Sal de Vida capacity increased to 45ktpa in two stages

04.04.2022 | GlobeNewswire

BRISBANE, April 04, 2022 - Allkem Ltd. (ASX|TSX: AKE, Allkem or the Company) advises an update to its wholly owned Sal de Vida Project located in Catamarca Province in Argentina.

HIGHLIGHTS

Project Summary

- Key changes from the 2021 Feasibility Study includes an increase in total planned capacity to 45,000 tpa, an increase in the capacity of Stage 1 and consolidation of Stages 2 and 3 into a single expansion
- Revised Resource Estimate of 6.85 million tonnes ("Mt") lithium carbonate equivalent ("LCE"), a 10% increase from the previous estimate in 2021
- Reserve Estimate of 1.74 Mt LCE supporting a 40-year project life based on reserves only, a 34% increase from the previous statement
- Front-end engineering design continues to confirm globally competitive capital intensity and operating costs

Stage 1 - 15ktpa production capacity

- Production capacity of 15,000 tpa Lithium carbonate ("LC") represents a 40% increase to previous production capacity
- Pre-tax Net Present Value ("NPV") of US$1.23 billion at a 10% discount rate and pre-tax Internal Rate of Return ("IRR") of 50%
- Development capital cost estimate of US$271 million and cash operating costs of US$3,612 per tonne, reflecting increased production output and scope
- Payback period of 1.75 years from the start of commercial production

Stage 2 Expansion - Additional 30ktpa

- Prefeasibility study completed for stage 2 expansion with the design basis a replication and expansion of Stage 1
- Stage 2 construction scheduled to commence immediately after Stage 1 construction completed
- Pre-tax NPV of US$1.81 billion and pre-tax IRR of 38% for Stage 2 on a standalone basis
- Revised development capital for Stage 2 of US$524 million and cash operating costs of US$3,280 per tonne LCE across both Stages 1 and 2

Execution strategy

- Stage 1 construction of the ponds commenced in January 2022 and targeting Stage 1 first production in H2 CY23
- Focus areas for CY22 include completion and filling of first two strings of ponds, and commencing construction of the Process Plant
- Targeting a sustainable energy mix, with at least 30% solar energy for Stage 1 at commencement of production
- Stage 2 construction anticipated to commence upon completion of Stage 1 construction with first Stage 2 production approximately 24 months thereafter

FINANCIAL METRICS

Development Capital and Operating Costs

The total initial project development capital expenditure (CAPEX) is estimated to be US$271 million for Stage 1. The estimate includes wellfields to ponds, the lithium carbonate plant, non-process infrastructure and various indirect costs detailed.

Operating expenditure (OPEX) is estimated to be US$3,612 per tonne LCE for Stage 1. The OPEX is predominately made up of reagents and also includes labour, energy and transport costs

The variance in development capital from the 2021 Feasibility study is largely due to the upgrade from 10.7ktpa to 15ktpa of production capacity, an increase of scope and accuracy for the carbonation plant design and inflationary impacts. The variance of US$117.2 million includes an additional US$30 million for the additional string of evaporation ponds and US$68 million for the construction of the process plant. Cost increases from global inflationary pressures, COVID-19 impacts and longer execution lead times are also incorporated into this variance.

Lithium carbonate price forecast

Forecast battery grade and technical grade lithium carbonate pricing was provided by Wood Mackenzie who updated near and long-term price outlooks for all products in Q4 CY21.

Battery grade carbonate demand increased by 38.6% CAGR between 2015 and 2021 and has remained the most widely consumed lithium compound and is used predominately in lithium-ion batteries in electric vehicles. Technical grade mineral concentrates accounted for a further 9.6% of consumption in 2021 and are used in similar ceramic, glass-ceramic, glass, and metallurgical applications to lithium carbonate.

The rapidly growing use of LFP chemistries for cathodes will result in strong growth for battery-grade lithium carbonate. LFP cathodes are expected to be the fastest growing cathode chemistry, increasing its share from 30% to 47% by 2050, as the Chinese market continues to expand and LFP cathode increasingly become the material of choice for a large number of EV-makers. This will correlate to a growth in lithium carbonate demand of 10.9% CAGR between 2022 and 2032. Over the forecast period, demand for lithium carbonate is expected to grow at 6.2% CAGR, from 255.2kt LCE in 2022 to 1,381kt LCE by 2050. This demand is likely to be met primarily with supply from brine projects.

Demand for battery grade lithium carbonate is set to exhibit strong growth due to the increasing use of LFP cathode chemistries. As demand growth seen in 2021 starts to slow and new supply enters the market over the next few years, prices are expected to gradually decline to around US$15,000/t by the mid-2020s. As demand continues to grow, a larger deficit will emerge towards the end of the decade and contract prices will trend towards a long-term price of around US$19,000/t.

Demand for technical-grade carbonate from industrial sectors is forecast to grow in line with economic growth, technical-grade lithium carbonate, however, lends itself very well to be reprocessed into battery-grade lithium chemicals. This is an established process occurring in Chile, US, China and soon in Japan. The ability to re-process the product into battery-grade lithium chemicals will ensure that prices will increase in line with prices of battery-grade lithium chemicals.

PROJECT ECONOMICS

An economic analysis was undertaken using the discounted cash flow method and was based on the data and assumptions for capital and operating costs detailed in this report. The evaluation was undertaken on a 100% equity basis.

