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Tivan secures long-term partnership with CSIRO for development and facilitation of TIVAN+ technology

- **Tivan secures long-term partnership with Australia's national science agency, CSIRO, to facilitate development and commercialisation of the TIVAN+ critical minerals processing technology.**
- **The partnership brings together the critical minerals processing intellectual property and expertise of both parties in an industry shaping collaboration of national significance.**
- **Tivan and CSIRO have executed a Technology Licence Agreement ("TLA") providing Tivan with an exclusive 20 year worldwide licence (except India) for use of CSIRO's critical minerals processing intellectual property to recover vanadium that will underpin the evolved TIVAN+ technology.**
- **Tivan and CSIRO have in parallel executed a Research Services Agreement to formalise collaboration on technology development in support of the TLA and to facilitate a TIVAN+ Pilot Plant project as a precursor to future full-scale commercialisation of the technology.**
- **The partnership with CSIRO supports the Tivan Board's longer-term vision of delivering a TIVAN+ Processing Facility for the Company's Speewah Vanadium-Titanium-Iron Project.**

The Board of Tivan Limited (ASX: TVN) ("Tivan" or the "Company") is delighted to advise that it has secured a long-term commercial and strategic partnership with Australia's national science agency CSIRO through the execution of a **Technology Licence Agreement** ("TLA") and a **Research Services Agreement** ("RSA"), under which the parties will collaborate on integration of their intellectual property and know-how for the development and commercialisation of the TIVAN+ critical minerals processing technology for the recovery of vanadium. The agreements are a major milestone in progressing the Board's longer-term vision of delivering a TIVAN+ Processing Facility for downstream processing of mineral concentrate produced from Tivan's 100% owned Speewah Vanadium-Titanium-Iron Project ("Speewah) in north-east Western Australia.

Tivan's partnership with CSIRO is a nationally significant collaboration. It represents:

1. The successful reshoring of a critical technology for Tivan in Australia, capturing many years of advanced research and development in a sector of strategic national interest;
2. A new alliance between industry and the scientific research sector, where a durable alignment of interests has been achieved;
3. An opportunity to contribute to the reshaping of the global vanadium industry for national benefit, including through the creation of diverse, resilient and sustainable supply chains with international partners;
4. An opportunity to capture downstream value-addition from resources in Australia, creating forward-facing employment and business opportunities, including in regional and Traditional Owner communities; and
5. An opportunity to design and deploy a sovereign capability within Australia that furthers the development of a large-scale renewable energy value chain based on principles of sustainable circularity.

Background

Tivan is a critical minerals company primarily focused on the development of vanadiferous titanomagnetite ("VTM") projects in Australia, including its flagship Speewah Project. Over the past decade, Tivan has progressed development of its 100% owned patented mineral processing technology the TIVAN® Process with the aim of commercialising VTM deposits through an unconventional flowsheet producing vanadium pentoxide, titanium dioxide and iron oxide fines.

CSIRO is Australia's national science agency and is one of the largest and most multidisciplinary mission-driven research organisations in the world, operating at 49 sites across Australia and sites overseas. CSIRO's stated purpose is to provide innovative scientific and technology solutions to national challenges and opportunities to benefit the nation – in industry, community and the environment.

In recent years and independent of Tivan's own technology development efforts, CSIRO developed and patented a novel mineral process to recover vanadium, titanium and iron in the form of their oxides from VTM and ilmenite concentrates, using a different flowsheet relative to the Company's TIVAN® Process. CSIRO's research and development program is also supported by a range of research partnerships.

In April 2023, the Company announced it had confirmed the preferred, longer-term technology pathway for facilitation of its VTM projects through an integrated mineral processing technology, TIVAN+, to be facilitated through ongoing collaboration with CSIRO (refer to ASX announcement of 12 April 2023). Prior to this announcement, Tivan and CSIRO had engaged in extensive knowledge sharing of their VTM processing intellectual property and had identified a strategic opportunity to consolidate efforts to develop TIVAN+ as an optimal process based on defined aspects of their respective flowsheets.

Initial phase of collaboration

Since the announcement in April 2023, CSIRO and Tivan have collaborated in good faith and with a collegiate ethos in development of the TIVAN+ technology ahead of formal execution of the TLA and RSA. The parties have shared extensive knowledge and experience in rapidly advancing an optimised VTM mineral processing flowsheet (TIVAN+) based on modifications to the CSIRO process and integration of certain aspects of the Company's TIVAN® Process.

To facilitate the TIVAN+ technology development, CSIRO assembled a team of research scientists and subject matter experts from different backgrounds to oversee development of relevant areas of the flowsheet and testwork. The team included several members who previously worked on various aspects of the Company's TIVAN® Process technology dating back to 2013. The collaboration with Tivan's technical team has involved multiple workshops and weekly project management and technical meetings.

The TIVAN+ technology development has been significantly advanced during this phase, with core development activities over the last six months including:

- Review of respective technologies with a focus on identifying risks and opportunities for an optimised flowsheet.
- Review of proposed flowsheet optimisations with a focus on identification of technology gaps.
- Scoping of a large-scale development testwork program.

