THE AUSTRALIAN NATIONAL FABRICATION FACILITY

VICTORIAN NODE

MCN
Melbourne Centre for Nanofabrication

ANFF
VICTORIA

ANFF-VIC STRATEGIC PLAN 2023–2028

ENABLED BY
NCRIS
National Research Infrastructure for Australia
An Australian Government Initiative

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FROM THE DIRECTOR

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I am delighted to present our Strategic Plan 2023-2028, outlining the goals we have identified as necessary in realising our node's potential and our mission to drive development and translation of Australian innovation in the micro- and nanotechnology sectors.

Our role is a rewarding one, affording us the opportunity to support and nurture a broad range of clients from seven universities in Victoria, from CSIRO and from industry with a truly amazing collection of research capability backed by a stellar team of process engineers and managers.

The ANFF-VIC joint venture, founded in 2007 to help establish and operate the Melbourne Centre for Nanofabrication (MCN), is arguably one of the largest and most productive long-term partnerships in the university sector and an exemplar for the deliberate consolidation of research infrastructure.

The year-long process of formulating this plan with our partners and various stakeholders has allowed us to take stock of past success and weakness and use it to refine our goals in view of the many challenges and opportunities ahead.

I want to thank everyone who contributed input to the development of this plan. Sincere gratitude goes to the ANFF-VIC Council for their support and guidance and for helping to oversee the Plan's implementation. Lastly, a special thanks to our host and operator, Monash University, for their unwavering support.

This plan sets a trajectory for the next five years that builds upon the success of ANFF-VIC and the MCN whilst leveraging significant developments within local precincts such as the Southeast Melbourne Innovation Precinct (SEMIP) and aligning with the Victorian Government's vision for next generation research ecosystems as well as with the three Strategic Pillars of ANFF.

I'm pleased that we can now point to a document that fully captures the longer-term ambitions of the ANFF-VIC collective and I look forward to helping implement this exciting agenda in the years to come.

Thank you for taking an interest in our future.

Prof. Nicolas Voelcker
Director, ANFF Victoria Node
Scientific Director, MCN

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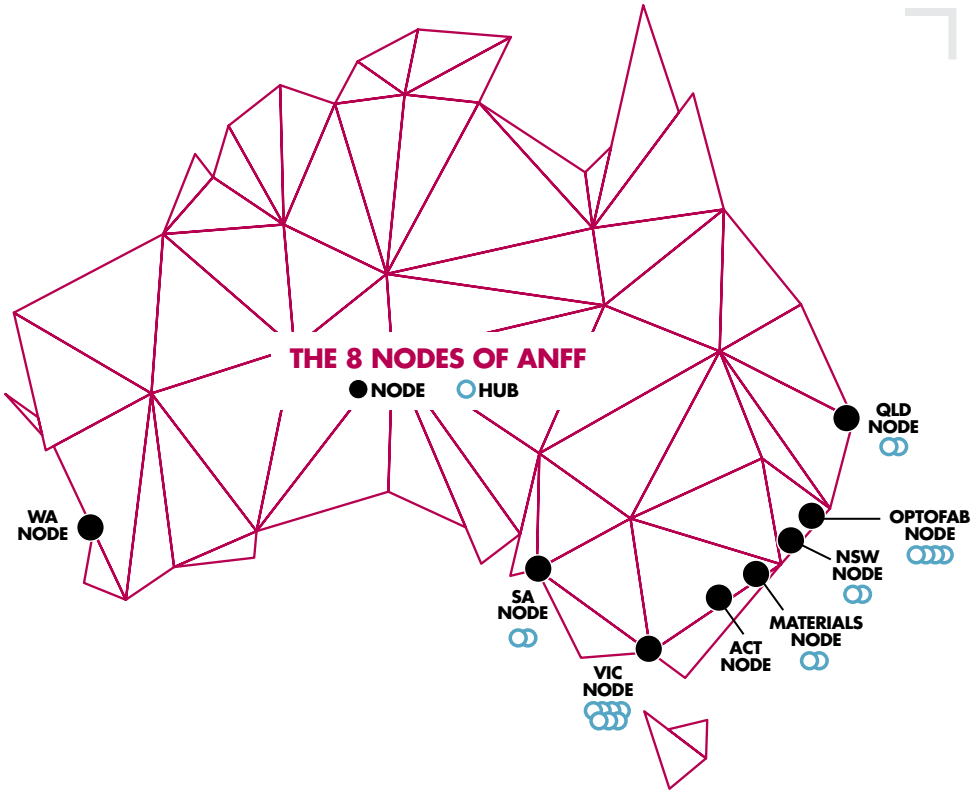
Victoria The Place To Be

ANFF **SNAPSHOT**

The Australian National Fabrication Facility (ANFF) was established under the Australian Government's National Collaborative Research Infrastructure Strategy (NCRIS).

