Archer Materials Limited (ACN: 123 993 233)
Lot Fourteen, Frome Road, Adelaide SA 5000
www.archerx.com.au

ASX Announcement (ASX: **AXE**) 26 July 2024

Q4 FY24 Activities Report and Appendix 4C

For the quarter ended 30 June 2024.

Key highlights

- Increased the accuracy and speed of reading quantum information using resonators through a new method, which will improve single electron spin detection.
- Achieved longer electron spin lifetimes of up to 300 nanoseconds in new carbon nano-onion ("CNO") films, using a new process.
- Paved the way for enhanced quantum device fabrication and performance testing by starting ion-implantation experiments to control CNO size and arrangement.
- Developed a graphene transistor test procedure to assess the gFET sensor performance and ensure consistency over time. The tests study the gFETs under different conditions and under different electrical operation modes.
- First six-inch whole wafer run for Archer's Biochip gFET through its Spain-based foundry partner.
- Miniaturised Biochip gFET design set to be fabricated at commercial foundry partner in Netherlands and then to be diced and assembled at OSAT partner in Japan.
- Archer showcased its technologies at the WEF Centre for the Fourth Industrial Revolution's Global Technology event and the WEF Advanced Manufacturing and Supply Chains strategy meeting in San Franciso.
- Appointed Dr Simon Ruffell as Chief Technology Officer to lead the growth of Archer's 12CQ quantum chip and its Biochip.
- Strong cash position to fund activities with $18.2 million and no debt.

Archer Materials Limited ("Archer", the "Company", "ASX: AXE"), a semiconductor company advancing the quantum computing and medical diagnostics industries, provides its Quarterly Activities Report and Appendix 4C for the quarter ended 30 June 2024 ("Quarter").

Commenting on Q4 FY24 activities, Greg English, Executive Chairman of Archer, said

"The quantum team has been doing important work and discovering new information and ways to bolster the 12CQ's capabilities including enhancing its fabrication and performance testing, improving electron spin lifetimes, and increasing the speed and accuracy of reading quantum information.

"Our Biochip design received substantial validations during the quarter as we continue to work with several foundries in Europe to develop Biochip gFETs, with a miniaturised chip design.

"The Biochip is also further moved along its development pathway with the confirmation that its specialised gFET designs can be fabricated through a whole six-inch wafer run at a commercial graphene foundry. This sets the stage for subsequent wafer test runs on commercial-scale eight and twelve-inch wafers. We will now optimise the gFET designs, performance, and readiness to ensure compatibility with the advanced fabrication processes."

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Technology development and commercialisation activities

^{12}CQ chip

During the Quarter, the quantum team made developments to its quantum chip, the 12CQ, including achieving longer electron spin lifetimes, development of a new manufacturable method of CNO synthesis, improving the accuracy and speed of quantum information readings, and initiating ion-implantation experiments to control CNO size and arrangement for enhancing its fabrication.

Archer extended its electron spin lifetimes of up to 300 nanoseconds compared to the previous 230 nanoseconds (ASX announcement 8 June 2023). The team did this through a new process of films of CNOs. These lifetimes match those measured on the pyrolysis method that was previously used for formation. This new method opens another way for a manufacturable process of devices based on CNOs.

The Company developed a new method that uses resonators to sample electron spin states. This means Archer can now fine-tune the resonators to make its readings faster and more accurate. Adjustable resonator responses allow the Company to handle more quantum bits (qubits) at once. By reading spin signals faster, more can be done with the electron before it loses its spin state. This builds on the work being done on the pulsed electron spin resonance ("p-ESR") chip.

Archer also found that the CNOs are highly electrical resistive, and did not show stable single electron charging signal, but the electron box devices which were used worked well with standard gold nanoparticles. To address this, the team is working to improve how the electrodes connect to CNOs, how electrons move through the CNOs, the number of electrons (spins) on our current CNOs, and the chemical makeup and size of the CNOs.

The Company has also commenced a project with Queen Mary University of London (QMUL) to study electron movement through CNOs using graphene-based nanodevices, to observe the Coulomb blockade phenomenon, an important phenomenon in quantum physics. Wafer measurements will be performed at a very low temperature of 77 Kelvin (-196 degrees Celsius), and the graphene electrodes on essential devices will be physically examined. The team will also check to confirm the presence of CNOs and clusters of CNOs on these devices and will follow up with QMUL to discuss the results.

