know-how acquired over more than a decade of intense process development initiatives.

### Advantages of the aMES™ technology include:

- improvements in mineral recovery and product quality,
- opportunity for substantial project capex & opex savings,
- efficient use of energy and produces pure water as a by-product, and
- improved project footprint and environmental sustainability.

Ongoing collaboration with a number of brine project developers and operators has confirmed there are many applications where the aMES™ technology has the potential to deliver substantial value by enhancing existing flowsheets, in order to improve overall project performance.

### Additional Information

[www.parkwayminerals.com.au/ames-technology](http://www.parkwayminerals.com.au/ames-technology)

## iBC™ Technology

The *integrated Brine Causticization*, or **iBC™** is a patented process technology that simultaneously removes common impurities from waste brine streams and converts sodium carbonates and bicarbonates commonly found in coal seam gas (CSG) brines, into more soluble sodium hydroxide.

As a result of the causticization step, the iBC™ technology produces a purified brine suitable for downstream processing, including with the aMES™ technology, for the production of various salt products and industrial-grade sodium hydroxide.

## aMES™

### Brine Processing Technology

#### Key Industries (Applications)

- Mining natural brine (salt lakes)
- Solution mining brine (potash)
- Refinery & industrial waste brine
- Water treatment waste brine

#### Target Products (Produced)

- Potash (MOP/SOP/KMS)
- Lithium and magnesium salts
- Range of byproducts (B, Br, Co, Na, Ni, NH<sub>4</sub>, Si)
- Reagents
- Water

## iBC™

### Brine Pre-Treatment Technology

#### Key Industries (Applications)

- Industrial waste brine (CSG)
- Water treatment waste brine

#### Target Products (Produced)

- Sodium hydroxide concentrate
- Sodium chloride
- Byproducts (Ca, Mg, Si)

## About Parkway Minerals

In October 2019, Parkway Minerals (ASX: PWN) completed a transformational transaction by acquiring an Australian unlisted public company, Consolidated Potash Corporation (CPC). Through CPC, Parkway Minerals acquired a minority interest in the Karinga Lakes Potash Project (KLPP) in NT Australia, as well as a majority interest in the New Mexico Lithium Project (NMLP), in the United States. The CPC transaction, also resulted in Parkway Minerals acquiring the innovative aMES™ technology, which has been developed to process a range of challenging brine streams from the mining industry, in order to recover valuable minerals, reagents as well as produce fresh water.

Given the significant market opportunities, Parkway Minerals is focused on building and leveraging the aMES™ technology platform to improve the efficiency, sustainability and ultimately the profitability of various brine and wastewater streams, by enabling the development of more innovative project development concepts, particularly in the mining and energy sectors.

### Strategic Investment

Parkway Minerals holds a strategic investment (34.3 million shares) in Davenport Resources (ASX: DAV), which has successfully delineated a globally significant in-situ potash resource (in excess of 550 million tonnes of contained potash) across 4 projects, at its South Harz project in Germany. Recently completed scoping studies have delivered excellent technical and economic results and provide Parkway Minerals with encouragement that this investment will generate significant returns as well as provide Parkway Minerals with the opportunity to investigate a range of value-accretive initiatives.

### Our Vision:

"To transform global brine processing methods, through innovative technology, to improve sustainability, and create value."

### Forward-Looking Statements

This ASX Release may contain certain "forward-looking statements" which may be based on forward-looking information that are subject to a number of known and unknown risks, uncertainties, and other factors that may cause actual results to differ materially from those presented here. Where the Company expresses or implies an expectation or belief as to future events or results, such expectation or belief is expressed in good faith and believed to have a reasonable basis. Forward-looking information includes exchange rates; proposed or projected project or transaction timelines; uncertainties and risks associated with the advantages and/or performance of the Company's projects and/or technologies; uncertainties and risks regarding the estimated capital and operating costs; uncertainties and risks regarding any envisaged timelines in relations to any results, milestones, partnerships, including but not limited to any milestones which may require obtaining approvals from third parties.

For a more detailed discussion of such risks and other factors, see the Company's other ASX Releases. Readers should not place undue reliance on forward-looking information. The Company does not undertake any obligation to release publicly any revisions to any forward-looking statement to reflect events or circumstances after the date of this ASX Release, or to reflect the occurrence of unanticipated events, except as may be required under applicable securities laws.