ANFF's mission is to provide micro and nano fabrication facilities for Australia's researchers, SMEs and start-up companies.

More than 500 tools are located across 21 institutions around Australia in a national network of 8 Nodes. Each Node offers complementary specialised manufacturing facilities supported by trained staff.



STRATEGIC PILLARS

1

Research Infrastructure Excellence

ANFF continues to build the organisation and communicate its success, such that it is broadly considered an essential part of the research capability of Australia.

2

Capturing the Benefits

ANFF demonstrates delivery on a pipeline of commercialisation outcomes. Including:

- Australian industry using our tools to gain global advantages with their products;
- Facilitating technology licensing deals; and
- The formation of new companies based on ANFF driven innovation.

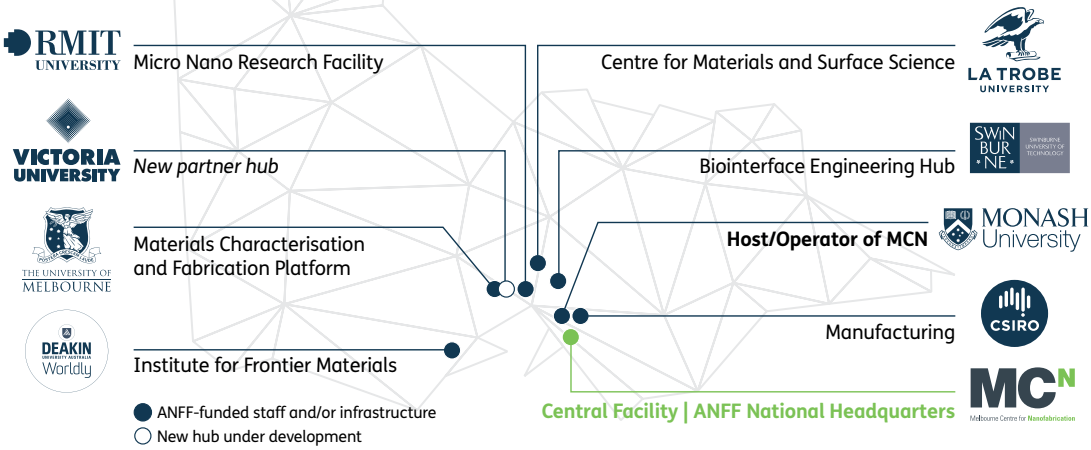
3

National Resilience

ANFF has played a significant role in the development of strategic and flexible sovereign manufacturing capability in Australia. Further, ANFF has made significant contributions to training a new workforce and stimulating activity for manufacturing businesses.

THE VICTORIAN NODE

ANFF-VIC IS A JOINT-VENTURE COLLABORATION COMPRISING:



OUR MISSION

The mission of ANFF-VIC is to drive development and translation of Australian innovation in the micro/nanotechnology sector by providing an openly accessible design, build, test and scale-up pipeline underpinned by key strategic partnerships, cutting-edge facilities and expert engineering support.

OUR VISION

ANFF-VIC and the MCN —indeed the entire national ANFF network— aspires to be a world leading hub for development and realisation of breakthrough technologies which will in turn assist in the establishment of new sovereign capability harnessing advanced manufacturing approaches. These aspirations will serve to foster research excellence, jumpstart commercial translation and scale-up activity within industry and academia and bring about the establishment of new and unique capabilities.

OUR VALUES

The ANFF-VIC node and its flagship MCN facility are committed to providing a supportive, creative and adventurous culture that brings together the Victorian research community, publicly funded research institutions and industry to facilitate collaborations and linkages both nationally and internationally. ANFF-VIC staff pride themselves in delivering high-quality professional services and support to clients by adhering to ISO-certified fabrication and training processes and a culture of continuous improvement.