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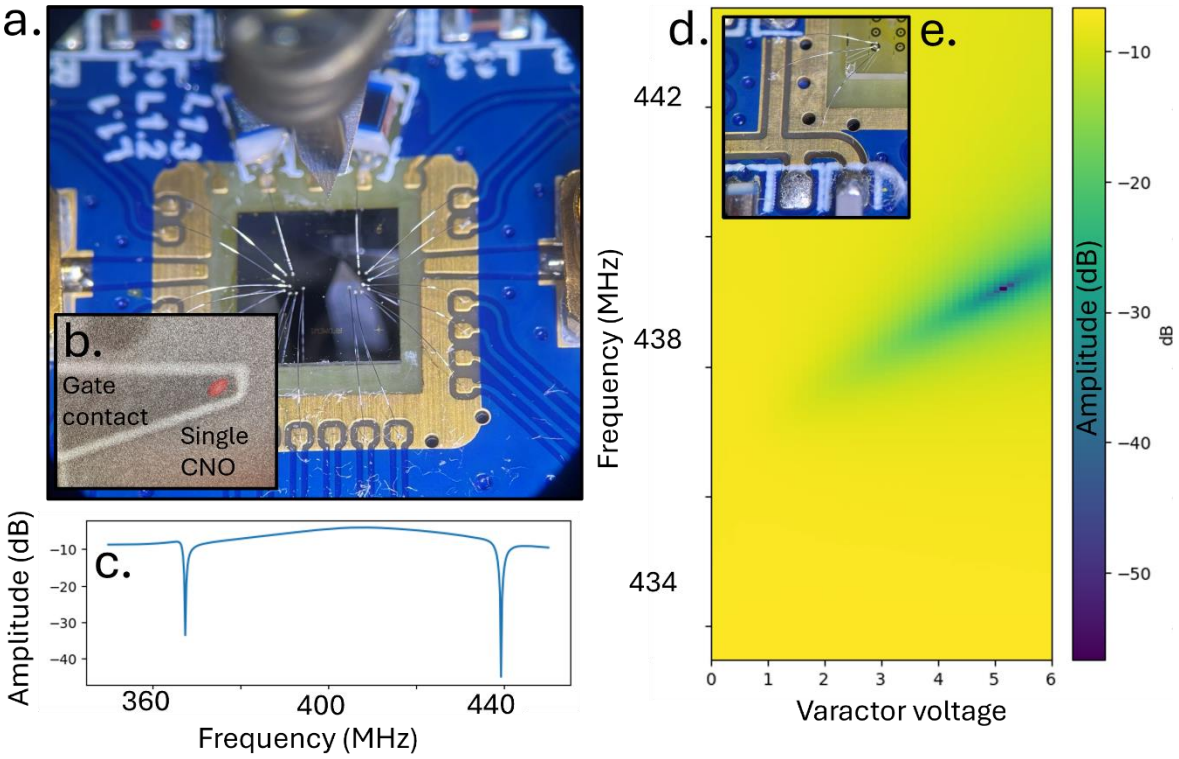

Image 1. The company's new method to enhance the accuracy and speed of readings quantum information using resonators to improve the ability to detect a single electron spin detection in the CNO material. (a) and (d) shows a test chip ready for testing with a high magnification image of a single CNO in a device (b). (c) and (e) show typical data collected from devices.

Biochip

Archer advanced its Biochip graphene field effect transistor ("gFET") design after it fabricated the latest generation of the design on a whole six-inch wafer run through its Spanish foundry partner. The design was sent for fabrication of a whole wafer run in December 2023 (ASX announcement 11 December 2023).

This is the first six-ich wafer run for Archer, which produced 145 chips with eight gFET devices on each chip. Archer validated that the gFET electronically preformed as expected after it came back from the foundry. The gFETs in this design are more advanced than previous designs as it has gating and channel definition and can be fabricated with structures suitable for liquid multiplexing, which is the detection of multiple diseases on a single chip. This also helps maintain graphene device stability from chip-to-chip.