- Execution of initial phases of testwork by CSIRO.
- Selection of preferred location for the TIVAN+ Pilot Plant, at East Arm in Darwin. This site is being evaluated by Tivan with the support of Investment Territory and Land Development Corporation for a proposed multi-use research and development hub for critical minerals.
- Environmental pre-referral screening process for the preferred Pilot Plant location.

Darwin based EcOz Environmental Consultants ("EcOz") completed the pre-referral screening of the proposed TIVAN+ Pilot Plant at East Arm, with the aim of determining the project's potential for significant environmental impact under the Northern Territory's *Environment Protection Act 2019*. The pre-referral screening process undertaken included a review of the proposed construction and operational phases of the Pilot Plant, and considered potential impacts in the areas of land, water, sea, air and people. In completing the pre-referral screening, EcOz formed the view that the Pilot Plant project is unlikely to have a significant environmental impact and therefore does not need to be referred under the *Environment Protection Act 2019.*

EcOz has proposed a number of impact avoidance measures identified as part of the pre-referral screening process which Tivan intends to incorporate into the project. The measures are standard industry practice and/or required by legislation, and there is a high degree of certainty that they will be effective in minimising potential environmental impacts.

The most substantive progress has been made in the testwork program, a large-scale program conducted at CSIRO's Minerals Research facility at Waterford in Perth. This involves a defined scope of work over a six month duration that is considered a major development step for the TIVAN+ technology. The purpose of this program is to:

- Investigate risks and opportunities identified for the integrated flowsheet.
- Investigate addressing identified technology gaps.
- Validate the TIVAN+ technology flowsheet utilising ore from Speewah and Tivan's Mount Peake Project.
- Support future process engineering activities.
- Address key areas required to support the future Pilot Plant.

Key outcomes from the testwork completed to date include, but are not limited to:

- Demonstration of high (>98%) vanadium extraction from the ore and recovery to an impure vanadium-rich concentrate from both Speewah and Mount Peake material.
- Narrowing vanadium pentoxide recovery options from the vanadium-rich concentrate to a single process via an ammonium metavanadate ("AMV") intermediate.
- CSIRO internal analyses via ICP-MS and ICP-OES demonstrated production of high purity (>99.5%) AMV from synthetic solution representative of Speewah ore leach liquor (refer to Table 1). External analyses via XRF and LA-ICP-MS at an independent laboratory confirmed a high purity (>99.5%) V_2O_5 product was prepared from the calcined high purity AMV.
- Testwork initiated across all core processing areas in the process flowsheet.

	Elemental analysis (%w/w)										
Sample	V	Al	Fe	Ti	Cr	Mg	Ca	Si	P	S	Na
AMV	43.6	<0.001	<0.004	<0.001	<0.001	NM	<0.001	0.025	0.004	NM	0.022

Calculation		Al_2O_3	Fe_2O_3	TiO_2	Cr_2O_3	MgO	CaO	SiO_2	P_2O_5	SO_3	Na_2O	SUM	Calculated purity
Max. AMV impurities (as oxides)		0.002	0.006	0.002	0.001	0.000	0.001	0.051	0.007	0.000	0.027	0.097	99.90

NM = not measured

Table 1: CSIRO assay results for AMV produced

Collaboration following execution of the Research Services Agreement (RSA)

The RSA has been executed in parallel to the TLA to formalise the on-going collaboration between CSIRO and Tivan on the TIVAN+ technology development which commenced in April. The RSA details the agreed pathway for technology development and optimisation, including the various workstreams and testwork program noted above and the contribution of both parties to this work.

The technology developed via the implementation of the RSA is captured under the TLA, and will be used to facilitate the planned TIVAN+ Pilot Plant. As a novel technology, the TIVAN+ process requires demonstration at a pilot plant scale to significantly reduce project risk and provide a final stage of technical validation to achieve project financing.

Given the Company's initial focus for Speewah on a salt roast technology pathway (refer to ASX announcement of 23 August 2023), the timeline previously disclosed for TIVAN+ has been modified, allowing more time for technology development to ensure the best outcomes will be achieved. The current testwork program is expected to continue into May 2024 and will be followed by a process engineering scope to translate the findings into a set of process documents that describe the new evolved technology. The documentation will include but is not limited to:

- process design criteria;
- mass and energy balance simulation;
- process flowsheet documents;
- process description;
- preliminary equipment list; and
- load list.

The engineered process will inform remaining testwork requirements to support the engineering and implementation of a TIVAN+ Pilot Plant.

Overview of the Technology Licence Agreement (TLA)

As noted above, the TLA represents a major step forward for the Board's longer-term ambitions for delivering a TIVAN+ Processing Facility for the Speewah Project. The Board views the TIVAN+ process route ultimately as the technology of choice for the exploitation of VTM deposits, offering a diversified product mix and revenue streams, opportunities for cost optimisation and reduced environmental impacts. With respect to the product mix, TIVAN+ also provides an opportunity to produce an intermediate titanium ilmenite feedstock of commercial value. The initial salt roast pathway workstreams at Speewah, including mining, beneficiation, non-process infrastructure and approvals, are shared with the TIVAN+ pathway, thereby providing extensive synergies and optionality.