STRATEGIC OBJECTIVES

SO1: Creating new partnerships aimed at driving translation
New partnerships aimed at driving translation

SO2: Enabling and hosting sovereign manufacturing capabilities by leveraging our networks
Foster sovereign manufacture

SO3: Creating a strong alliance with the Australian Synchrotron
Strongly ally with the Australian Synchrotron

SO4: Maintaining and enhancing our cutting-edge infrastructure
Maintain cutting edge capability

SO5: Growing impact in concert with facility and capability utilisation
Growth in utilisation and impact

SO6: Raising our profile and increasing engagement
Increase awareness and engagement

SO1

CREATING NEW PARTNERSHIPS AIMED AT DRIVING TRANSLATION

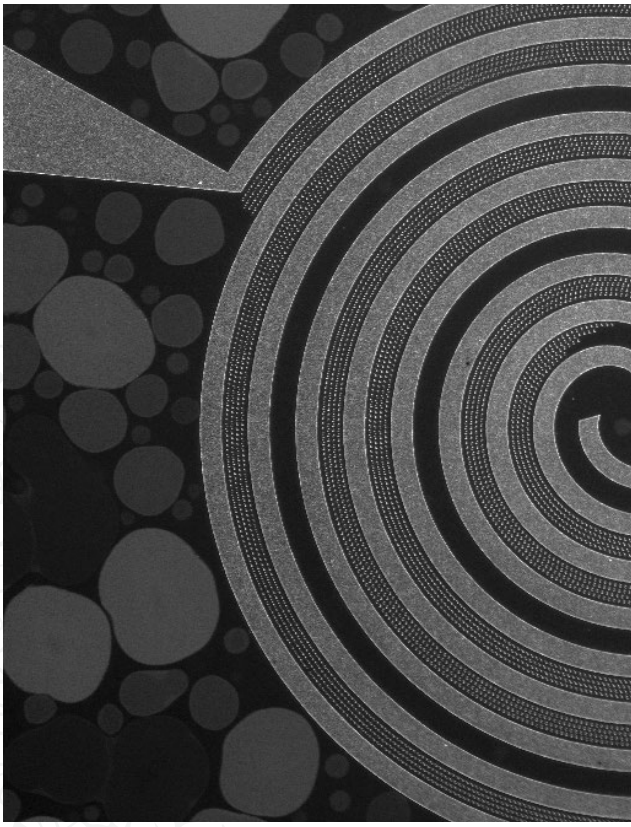
The Victorian Node of ANFF (ANFF-VIC), and in particular, the Melbourne Centre for Nanofabrication (MCN), has a strong track record of industry engagement with service agreements and partnerships extending from university spin-outs and SMEs to multinationals.

Victoria too boasts a vibrant local "ecosystem" comprising important activities such as the Melbourne North Advanced Manufacturing Group, and the Aikenhead Centre for Medical Discovery. As the name implies, this objective is specifically focused on extracting the full translational and collaborative potential of the MCN, the surrounding infrastructure contained within the South East Melbourne Innovation Precinct (SEMIP) and the broader Australian and international landscape. It will harness the ANFF-VIC hubs, the Australian Synchrotron and collective research output of the joint venture (JV) partners to attract and capture long-term partnerships with multinationals in the micro- and nanofabrication field and establish R&D centres with strong geographic and thematic links to the MCN and greater ANFF network.

This activity will help spawn high-tech incubator environments that encourage start-ups and spin-offs, particularly those in the medical technology, energy and defence sectors, to set up activities in the precinct. It will provide access to cutting edge open-access infrastructure and consultation resources across ANFF's national network and will produce a steady stream of skilled post-graduates that will put us in an ideal position to nurture and support these companies, accelerating their journey up the TRL ladder.

We will support this endeavour in several ways by: setting up opportunities for residencies in existing MCN spaces, exploring options for the expansion of the MCN's footprint and the renovation of existing facilities, providing support for collaborative voucher schemes in partnership with e.g. Victorian State Government and MTP Connect, organising high-value seminars and workshops and by ensuring that our partners and prospective users are well aware of the MCN's IP-unencumbered operational policy. ANFF will support these activities through their ANFF-C Director, Chief Strategic Partnerships Officer and Client Engagement Facilitators. We will also leverage our JV partners including CSIRO, the new Victorian Heart Hospital and local industry to collaborate on hybrid research tracks in which medical professionals learn fabrication skills as a mechanism for catalysing innovation and deepening engagement.

Achieving this objective will help secure MCN's position as the region's premier translational nanofabrication facility and it will allow the JV partners to draw benefit from these new partnerships through streamlined access to technological commercialisation routes, greater opportunities to participate in research collaborations and cooperative research investment schemes such as ARC Linkage, Industrial Transformation Research Hubs and Centres, Cooperative Research Centres (CRC), the Trailblazer scheme and the Modern Manufacturing Initiative (MMI). What is more, success here will contribute greatly to ANFF's strategic pillar of "Capturing the Benefits".