A royalty agreement with the Catamarca Provincial Government has been executed, confirming a life of project royalty rate at 3.5% of net sales revenue (revenue less taxes). This agreement also applies to the stage 2 expansion of additional 30ktpa.

The key assumptions and results of the economic evaluation are displayed in Table 1 and 2.

Table 1: Key assumptions utilised in the project economics

Assumption	Units	Stage 1
Project Life Estimate	*Years*	40
Discount Rate (real)	*%*	10
Provincial Royalties [1,2]	*% of LOM revenue*	3.5
Corporate Tax[2]	*%*	35
Annual Production[3]	*t LC*	15,000
CAPEX	*US$M*	271
OPEX	*US$/ tonne LC*	3,612
Average Selling Price[4]	*FOB US$/ tonne LC*	17,485

[1] Provincial royalty agreement at 3.5%, export duties, incentives and other taxes are not shown.
[2] There is a risk that the Argentina Government may, from time to time, adjust Corporate tax rates, export duties and incentives that could impact the Project economics
[3] Based on 80% battery grade, 20% technical grade lithium carbonate of annual production
[4] Based on price forecast provided from Wood Mackenzie and targeted production grades stated in Footnote 3 above

Table 2: Summary of financials over a 40-year project life

Financial Summary	Units	Stage 1
NPV (Pre-tax)	*US$M*	1,226
NPV (Post-tax)	*US$M*	762
IRR (Pre-tax)	*%*	50
IRR (Post-tax)	*%*	37
Payback Period[1]	*Years*	1.75
Development Capital Intensity	*US$ / tpa LC*	18,041
Pre-tax NPV: Development CAPEX	*X: 1*	4.5

1 payback period is from date of first commercial production

PROJECT BACKGROUND

Allkem is developing the Sal de Vida Project in Catamarca Province on the Salar del Hombre Muerto, approximately 1,400km northwest of Buenos Aires, Argentina. The Sal de Vida deposit lies within the "lithium triangle", an area encompassing Chile, Bolivia and Argentina that contains a significant portion of the world's estimated lithium resources. Catamarca is a proven mining jurisdiction, home to several successful mining operations and development projects such as Livent Corp and Minera Alumbrera.

Allkem is de-risking the development of Sal de Vida by adopting a simplified flowsheet, utilising mature technology and by staging development to reduce project risk and allow cash flow generation from Stage 1 and other operations to support development of Stage 2.

The 2022 Feasibility Study focuses on Stage 1, which includes brine extraction, evaporation and processing operations onsite to produce 15,000 tpa of high-grade LC. The layout and development plan for Stage 1 allows for future expansion for subsequent stages. A pre-feasibility study ("PFS") has been completed for Stage 2, a single staged expansion of 30,000tpa LC to bring the total capacity to 45,000 tpa LC.

A number of experienced engineering and consulting firms were engaged by the Company to assist in the completion of the Feasibility Study and Technical Report in accordance with the Canadian National Instrument 43-101 Standards of Disclosure for Mineral Projects. Stage 1 engineering has now reached a level of accuracy that is equivalent to the Association for the Advancement of Cost Engineering (ACCE) Class 2 for the wellfield and ponds; and Class 4 for the plant design. Stage 2 estimates are at a Class 4 accuracy level.

GEOLOGY & MINERALISATION

The salar system in the Hombre Muerto basin is considered to be typical of a mature salar. Several salars in the lithium triangle contain relatively high concentrations of lithium brine due to the presence of lithium-bearing rocks and local geothermal waters associated with Andean volcanic activity. Such systems commonly have a large halite core with brine as the main aquifer fluid in at least the centre and lower parts of the aquifer system.

Sal de Vida's brine chemistry has a high lithium grade, low levels of magnesium, calcium and boron impurities and readily upgrades to battery grade lithium carbonate. Long-term hydrological pump testing under operating conditions has demonstrated excellent brine extraction and aquifer recharge rates to support the production design basis.

RESOURCE AND RESERVE ESTIMATES

Production wellfield drilling

The production wellfield drilling program commenced in late 2020 to construct an additional eight wells in the eastern region of the salar for Stage 1 brine production and to explore the resource at depth. The drilling program which also entailed aquifer and pump testing reached completion in October 2021 and was monitored by consultants Montgomery & Associates ("Montgomery") and Allkem personnel. Once drilling was completed, 10-inch diameter PVC casing, and slotted PVC well screen was installed. The constructed wells were air-lifted and clean brine samples were collected at the well head.

Further exploration and aquifer data on the hydrogeological settings of the salar was also obtained. The wells reached depths between 202 m and 307 m and five out of eight wells reached bedrock. The lithium concentrations recorded were significantly higher than the average lithium resource grade of 754 mg/L and the reserve grade of 805 mg/L (for years 1-6). The wells returned average lithium concentration ranging between 811 mg/L and 936 mg/L.

Brine Resource Estimate

Montgomery was engaged to estimate the lithium resources and reserves in brine for various areas within the Salar del Hombre Muerto basin in accordance with the 2012 edition of the JORC code ("JORC 2012"). Although the JORC 2012 standards do not address lithium brines specifically in the guidance documents, Montgomery followed the NI 43-101 guidelines for lithium brines set forth by the Canadian Institute of Mining, Metallurgy and Petroleum (CIM 2014) which Montgomery considers complies with the intent of the JORC 2012 guidelines with respect to providing reliable and accurate information for the lithium brine deposit in the Salar del Hombre Muerto.