The key attributes of the TIVAN+ pathway as compared to the TIVAN® Process are illustrated in Figure 1 below.

Figure 1: TIVAN+ pathway attributes; the partnership is a major milestone in Tivan's longer-term vision of delivering a step-change technological advance in the critical mineral processing of Vanadium

The TLA provides Tivan with an exclusive, non-transferable 20 year licence to use CSIRO's specified VTM intellectual property, patents, know-how and any further improvements thereto for the recovery of vanadium ("Technology") that will form the basis for the TIVAN+ technology.

The key terms of the TLA are as follows:

- **Licence term**: the later of 20 years from a positive final investment decision ("FID") by the Tivan Board in favour of proceeding with the building and operation of a commercial vanadium processing plant in Australia that implements the Technology (for Speewah), or the date the last valid claim to the patent rights the subject of the TLA lapses, is abandoned or ceases to exist.
- **Licence territory**: worldwide, excluding India.
- **Field of use**: recovery of vanadium.

- **Commercial terms**: an agreed schedule of annual cash licence fees payable by Tivan to CSIRO during the licence term for the first commercial use of the Technology at the Speewah Project, commencing at FID and continuing annually thereafter through effective construction, commissioning/ramp-up and steady state operational phases, up to production of 25,000 tonnes per annum of vanadium pentoxide. Should production exceed 25,000 tonnes of vanadium pentoxide in a 12 month period, the licence fee will become the greater of the applicable annual cash fee or a pre-determined percentage of net sales revenue (with the fee payable capped at a pre-determined annual amount).

  Should Tivan use the Technology at another Tivan owned site, Tivan will pay to CSIRO a pre-determined percentage of net sales revenue from that site commencing at FID. Should Tivan process third party ore in a Pilot Plant using the Technology, the parties will share equally any net profit generated.

- **Sublicensing**: Tivan will actively seek to sublicence the Technology to third parties for use at other vanadium deposits, subject to the pre-approval of CSIRO of such third parties; the terms of a sublicence must be consistent with and no less onerous than the TLA. For any such third party sublicence, Tivan will pay CSIRO the greater amount of a pre-determined percentage of net sales revenue generated from the sublicence or 50% of any royalty paid to Tivan under the sublicence.

- **Project criteria**: Tivan has agreed to meet a schedule of key milestones for the first commercial use of the Technology (for Speewah) including for FID, and for the Pilot Plant and sublicensing arrangements.

CSIRO Chief Executive Dr Doug Hilton commented:

"This is a really important partnership that will see the development and commercialisation of cutting-edge, CSIRO-patented technology increasingly used in the production of renewable energy storage systems.

"The technology is a vital piece in the puzzle in Australia's renewable energy future and it will deliver long term community benefit, boosting the economy and supporting more jobs and opportunities for Australians.

"This is important, innovative, inventive work, creating new sovereign capability that harnesses the critical technologies Australia needs to transition to net zero."

Tivan Executive Chairman Mr Grant Wilson commented:

"In March the Board of Tivan made the decision to integrate many years of research and development of the TIVAN® critical minerals processing technology with independent technological advances that the Mineral Resources team at CSIRO had achieved. Over the subsequent period Tivan and CSIRO have been working together in close collaboration, rapidly advancing the resulting TIVAN+ technology pathway.

Our partnership has been formalised today in binding form, aligning Tivan and CSIRO for the decades ahead. We are delighted to have achieved this outcome, reflecting as it does, the reshoring of a critical technology, and the opportunity to meaningfully advance the energy transition through sovereign capabilities.

On behalf of the Board, I extend sincere thanks to the team at CSIRO for their collegiate ethos and goodwill throughout this journey. I am confident that our partnership will endure, and will come to exemplify how research and industry can work together in mission-driven science that addresses Australia's greatest challenges."

This announcement has been approved by the Board of the Company.

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Forward looking statement

This announcement contains certain “forward-looking statements” and comments about future matters. Forward-looking statements can generally be identified by the use of forward-looking words such as, “expect”, “anticipate”, “likely”, “intend”, “should”, “estimate”, “target”, “outlook”, and other similar expressions and include, but are not limited to, the timing, outcome and effects of the future studies, project development and other work. Indications of, and guidance or outlook on, future earnings or financial position or performance are also forward-looking statements. You are cautioned not to place undue reliance on forward-looking statements. Any such statements, opinions and estimates in this announcement speak only as of the date hereof, are preliminary views and are based on assumptions and contingencies subject to change without notice. Forward-looking statements are provided as a general guide only. There can be no assurance that actual outcomes will not differ materially from these forward-looking statements. Any such forward looking statement also inherently involves known and unknown risks, uncertainties and other factors and may involve significant elements of subjective judgement and assumptions that may cause actual results, performance and achievements to differ. Except as required by law the Company undertakes no obligation to finalise, check, supplement, revise or update forward-looking statements in the future, regardless of whether new information, future events or results or other factors affect the information contained in this announcement.