SO2

ENABLING AND HOSTING SOVEREIGN MANUFACTURING CAPABILITIES BY LEVERAGING OUR NETWORKS

The third strategic pillar of ANFF aims to bolster "National Resilience" by supporting the development of new sovereign manufacturing capability in Australia. ANFF-VIC will support this initiative by activating the unique open-access capabilities at the MCN and associated industrial transformation research hubs and centres.

A key opportunity in this regard is to support the medical device sector by filling the gap in the Australian medical device ecosystem related to the provision of open-access good-manufacturing practice (GMP) —or equivalent— infrastructure suitable for iterative device development, scalability demonstration and TGA-ready pilot production. Establishment of local ANFF-associated fabrication facilities with these specialised operational environments and quality management frameworks will reduce turnaround times in the product development lifecycle and boost the ability to rapidly produce and validate prototypes for testing in clinical trials by SMEs and start-ups.

FILLING THE GAP IN THE AUSTRALIAN MEDICAL DEVICE ECOSYSTEM RELATED TO THE PROVISION OF OPEN-ACCESS GMP (OR EQUIVALENT) INFRASTRUCTURE AND TGA-READY PILOT PRODUCTION.

The longer term benefits of this initiative are far reaching and include the potential for new research collaborations and high-tech job opportunities. Beyond medical devices, there are major opportunities to be leveraged via the node's expertise in fibre production and advanced textiles, renewable energy, quantum computing, space and defence, all of which are strategically aligned with the Victorian Science Agenda and the aims of many Commonwealth-funded research programs.

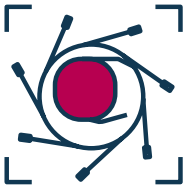
MCN cannot operate under a blanket GMP or ISO13485 certification, as these frameworks are incompatible with an open-access ethos. Therefore, in close collaboration with ANFF, we will work with our JV partners on using suitable space as a medtech GMP-operated incubator. Additional partnerships and associated infrastructure will span MedTechVic at Swinburne, NeoBionica's site at the University of Melbourne and the Aikenhead Centre for Medical Discovery.

Looking at best practice international examples, such as the facilities in Tsukuba, Japan, we will explore options for the expansion of the current MCN facility footprint to incorporate "super cleanroom" spaces catering to GMP production. To further support such activities, we will explore options for providing analytical and metrological testing services under ISO17025 to better align with the new precision measurement initiatives (see SO4) announced by the Commonwealth. These services will afford value-add opportunities to programs funded under Trailblazer, the Modern Manufacturing Initiative (MMI) and the Cooperative Research Centre (CRC) program (see SO5). Lastly, we will seek to engage with CSIRO's Linfield Collaboration Hub to learn from their well-established industry engagement model.

In terms of serving our translational focus, pursuing this objective will contribute to addressing the problems defined by the industry sector and fill an obvious gap in the Australian landscape which forces companies to seek suitable development and fabrication facilities/services abroad.

SO3

CREATING A STRONG ALLIANCE WITH THE AUSTRALIAN SYNCHROTRON



The unique adjacency of the MCN and the Australian Synchrotron (AS) has not yet been fully leveraged.

The location of the MCN was in fact strategically chosen in part because of its proximity to the AS and the potential for a future physical connection of the two facilities. Globally, there are only a few examples of such a colocation of capability e.g., Lawrence Berkeley National Lab in California, the Paul Scherrer Institute in Switzerland and the Singapore Synchrotron Light Source. In each instance, the facilities have been joined to leverage synchrotron radiation for both measurement and nanofabrication, giving rise to an abundance of unique research and development opportunities.

Learning from these examples, a logical way to fulfil this ambition is to work towards the establishment of an x-ray nanolithography beamline from the AS towards the MCN. Such a capability would allow nanopatterning at large scales and at high resolution, supporting research activities across a range of areas including space, defence, energy and medtech to name a few.

The metrology capability required to evaluate nanofabricated patterns and structures demands a precision measurement paradigm that is well aligned to the current National Research Infrastructure (NRI) roadmap. Such alignment ensures future NCRIS opportunities in the way of precision measurement (see SO4) and assists in seeding new collaborative opportunities. More broadly, the precision measurement activity allows ANFF-VIC hubs to engage with interest in materials informatics, artificial intelligence (AI), machine learning and digital manufacturing. There is strong support for this endeavour from a range of stakeholders including industry, the Victorian State Government, the AS and ANFF as well as clear acknowledgement of the impact that establishing such a flagship capability would bring. ANFF-VIC, has a strong research interest in x-ray nanolithography, as demonstrated by the successful ARC LIEF bid for the construction of a new end station on the AS's soft x-ray beamline led by La Trobe University in partnership with Monash University, Swinburne University of Technology, RMIT, University of Melbourne, Deakin University and CSIRO.