The foundry is ISO 13485 certified to manufacture medical device components and Archer is continuing to work with it to enhance the efficiency of its processes to integrate testing of the gFET devices at the point of manufacture.

The Company also developed a standardised procedure for testing its gFETs manufactured by its European suppliers. The new procedure was developed to ensure the gFETs work correctly before using them in sensors.

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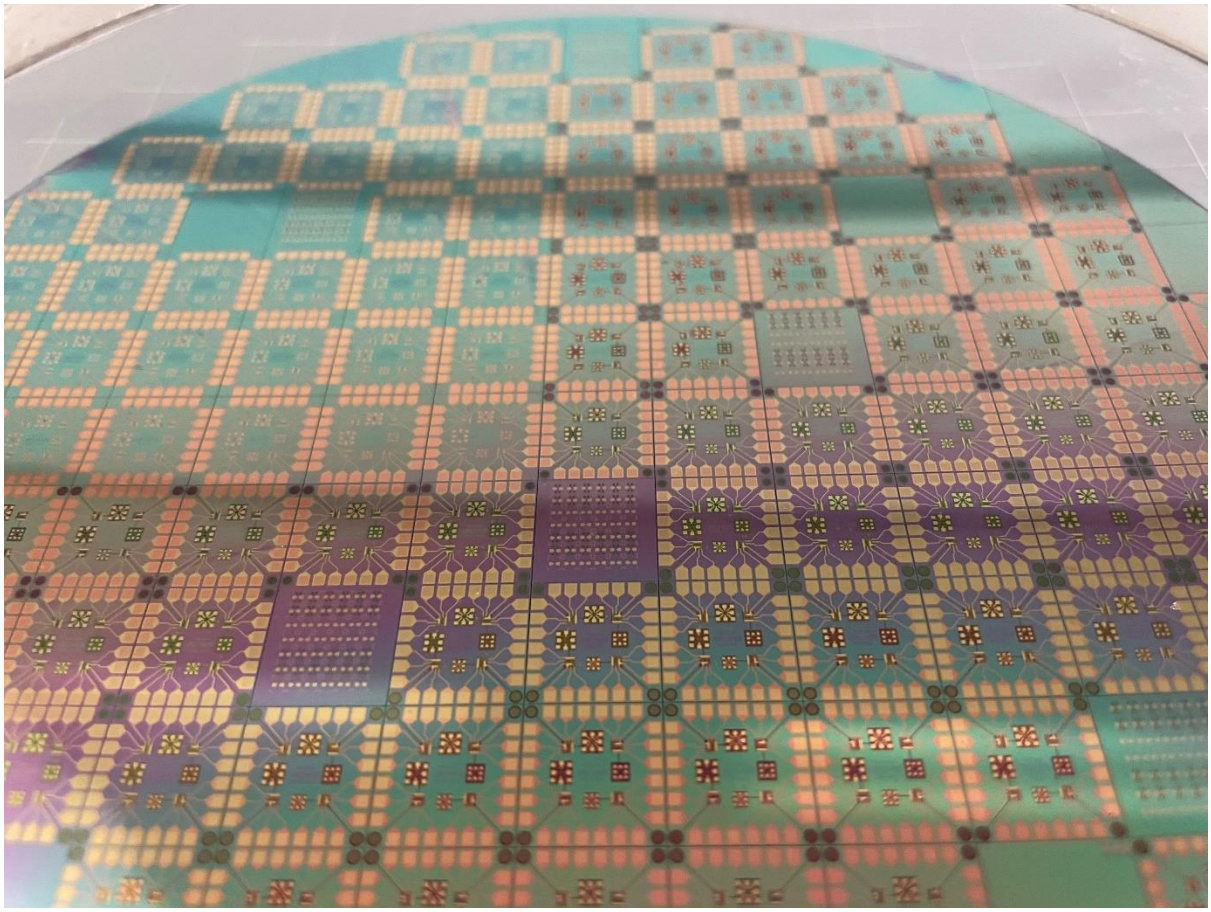
Archer determined new ways to electrically operate the gFET sensor – speed, and the direction of the voltage applied to the gate (a part of the transistor). These factors change how the transistor responds based on the liquid and the number of ions in the liquid (tiny, charged particles), ultimately setting the sensitivity and speed of the sensor. This ability allows Archer to use new ways to detect substances under different operating conditions using data analysis and machine learning.