Drilling results from eight production wells increased the depth of the basement model and the size of the brine aquifer, leading to an increase in Inferred Mineral Resources of 0.6Mt. The revised Mineral Resource estimate of 6.85 Mt LCE reflects a ~10% increase to the prior Resource of 6.23 Mt LCE.

The different resource categories were assigned based on available data and confidence in the interpolation and extrapolation possible given reasonable assumptions of both geologic and hydrogeologic conditions.

Brine Reserve Estimate

The revised reserve estimate of 1.74 Mt LCE for 40 years reflects a 34% increase compared to the previous estimate of 1.3Mt LCE for 44 years. The difference of four years reflects the Company's development approach of two stages, compared to the previous three stages detailed in the 2021 Feasibility Study.

The updated proven and probable lithium brine reserves are based on the modelled system and results of the numerical modelling, the Proven Brine Reserve reflects what is feasible to be pumped to the ponds and recovered through the process plant during the first eight years of operation at each of the wellfields.

The model projects that the wellfields will sustain operable pumping for 40 years; 34 years of pumping from each wellfield has been categorised as a Probable Brine Reserve. The Proven and Probable Reserve estimate of 1.74 Mt LCE represents approximately 28% of the current Measured and Indicated Brine Resource estimate.

The current numerical model projections suggest that additional brine could be pumped from the basin from the proposed wellfields past a period of 40 years. However, recalibration of the model would be required after start-up pumping of each wellfield to refine the model and support this projection.

Additional information for the reserve estimation can be found in the Annexures.

BRINE EXTRACTION AND PROCESSING

Front-end engineering design ("FEED") work for Stage 1's wellfields to process plant and non-process infrastructure has been completed for an initial production capacity of 15ktpa, later expanding in Stage 2. The process commences with brine extracted from wells extending to a depth of up to 280m in the salar. Brine will be pumped to a series of evaporation ponds, where it will be evaporated and processed at the onsite lithium carbonate plant. Project facilities are divided into four main areas including wellfield and brine distribution, evaporation ponds, the lithium carbonate plant and discard stockpiles.

Wellfield and brine distribution

There are two wellfields considered for production; one in the East and one in the Southwest. For Stage 1, only wells from the East wellfield will be used, while Stage 2 will utilise the Southwest wellfield. The location of the production wells were selected to reduce long-term freshwater level drawdown and maintain the highest possible brine grade.

Nine wells have been constructed for Stage 1, of which eight will be operational during the maximum brine pumping season, and one will be on stand-by. All wells will be connected through pipelines to a booster station that will be situated in a central location to the wellfield. The booster station will mix brine from the different wells and act as a brine pumping station to reach the ponds and provide a buffer for seasonal flow changes. The average flow from the brine wells to the first evaporation ponds will be approximately 159 litres per second ("L/s") for Stage 1.

Evaporation ponds

The solar evaporation pond system will consist of a series of halite and muriate ponds, which will concentrate brine suitable for feeding the lithium carbonate plant. The ponds for Stage 1 will cover a total area of approximately 450 ha and Stage 2 will cover a total of 850 ha. These areas were calculated based on the expected evaporation rates and the production well flow rates.

Halite ponds for Stage 1 will be arranged in three strings which will operate in parallel, each string will contain six cells plus a buffer pond with the flow from one pond to the next in series. Ponds of the same type will be connected through weirs, which will allow for constant natural flow from one pond to the next, maintaining brine levels in all ponds and reducing pump usage.

Evaporation will result from the combination of solar radiation, wind, temperature and relative humidity. Halite salts (primarily sodium chloride) will precipitate at the bottom of the pond, harvested periodically and stockpiled in accordance with environmental requirements. The muriate ponds will have the same design basis and be located adjacent to the halite ponds. When the brine reaches a concentration of 21 g/L, it will be stored in a set of concentrated brine storage ponds, from where the brine would be fed to the lithium carbonate plant.

Liming

The halite ponds will feed evaporated brine to the liming stage to partially remove magnesium. A solution of milk-of-lime will be added to the brine inside mixing tanks, precipitating magnesium and removing other impurities such as boron and sulphates. The solids will be separated from the brine and pumped to a discard facility. The limed brine will be fed to a series of muriate ponds for further concentration. It will then be stored in the concentrated brine storage ponds to act as buffer ponds before the process plant, to accommodate seasonal flow variations and provide consistent feed to the process plant.

Lithium carbonate plant

The lithium carbonate plant is designed to produce 15,000 tpa of lithium carbonate in Stage 1, with Stage 2 enabling the production of an additional 30,000 tpa. This design is based on average brine supply of 920 m^3 /hr for Stage 1, and an average lithium concentration of 21 g/L in the softening feed. The plant will operate continuously with a design availability of 91%.

Softening

Brine from the concentrated brine storage ponds will re-enter the process plant in the softening stage to further remove magnesium and calcium. The brine will be heated and sent to a series of six softening and mixing tanks to allow the brine to react with all reagents. The reagents will enable the precipitation of magnesium hydroxide, magnesium carbonate and calcium carbonate, as solids within the brine. Press filters and polish filters will separate the liquid brine and precipitated solids to remove all solid contaminants. The lithium-concentrated brine will then be sent to storage tanks to feed the crystallisation stage. Solid contaminants will be sent to a filter cake tank to be re-pulped with the liming discards before reporting to the discard facility.