SUCH A CAPABILITY WOULD ALLOW NANOPATTERNING AT LARGE SCALES AND AT HIGH RESOLUTION SUPPORTING RESEARCH ACTIVITIES ACROSS A RANGE OF AREAS INCLUDING SPACE, DEFENCE, ENERGY AND MEDTECH.

We plan to achieve this objective using a staged approach. The first stage, which has already commenced, involves the modification of the existing soft x-ray beamline with a custom x-ray nanolithography end station. Following commissioning, we will develop initial processes for high throughput patterning at an expected resolution of 20nm and leverage this new capability to attract and build a foundational community of core users. We anticipate usage of this end station by the broad network of investigators involved in the LIEF proposal as well as from other Australian universities and industry. The second stage of this process will be to leverage the activity and output in the preparation of a business case for a new stand-alone beamline, garnering industry interest and investment (refer to SO1) with co-funding from the AS's BRIGHT program and NCRIS.

In parallel, we will pursue collaborative opportunities with the Medicines Manufacturing Innovation Centre (MMIC) and InFact and will engage the AS to establish an analysis pipeline for materials produced in the forthcoming Materials Discovery Platform Glovebox at the MCN. In this way, we will demonstrate the benefits of hosting a nexus of nanofabrication and precision measurement, including showing how such capabilities foster the creation of new research partnerships and a unique value proposition for industry.

The x-ray nanolithography beamline and the association with precision measurement capabilities will help cement the MCN as one of the world's premier nanofabrication facilities and an exemplar of collaboration, drawing in new research and industry partnerships in defence, renewable energy, and medtech sectors. Progress against this objective will also contribute to achieving ANFF's Strategic pillars of Infrastructure Excellence and National Resilience.

SO4

MAINTAINING AND ENHANCING OUR CUTTING-EDGE INFRASTRUCTURE

The forthcoming NCRIS Capital Upgrade Plan for the period FY23/24 to FY29/30 (CUP30) is the ANFF-VIC node's principal opportunity to ensure that collective capabilities are maintained, as near as possible, to state of the art.

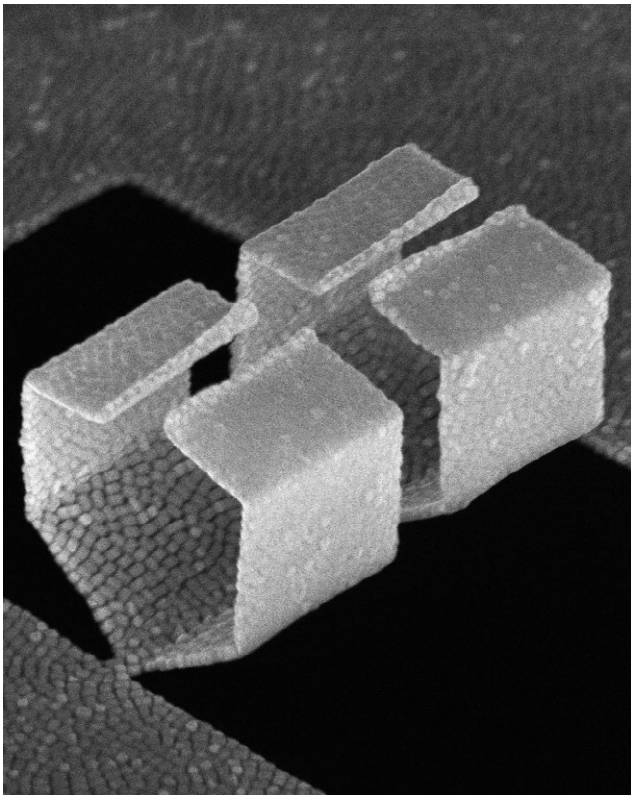
It is also one of the few opportunities available to NCRIS platforms for advancing capability enhancement and extension proposals. CUP30 is expected to be outward looking and capability focussed. It will be well-aligned with the collective needs of the JV, relevant partner networks and the ambitions outlined in the recent NRI Roadmap. Whilst the majority CUP30 investment will be directed toward updating capability within the shared MCN facility, it is also important that we use the opportunity to strengthen the node's satellite in-kind capabilities (hubs) with a focus on delivering high impact research outcomes and the development of new synergistic workflows and support structures. The curation of new investments at the hubs is consistent with the strategic vision for the node and meets critical partner needs.