Photograph of the received six-inch wafer from the European foundry. The individual Archer sensing chips, of 1x1 square centimetre, are arranged in a grid on the wafer ready for singulation and then testing.

Archer is now determining how best to protect the transistor by adding proprietary materials modification steps and adding special ultrathin coatings. This work is to address uniformity and durability issues with the gFETs and is critical to developing a sensor product. In addition, the work on materials modification aims at improving the ability to detect substances at ultra-low concentrations. This work will help Archer move to the next phase of developing a sensing method.

Archer is also expecting the fabrication of its miniaturised Biochip gFET design from its Netherlands-based commercial foundry (ASX announcement 11 March 2024). It is being done on a whole four-inch wafer run and is expected to produce 1375 chips on the wafer. This is a significant increase in the amount of chips from the previous Biochip design, which produced 45 chips from a whole four-inch wafer run (ASX announcement 14 September 2023).

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Once the smaller design is fabricated, the wafer will then be diced and assembled at Archer's outsourced semiconductor assembly and testing ("OSAT") partner in Japan. The OSAT includes moulding, dicing, and lead frame design for the wafer assembly, along with device electronic shorting and related packaging testing. Delivery of the packaged chips is anticipated in the second half of this year.

Archer is continuing to work with Sydney-based multidisciplinary laboratory Cicada Innovations for the development of its Biochip and the integration of the miniaturised gFET designs including R&D, material engineering, and hardware testing and analysis.

Management changes

Archer promoted Dr Simon Ruffell to Chief Technology Officer ("CTO") to help drive the growth and development of the Company's two technologies, its Biochip and 12CQ qubit material. Dr Ruffell has been managing the progressing across both the Biochip and 12CQ teams and will be ramping up the development as the CTO.

Dr Ruffell has 20 years of global industry experience of managing technology projects and teams. He has semiconductor and quantum experience at leading organisations including Microsoft, Applied Materials, and the University of Sydney.

Archer announced the departure of CEO, Dr Mohammad Choucair. Dr Choucair will remain as CEO until 17 January 2025 to ensure a smooth transition and continuity of the 12CQ and biochip programs.

Financial and corporate update

The Company's cash balance at the end of the Quarter was $18,210,000 with no debt.

The Company holds 1,633,944 shares in Canadian Stock Exchange listed Volatus Capital Corp (CSE:VC) and 11,571,119 shares and 2,892,780 quoted options in ASX listed ChemX Materials Ltd (ASX:CMX).

Archer's accompanying Appendix 4C cashflow report for the Quarter includes an amount of $142,000 at item 6.1, relating to executive and non-executive director fees paid as salaries and wages.

Events and outreach

Archer was present at key World Economic Forum (WEF) events in San Francisco in May, where it presented the capabilities of the Company, and its technologies and commercialisation approach to industry business leaders and technology companies. As the first Australian company to join the WEF's Centre for the Fourth Industrial Revolution (C4IR), Archer attended the C4IR's annual Global Technology flagship event. More than 230 leaders from 40 countries discussed how the rise of new technologies such as artificial intelligence (AI) and how it can be more human-centred in its implementation, along with suitable governance structures around the equitable use of quantum.

The Company also presented at the WEF's Advanced Manufacturing and Supply Chains Strategy Meeting, explaining the advantages of fabless semiconductor companies and how Australia is supporting quantum and semiconductors through the government's investments across high tech industries.

Archer presented at the ShareCafe 'Hidden Gems' series in April, where it outlined the latest developments for its Biochip and 12CQ qubit, the Company's fabless model and its advantages, along with where it fits into the semiconductor value chain.

Archer distributed the following newsletters:

- April 2024 Newsletter: Quantum and AI are prompting transformative potential across industries
- May 2024 Newsletter: Archer features in WEF global report and quantum investments remain strong
- June 2024 Newsletter: Archer presents at the World Economic Forum in the US

The Board of Archer authorised this announcement to be given to ASX.