Ion exchange

Softened brine will report to a typical ion exchange ("IX)" circuit feed tank to remove the remaining calcium and magnesium ions and meet battery grade specifications. Hydrochloric acid will be used for stripping and sodium hydroxide or water will be used for regeneration of the IX resin.

Crystallisation

Lithium-concentrated brine from the IX stage will be combined with sodium carbonate at elevated temperatures to produce lithium carbonate. The heated brine will feed a group of four crystallisation mixing tanks that will operate in series, precipitating lithium carbonate as a solid inside the solution. The solution will feed a thickener then a crystallisation cyclone cluster, to further remove liquid from the final product. The lithium carbonate solids will be recovered while the liquor will be recycled back into the process.

Product finishing

The purpose of the product finishing circuit is to perform the final physical operations required to make the lithium carbonate suitable for transport to customers. First, the lithium carbonate solids will be dried to <1% moisture, before being filtered and cooled. The solids will be micronised and iron contaminants will be removed magnetically. The micronised product will then be bagged for transport.

Salt waste disposal

During the evaporation phase the build-up of solid sodium chloride, magnesium, boron and sulphates will occur in the ponds. Over time the solids will build to a level where their removal is required to maintain a working liquid volume within the ponds. All ponds will be harvested on average once per year with the solids placed in storage facilities adjacent to the ponds. The estimated annual total of salt harvested and stockpile from the halite ponds is 1.4 million t/a, and from the muriate ponds is 79,000 tpa for Stage 1 of the Project. For Stage 2, the annual salt harvest will be 2.8 million tpa and 158,000 tpa for halite and muriate ponds respectively.

The salt disposal facility covers ~300 ha for Stage 1 and 600 ha for Stage 2 and will consist of halite, muriate, and co-disposal stockpiles surrounding the halite ponds. All salt waste is of similar chemistry to the surrounding salar and no adverse environmental impacts are expected.

From year two of production onward, both liquid and solid wastes from the process plant will be mixed in a tank located near the production plant and will be sent as a pulp to the co-disposal area. This setup will operate for the remainder of the Project life. Some halite salts will be stockpiled separately to be used as construction material for future evaporation ponds, further reprocessing or sold as a by-product.

The infrastructure in the salt waste stockpile and co-disposal areas will consist of:

- Access roads to each stockpile and co-disposal area, accessible by trucks and light vehicles; and
- Containment system such as low-height berms, for any liquids that may permeate from the salt stockpiles.

Final product

Piloting activities and operations at the pilot pond and pilot plant have continued to meet and exceed battery grade specifications and design parameters in line with commercial operations. Instrumentation and equipment were assessed, and continuous softening-IX-crystallisation operation was also achieved.

Project economics are based on a production and sales volume mix comprising 80% battery grade and 20% technical grade. The operating intention is to maximise the production of battery grade however the 20% allowance for lower grade products is a prudent approach at this stage of the development.

SITE LAYOUT & INFRASTRUCTURE

The Project's tenements cover 26,253 ha and all process facilities will be located in the southeastern sector of the Salar del Hombre Muerto. The East Wellfield for Stage 1 will be located directly above the eastern sub-basin of the Salar del Hombre Muerto over the salt pan, and the ponds for Stage 1 will be located in two areas directly south. Stage 2 will be located southeast of the Southwest wellfield.

The brine distribution system will traverse the salar towards the evaporation ponds will be located. The location of the ponds has been determined based on a number of a factors including optimal constructability properties and minimising earthworks, environmental impact and risk of flooding.

The processing plant for all stages will be located in the centre of to Stage 1's evaporation ponds. A road system, including ramps and causeways, will connect the processing facilities and provide access to all working areas.

Supporting infrastructure & logistics

The following main facilities are planned for the Project:

- Raw water system
- Power generation and distribution
- Fuel storage and dispensing
- Construction camp to accommodate up to 600 people
- Sewage treatment plant
- Fire protection system
- Buildings for the process plant, reagent and product storage
- Various buildings for administration & site services
- Site roads, causeways, and river crossings
- Communications & mobile equipment
- Steam generation, water heating and & compressed air system
- Drainage system

Early construction commenced in late 2020, constructing key roads to the main process areas and upgrading the accommodation camp to host up to 330 people which is currently used by staff and contractors. The Project is also serviced by key infrastructure including major roads, rail, air and multiple seaports in Argentina and Chile.

The main route to the Project site is from the city of Catamarca via national route 40 to Belen, then provincial route 43 through Antofagasta de la Sierra to the Salar del Hombre Muerto. The road is mostly paved to Antofagasta de la Sierra and continues unpaved for the last 145 km to Salar del Hombre Muerto. This road is well maintained and also serves Livent Corporation's Fenix lithium operations and Galan Lithium Ltd.'s Hombre Muerto Project.

The Ferrocarril Belgrano railway line is located 100 km to the north of the Project and the use of rail during later Project stages is a possibility. A public airstrip is located in Antofagasta de La Sierra and a private airstrip is located at Livent's Salar del Hombre Muerto operations.

International cargo for Sal de Vida could use a combination of ports in Buenos Aires, Argentina and Chile. The Ports of Antofagasta and Angamos consist of deep-water port facilities serving the mining industry in northern Chile. The Ports of Rosario, Campana and Buenos Aires consist of large port facilities serving multiple industries in Argentina's main economic hubs.

ENVIRONMENTAL AND SOCIAL IMPACTS

Carbon emissions management

Allkem is committed to the transition to net zero emissions by 2035 and is progressively implementing actions across the group to achieve this target. Each project within the group will contribute to this target in a different, but site appropriate manner.

In prior studies, power generation at Sal de Vida was designed to be sourced from diesel generators whilst simultaneously pursuing and maximising a photovoltaic energy solution. Despite diesel power generation remaining in the current study, Allkem is targeting 30% of power generation for Stage 1 production to be sourced from photovoltaic energy generated by a site-based solar farm. The Company is currently in a tender process to install this hybrid solution for day 1 of Stage 1 production and this will be defined further in H2 CY22.

Allkem will seek to further decarbonise the project by maximising this renewable energy source through its life. A standalone study for Stage 2 will also be undertaken with the intention of replacing all remaining site-based diesel generated power with natural gas. The design basis and infrastructure allows the project to move to a 100% photovoltaic energy solution when battery storage technology is certified to work at altitude.

Environment

Allkem is committed to the responsible use of water resources and minimising environmental impacts. The internally developed process flowsheet was selected partly on the basis it consumed significantly less energy and water than other conventional technologies.

The Sal de Vida Project will consume minor amounts of raw water, equivalent to 1-2% of the groundwater recharge to the system. There is no expected loss of water to communities in either their groundwater or surface water usage. Water monitoring takes place at seven different control points alongside nearby rivers in addition to periodic sampling to test flow rates, chemical and physical properties.

An environmental baseline study was performed covering areas such as water, flora, fauna, hydrogeology, hydrology, climate, landscape, ecosystem characterisation, and socio-economic considerations. This study was used to support the EIA and will be used to monitor any impacts from constructions and/or operations. Collaborative and community water samplings continue with local communities and provincial regulators.

A physical climate change impact risk study was completed in 2020. Overall, no material climate change risks were identified, and projections will continue to be used to inform project design.

Community engagement

Allkem is committed to regularly engaging with community stakeholders and providing positive, lasting benefits through employment opportunities, local procurement, and educational and health initiatives. As part of a two-year corporate social responsibility program agreed in 2019, the Company funded three projects to support the communities nearest to Sal de Vida. This includes the construction of the high school in El Pe??n village, expansion of the primary school in Antofagasta de la Sierra and construction of a first aid facility in Cienaga La Redonda. A community office was established in Antofagasta de la Sierra in January 2020. Separately, a social baseline study including a perceptions test returned positive results about the Company and the Sal de Vida Project.

Since 2021, Sal de Vida has been developing a "Completion of education" programme that benefits employees of the project, the communities of Ci?naga Redonda and Antofalla. This programme is carried out jointly through an agreement signed with Catamarca Education Ministry. Allkem aims to support local communities by maximising health, wellbeing and the procurement of local goods and services whilst upskilling and providing future employment opportunities. During CY21 Allkem undertook a number of initiatives including:

- Industrial technical training program in Antofagasta de La Sierra, carrying out more than 43 courses attended by more than 600 people;
- The development of local suppliers in Antofagasta de La Sierra, establishing a local laundry service for Sal de Vida project;
- Implementation of Health and Wellbeing seminars in Antofagasta de la Sierra villages, which involved talks by medical professionals about the prevention and care of different conditions and pathologies in all communities

As at 31 March 2022, over 70% of the local employees are from Catamarca and Stage 1 will create approximately 900 full-time positions in the peak of construction and 170 full time position during stable Stage 1 operations.

Further engagement with the provincial government and stakeholders, including the communities of Antofagasta de La Sierra, continue in relation to project updates.

Regulations and permitting

Sal de Vida Stage 1 of 10.7kpta is fully permitted after receiving approval from regulators in December 2021. This permit is being used for construction activities which commenced in January 2022 to build the first two string of ponds, the brine distribution system, additional camp capacity, process plant and non-process infrastructure.

The Stage 1 expansion to 15ktpa requires a permit for the additional, third string of evaporation ponds which covers an extra ~150ha. The revised EIA has already been submitted to regulators and is expected to be approved by August 2022. The plant requires minimum changes from the upgraded capacity and therefore consultation with regulators is straightforward.

Stage 2 will require a new EIA approval that will be submitted once the front-end engineering design and technical studies toto this stage are completed. A ground water permit is also in place, providing sufficient supply of water for all stages of operations.

PRE-FEASIBILITY STUDY ON STAGE 2 EXPANSION

Since the merger of Galaxy Resources and Orocobre Limited, Stages 2 and 3 from the 2021 Feasibility Study have been combined into a single expansion with production increasing to 30ktpa, a 40% increase compared to the previous combined capacity. The PFS has used the Canadian Institute of Mining, Metallurgy and Petroleum as the minimum engineering standard to be achieved and this is a prerequisite for the conversion of Mineral Resources to Mineral Reserves.