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About Archer

Archer is a technology company that operates within the semiconductor industry. The Company is developing advanced semiconductor devices, including chips relevant to quantum technology and medical diagnostics. Archer utilises its global partnerships to develop these technologies for potential deployment and use across multiple industries. www.archerx.com.au

Appendix 4C

Quarterly cash flow report for entities subject to Listing Rule 4.7B

Name of entity	
Archer Materials Limited	
ABN	**Quarter ended ("current quarter")**
64 123 993 233	30 June 2024

Consolidated statement of cash flows		**Current quarter $A'000**	**Year to date (12 months) $A'000**
1.	**Cash flows from operating activities**		
1.1	Receipts from customers	-	-
1.2	Payments for		
	(a) research and development (excludes wages allocated to R&D)	(534)	(1,888)
	(b) product manufacturing and operating costs	-	-
	(c) advertising and marketing	-	-
	(d) leased assets	(84)	(116)
	(e) staff costs	(1,068)	(3,897)
	(f) administration and corporate costs	(207)	(1,564)
1.3	Dividends received (see note 3)	-	-
1.4	Interest received	134	1,099
1.5	Interest and other costs of finance paid	-	-
1.6	Income taxes paid	-	-
1.7	Government grants and tax incentives	-	1,456
1.8	Other (provide details if material)		
1.9	**Net cash from / (used in) operating activities**	**(1,759)**	**(4,910)**

2.	**Cash flows from investing activities**		
2.1	Payments to acquire or for:		
	(a) entities	-	-
	(b) businesses	-	-
	(c) property, plant and equipment	(30)	(116)
	(d) investments		
	(e) intellectual property	(11)	(81)

Consolidated statement of cash flows		Current quarter $A'000	Year to date (12 months) $A'000
	(f) other non-current assets	-	-
2.2	Proceeds from disposal of:		
	(a) entities	-	-
	(b) businesses	-	-
	(c) property, plant and equipment	-	-
	(d) investments	-	-
	(e) intellectual property	-	-
	(f) other non-current assets	-	-
2.3	Cash flows from loans to other entities	-	-
2.4	Dividends received (see note 3)	-	-
2.5	Other (provide details if material)	-	-
2.6	**Net cash from / (used in) investing activities**	**(41)**	**(197)**

3.	**Cash flows from financing activities**		
3.1	Proceeds from issues of equity securities (excluding convertible debt securities)	-	-
3.2	Proceeds from issue of convertible debt securities	-	-
3.3	Proceeds from exercise of options	-	-
3.4	Transaction costs related to issues of equity securities or convertible debt securities	-	-
3.5	Proceeds from borrowings	-	-
3.6	Repayment of borrowings	-	-
3.7	Transaction costs related to loans and borrowings	-	-
3.8	Dividends paid	-	-
3.9	Other (provide details if material)	-	-
3.10	**Net cash from / (used in) financing activities**	**-**	**-**

4.	**Net increase / (decrease) in cash and cash equivalents for the period**		
4.1	Cash and cash equivalents at beginning of period	20,010	23,317
4.2	Net cash from / (used in) operating activities (item 1.9 above)	(1,759)	(4,910)
4.3	Net cash from / (used in) investing activities (item 2.6 above)	(41)	(197)

Consolidated statement of cash flows		Current quarter $A'000	Year to date (12 months) $A'000
4.4	Net cash from / (used in) financing activities (item 3.10 above)	-	-
4.5	Effect of movement in exchange rates on cash held	-	-
4.6	**Cash and cash equivalents at end of period**	**18,210**	**18,210**

5.	Reconciliation of cash and cash equivalents at the end of the quarter (as shown in the consolidated statement of cash flows) to the related items in the accounts	Current quarter $A'000	Previous quarter $A'000
5.1	Bank balances	2,839	339
5.2	Call deposits	15,371	19,671
5.3	Bank overdrafts	-	-
5.4	Other (provide details)	-	-
5.5	**Cash and cash equivalents at end of quarter (should equal item 4.6 above)**	**18,210**	**20,010**

6.	Payments to related parties of the entity and their associates	Current quarter $A'000
6.1	Aggregate amount of payments to related parties and their associates included in item 1 * The above payments relate to fees and salaries paid to Directors during the quarter.	142
6.2	Aggregate amount of payments to related parties and their associates included in item 2	-

Note: if any amounts are shown in items 6.1 or 6.2, your quarterly activity report must include a description of, and an explanation for, such payments.