Development of Stage 2 is supported by the design basis of Stage 1 and the additional processing capacity will be achieved by adding to the existing plant in a staged approach. Synergies are expected with labour, reagents and product handling. The PFS confirms capital and operating assumptions for the processing plant expansion and additional evaporation ponds according to ACCE Class 4. Project delivery synergies from continuity of engineering, and allocated contingency have not yet been determined and are expected to be realised as further work is completed.

Development capital and operating costs

Project development capital expenditure for both stages combined is estimated to be US$794 million and incudes the same key design assumptions as Stage 1. OPEX for all stages is estimated to be US$3,280 per tonne LC, an 8% decrease compared to Stage 1 on a standalone basis.

While the fundamental approach is to replicate Stage 1 with increased wells, pumps, evaporation ponds and plant capacity, it is expected that many synergies will be realised including project delivery and development capital and operating costs. Continuity of people, systems and processes, engineering efficiencies and targeted allocation of contingency are expected. However, the PFS level does not accommodate these expected additional synergies other than minor indirect cost reductions. Further upside is expected as more detailed engineering on these stages advance.

Project Economics

The Feasibility for all stages demonstrates strong financial outcomes with a Pre-tax $NPV_{10\% \text{ real}}$ of US$ US$3.0 billion and a capital intensity of US$17,648 /tonne per annnm LC.

EXECUTION STRATEGY

Project Schedule

Stage Pond construction commenced in January 2022 and Stage 1 first production is expected in H2 CY23. To achieve this, key focus areas in CY22 for Stage 1 include:

- Construction of non-process infrastructure, ponds and the lime plant
- Procurement for long lead items to meet the construction schedule
- Completion of tendering process for a 30% photovoltaic energy solution
- Progression of updated regulatory approvals to reflect the increased production capacity of Stage 1

Project execution later in the year will focus on commissioning the first string of operational ponds before commencing the plant construction and progressing towards operational readiness. This schedule allows for brine evaporation to occur during plant construction, allowing evaporated brine to feed the plant once commissioned.

It is proposed that once the commissioning of Stage 1 commences, the development of Stage 2 will occur in parallel.

Funding

Funding is expected to be provided through one or more of the following:

- existing corporate cash;
- existing or new corporate debt or project finance facilities;
- cash flow from operations;
- strategic offtake partner(s).

Offtake Strategy

Allkem continues discussions with prospective customers. In line with the Project execution schedule, these discussions are expected to advance to negotiations throughout the course of the project. Interest and demand remains strong against the backdrop of a tight market, and Allkem seeks to target high growth regions and determine the optimal contracting arrangement at the time of product qualification.

ENDS

IMPORTANT NOTICES

This investor ASX/TSX release ("Release") has been prepared by Allkem Ltd. (ACN 112 589 910) (the "Company" or "Allkem"). It contains general information about the Company as at the date of this Release. The information in this Release should not be considered to be comprehensive or to comprise all of the material which a shareholder or potential investor in the Company may require in order to determine whether to deal in Shares of Allkem. The information in this Release is of a general nature only and does not purport to be complete. It should be read in conjunction with the Company's periodic and continuous disclosure announcements which are available at allkem.co and with the Australian Securities Exchange ("ASX") announcements, which are available at www.asx.com.au.

This Release does not take into account the financial situation, investment objectives, tax situation or particular needs of any person and nothing contained in this Release constitutes investment, legal, tax, accounting or other advice, nor does it contain all the information which would be required in a disclosure document or prospectus prepared in accordance with the requirements of the *Corporations Act 2001* (Cth) ("Corporations Act"). Readers or recipients of this Release should, before making any decisions in relation to their investment or potential investment in the Company, consider the appropriateness of the information having regard to their own individual investment objectives and financial situation and seek their own professional investment, legal, taxation and accounting advice appropriate to their particular circumstances.

This Release does not constitute or form part of any offer, invitation, solicitation or recommendation to acquire, purchase, subscribe for, sell or otherwise dispose of, or issue, any Shares or any other financial product. Further, this Release does not constitute financial product, investment advice (nor tax, accounting or legal advice) or recommendation, nor shall it or any part of it or the fact of its distribution form the basis of, or be relied on in connection with, any contract or investment decision.

The distribution of this Release in other jurisdictions outside Australia may also be restricted by law and any restrictions should be observed. Any failure to comply with such restrictions may constitute a violation of applicable securities laws.

Past performance information given in this Release is given for illustrative purposes only and should not be relied upon as (and is not) an indication of future performance.

Forward Looking Statements

Forward-looking statements are based on current expectations and beliefs and, by their nature, are subject to a number of known and unknown risks and uncertainties that could cause the actual results, performances and achievements to differ materially from any expected future results, performances or achievements expressed or implied by such forward-looking statements, including but not limited to, the risk of further changes in government regulations, policies or legislation; risks that further funding may be required, but unavailable, for the ongoing development of the Company's projects; fluctuations or decreases in commodity prices; uncertainty in the estimation, economic viability, recoverability and processing of mineral resources; risks associated with development of the Company Projects; unexpected capital or operating cost increases; uncertainty of meeting anticipated program milestones at the Company's Projects; risks associated with investment in publicly listed companies, such as the Company; and risks associated with general economic conditions.