7.	**Financing facilities** *Note: the term "facility' includes all forms of financing arrangements available to the entity.* *Add notes as necessary for an understanding of the sources of finance available to the entity.*	**Total facility amount at quarter end $A'000**	**Amount drawn at quarter end $A'000**
7.1	Loan facilities	-	-
7.2	Credit standby arrangements	-	-
7.3	Other (please specify)	-	-
7.4	**Total financing facilities**	**-**	**-**

7.5	**Unused financing facilities available at quarter end**	n/a

7.6 Include in the box below a description of each facility above, including the lender, interest rate, maturity date and whether it is secured or unsecured. If any additional financing facilities have been entered into or are proposed to be entered into after quarter end, include a note providing details of those facilities as well.

n/a

8.	**Estimated cash available for future operating activities**	**$A'000**
8.1	Net cash from / (used in) operating activities (item 1.9)	(1,759)
8.2	Cash and cash equivalents at quarter end (item 4.6)	18,210
8.3	Unused finance facilities available at quarter end (item 7.5)	-
8.4	Total available funding (item 8.2 + item 8.3)	18,210
8.5	**Estimated quarters of funding available (item 8.4 divided by item 8.1)**	10.4

Note: if the entity has reported positive net operating cash flows in item 1.9, answer item 8.5 as "N/A". Otherwise, a figure for the estimated quarters of funding available must be included in item 8.5.

8.6 If item 8.5 is less than 2 quarters, please provide answers to the following questions:

8.6.1 Does the entity expect that it will continue to have the current level of net operating cash flows for the time being and, if not, why not?

Answer: n/a

8.6.2 Has the entity taken any steps, or does it propose to take any steps, to raise further cash to fund its operations and, if so, what are those steps and how likely does it believe that they will be successful?

Answer: n/a

8.6.3 Does the entity expect to be able to continue its operations and to meet its business objectives and, if so, on what basis?

Answer: n/a

Note: where item 8.5 is less than 2 quarters, all of questions 8.6.1, 8.6.2 and 8.6.3 above must be answered.

Compliance statement

1 This statement has been prepared in accordance with accounting standards and policies which comply with Listing Rule 19.11A.

2 This statement gives a true and fair view of the matters disclosed.

Date: ..... 26 July 2024.....

Authorised by: ..... By the Board.....
(Name of body or officer authorising release – see note 4)

Notes

1. This quarterly cash flow report and the accompanying activity report provide a basis for informing the market about the entity's activities for the past quarter, how they have been financed and the effect this has had on its cash position. An entity that wishes to disclose additional information over and above the minimum required under the Listing Rules is encouraged to do so.

2. If this quarterly cash flow report has been prepared in accordance with Australian Accounting Standards, the definitions in, and provisions of, *AASB 107: Statement of Cash Flows* apply to this report. If this quarterly cash flow report has been prepared in accordance with other accounting standards agreed by ASX pursuant to Listing Rule 19.11A, the corresponding equivalent standard applies to this report.

3. Dividends received may be classified either as cash flows from operating activities or cash flows from investing activities, depending on the accounting policy of the entity.

4. If this report has been authorised for release to the market by your board of directors, you can insert here: "By the board". If it has been authorised for release to the market by a committee of your board of directors, you can insert here: "By the [*name of board committee – eg Audit and Risk Committee*]". If it has been authorised for release to the market by a disclosure committee, you can insert here: "By the Disclosure Committee".

5. If this report has been authorised for release to the market by your board of directors and you wish to hold yourself out as complying with recommendation 4.2 of the ASX Corporate Governance Council's *Corporate Governance Principles and Recommendations*, the board should have received a declaration from its CEO and CFO that, in their opinion, the financial records of the entity have been properly maintained, that this report complies with the appropriate accounting standards and gives a true and fair view of the cash flows of the entity, and that their opinion has been formed on the basis of a sound system of risk management and internal control which is operating effectively.