Subject to any continuing obligation under applicable law or relevant listing rules of the ASX, the Company disclaims any obligation or undertaking to disseminate any updates or revisions to any forward-looking statements in this Release to reflect any change in expectations in relation to any forward-looking statements or any change in events, conditions or circumstances on which any such statements are based. Nothing in this Release shall under any circumstances (including by reason of this Release remaining available and not being superseded or replaced by any other Release or publication with respect to the subject matter of this Release), create an implication that there has been no change in the affairs of the Company since the date of this Release.

Competent Person Statement

The information in this report that relates to Sal de Vida's Exploration Results, Mineral Resources and Reserves is based on information compiled by Michael Rosko, MS PG, a Competent Person who is a Registered Member of the Society for Mining, Metallurgy and Exploration, Inc (SME), a 'Recognised Professional Organsation' (RPO) included in a list posted on the ASX website from time to time. Mike Rosko is a full-time employee of E.L Montgomery and Associates and has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the 2012 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Mike Rosko consents to the inclusion in this announcement of the matters based on his information in the form and context in which it appears.

The scientific and technical information contained in this announcement has been reviewed and approved by, Michael Rosko, MSc. Geology (Montgomery and Associates), as it relates to geology, modelling and resource reserve estimates; Michael Gunn, BSc. Chemical Engineering (Gunn Metals), as it relates to processing, facilities, infrastructure, project economics, capital and operating cost estimates; Scott Weston, BSc. (Hons) and MBA in Mineral Resources Management (Ausenco), as it relates to permitting and environmental and social studies. The scientific and technical information contained in this release will be supported by a technical report to be prepared in accordance with National Instrument 43-101 - Standards for Disclosure for Mineral Projects. The Technical Report will be filed within 45 days of this release and will be available for review under the Company's profile on SEDAR at www.sedar.com.

Not for release or distribution in the United States

This announcement has been prepared for publication in Australia and may not be released to U.S. wire services or distributed in the United States. This announcement does not constitute an offer to sell, or a solicitation of an offer to buy, securities in the United States or any other jurisdiction, and neither this announcement or anything attached to this announcement shall form the basis of any contract or commitment. Any securities described in this announcement have not been, and will not be, registered under the U.S. Securities Act of 1933 and may not be offered or sold in the United States except in transactions registered under the U.S. Securities Act of 1933 or exempt from, or not subject to, the registration of the U.S. Securities Act of 1933 and applicable U.S. state securities laws.

ANNEXURE A

ADDITIONAL RESOURCE & RESERVE INFORMATION

Additional information for the resource estimation

Diamond drill cores were obtained in the field for both drainable and total porosity. Porosity samples were sealed in plastic tubes and shipped to Core Laboratories in Houston, Texas, for analysis. Depth-specific brine samples were collected from the in-situ formation, ahead of the core bit. Four additional methods were used to obtain brine samples. Brine samples used to support the reliability of the depth-specific samples included analyses of brine centrifuged from core samples, brine obtained from low flow sampling of the exploration core holes, brine samples obtained near the end of the pumping tests in the exploration wells, and brine samples obtained during reverse- circulation air drilling. After the samples were sealed on site, they were stored in a cool location, then shipped in sealed containers to the laboratories for analysis.

Borehole and well spacing is in general about 4 km in most areas, and is consistent with guidelines determined by Houston et al., 2011 for evaluation of brine-based lithium resources in salar-type systems.

The drilling density was sufficient to demonstrate a high degree of confidence in the understanding of the location and nature of the aquifer, and brine grade both horizontally and vertically. The Sal de Vida area has been drilled and logged with vertical exploration boreholes and wells.

The resource was estimated using the polygon method. To estimate total amount of lithium in the brine, the basin was first sectioned into polygons based on the location of exploration drilling. Polygon sizes were variable. Each polygon block contained one diamond drill exploration hole that was analysed for both depth specific brine chemistry and drainable porosity. Boundaries between polygon blocks are generally equidistant from diamond drill holes. For some polygon blocks, outer boundaries are the same as basin boundaries, as discussed above.

Within each polygon shown on the surface, the subsurface lithologic column was separated into hydrogeologic units. Each unit was assigned a specific thickness based on core descriptions and was given a value for drainable porosity and average lithium content based on laboratory analyses of samples collected during exploration drilling. Correlation between depth and lithium concentration in the brine was observed further increasing confidence in the method. The computed resource for each polygon was the sum of the products of saturated hydrogeologic unit thickness, polygon area, drainable porosity and lithium content.

A cut-off grade of 500 mg/L of lithium was used. Hydrogeologic units within each polygon with lithium content less than cut-off grade were not included in the lithium resource calculations. The resource computed for each polygon is independent of adjacent polygons, but adjacent borehole geology was used to confirm stratigraphic continuity of the units surrounding each borehole.

Mining methodology ultimately would be via well pumping in areas identified as favourable for brine extraction. An on-site pilot plant demonstrated the ability to extract the lithium from the brine.

Drilling information from the production well extensions have resulted in the increased depth of the basement model and have increased the volume of the lithium brine hosting aquifer.

Additional information for the reserve estimation

The methodology used to develop the estimated resources, is different to the methodology used to estimate the reserves, but consistent with the informal guidelines for lithium brines developed by Houston et al., 2012. Their document provides informal guidelines for estimation of Brine Resources and Brine Reserves, and their methodology is consistent with industry standards for characterisation of aquifers and wellfields.

The document states that key variables, "*hydraulic conductivity, recovery, brine behaviour and grade variation over time, etc. and fluid flow simulation models*" are considered when estimating the Brine Reserve and determining economic extraction. Given the nature of brine, the same guidelines regarding well spacing and grade cannot be applied as if the deposit was a stationary (i.e. static) orebody. The guidelines regarding lithium brine deposits, as suggested by the Ontario Securities Commission (2011), were considered acceptable and applied by Montgomery during construction of the groundwater flow model used to estimate the reserve.

Where previous methods were used to estimate the total amount of brine, and therefore lithium in storage that could be theoretically drained in the entire mining concession, the method used for reserve estimation is completely different and focuses on the potential for retrieval of lithium via wellfield pumping in selected areas where pumping at relatively large abstraction rates have been demonstrated. As the brine is a mobile fluid, it is necessary to use a calibrated numerical groundwater flow model, respective of fluid density, to project future wellfield production and projected future brine grade.

Due to various levels of uncertainty in conceptualizing any hydrogeological system, all groundwater flow models necessarily incorporate inherent uncertainty. To lessen the effects of uncertainty, good model calibration to observed field conditions is essential for judging confidence in model projections. However, even with reasonable short-term model calibration to 30-day, hydraulic testing of the brine aquifer that was conducted in late 2012 and in 2020, long-term model projections are less certain because of outstanding variables. These variables include locations of aquifer boundaries, lateral continuity of key aquifer zones, presence of fresh and brackish water that have the potential to dilute the brine in the wellfield area, and the uniformity of aquifer parameters within specific aquifer units. Although the numerical model was constructed to be reasonably conservative when data are scarce or assumed (i.e., law of parsimony), there is always a level of uncertainty associated with projections of long-term outcomes. Therefore, it is appropriate to categorize the pumping from the first six years of pumping at each wellfield as a Proven Brine Reserve. Although projections of long-term pumping past the first six years from the wellfields are less certain. There is a reasonable understanding of the hydrogeological system that over the long-term the projected pumped brine can be categorized as a Probable Brine Reserve for the remaining 34 years of pumping at each wellfield.

It is standard in the industry to recalibrate and update numerical groundwater models after start-up and during operation of the production wellfields. As the wellfields are pumped, long-term data for pumping rates, water levels, and brine chemistry are generated; calibration to these new data will improve the reliability and predictive capabilities of the model. Future probable reserve estimates may also be modified based on production pumping results, and projections from the recalibrated model may result in confidence category upgrades of Probable Brine Reserves to Proven Brine Reserves.

Statement of Brine Reserves

The groundwater model simulates concentrations of TDS, which are used to derive concentrations of lithium by linear relationships developed for each wellfield. It is assumed that the relationship between TDS and lithium content is constant during 40-year period of brine production from the East and Southwest wellfields. In this manner, the concentrations of lithium on model projections of TDS in the brine produced from pumping wells in each production wellfield are estimated.

Using the numerical groundwater flow model projections, total lithium to be extracted from the proposed Southwest and East wellfields was calculated for a total period of 40 years, considering the three stages of the project and taking into account that each wellfield will be pumping for 40 years with a gap of two years between wellfields (East, Southwest (South) and Southwest (North)). The model projections used to determine the Brine Reserve that assumed increasing pumping from both wellfields, indicate that the proposed wellfields should be able to produce a reliable quantity of brine at an average annual rate of approximately 10,000 m^3/d (about 116 L/s) in the case of the East wellfield and 18,000 m^3/d in the case of Southwest wellfield (about 208 L/s). The average grade at start-up calculated from the initial model simulations used to estimate the Brine Reserve is expected to be about 810 mg/L of lithium (East wellfield); average final grade after 40 years of pumping is projected to be 778 mg/L of lithium (Southwest wellfield). Depending on how the wellfields are ultimately operated, these rates and grades may be different.

Using the groundwater model, the average TDS content of brine was estimated for each pumping cycle for each wellfield. After estimating the total lithium content for each time step and summing the amounts of lithium projected to be pumped during those time steps, a total mass of unprocessed lithium to be pumped from the wellfields was estimated.

Total mass values in 1,000-kilogram units (tonnes) of lithium were then converted to lithium carbonate equivalent (LCE) units using 5.3228 as the conversion factor. Therefore, the amount of lithium in the brine supplied to the ponds in 40 years of pumping is estimated to be about 2.48 Mt LCE, assuming no losses during processing.

Modelling results indicate that during the 40-year pumping period, brine will be diluted by fresh and brackish water, so the pumping rates increase slightly with time, to meet the anticipated LCE tonnes per year for each wellfield.

During the evaporation and concentration process of the brines, there will be anticipated losses of lithium. Therefore, because the total amounts provided in Table 13 do not include anticipated loss of lithium due to process losses and leakages, those values cannot be used for determination of the economic reserve. The amount of recoverable lithium in the brine feed is calculated to be about 68.7% of the total brine supplied to the ponds.

Allkem Ltd.		
	Investor Relations & Media Enquiries	Connect
ABN 31 112 589 910	Andrew Barber	info@allkem.co
	+61 418 783 701	+61 7 3064 3600
Level 35, 71 Eagle St	Andrew.barber@allkem.co	www.allkem.co
Brisbane, QLD 4000		