ANFF-VIC will develop its CUP30 application in consultation with key academic users across the node. We will ensure transparency within the JV partner institutions including (and especially) at the level of their Deputy Vice Chancellors (Research) or equivalent and will make use of a fair, agile and utilisation-reflective co-investment model. At the same time, we will ensure visibility of planned investments and commitments within the Victorian State Government, providing a level of input, ownership and awareness well in advance of requests for co-investment.

CUP30 must contemplate the need for "big ticket" investments that will continue to set the VIC node apart as the leading provider of open-access micro- and nanofabrication infrastructure in Australia. This will include a new top of the range e-beam lithography tool and replacement of several ageing core capabilities. Consistent with SO1 and SO2, we will identify capabilities that facilitate research-industry collaboration, translation and/or scale-up such as roll-to-roll nanoimprint lithography. We will critically evaluate capabilities and determine which tools are essential and those that are no longer relevant. We will identify critical capability areas where strategic redundancy is beneficial for operational stability and will work with our partners and hubs to ensure that pathways for staff cross-training, job sharing and user access are clear and well maintained.

We will leverage the ARC LIEF scheme and bring the weight of the JV collaboration to bear in order to secure additional investments in emerging areas without the need for NCRIS investment. We will also work with ANFF to ensure that ANFF-VIC is well positioned to participate in new investment initiatives such as the NCRIS platform for Precision Measurement (see SO3).

We will have achieved our objective if we secure a CUP30 allocation to ANFF-VIC that is at least consistent with the size of the node (20-25% of the total ANFF investment) and which ensures the continuity of core capability with strategic enhancements that address clear trends in the direction of research. Success will also be measured by a cohesive investment approach across MCN and the research hubs that yields a collective outcome that is greater than the sum of its parts. Success here will also contribute greatly to ANFF's Strategic Pillar of Infrastructure Excellence.



SO5

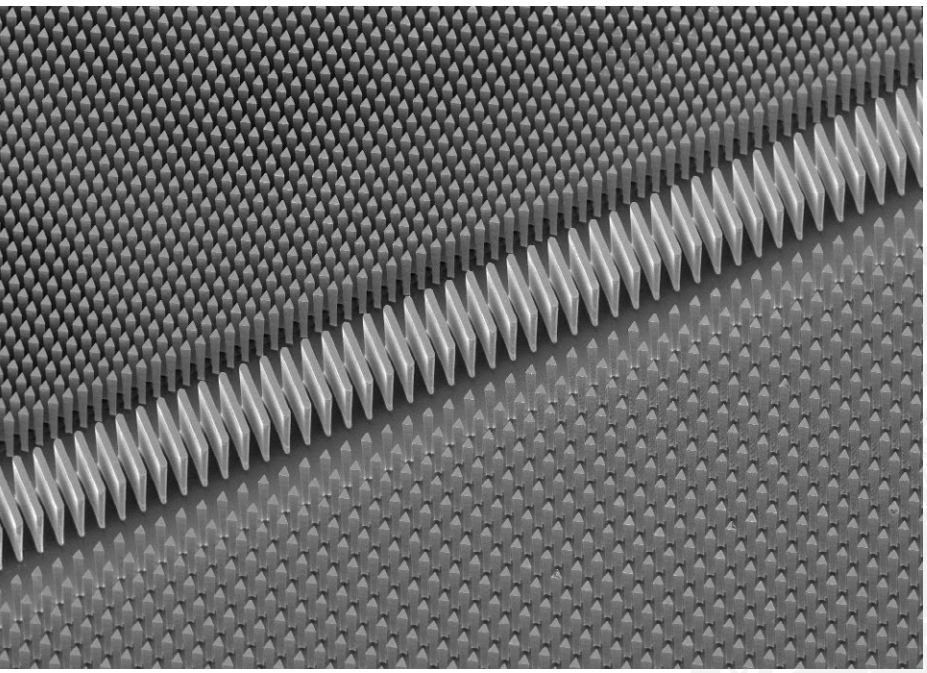
GROWING IMPACT IN CONCERT WITH FACILITY AND CAPABILITY UTILISATION

As an ANFF node, we understand maintaining and expanding capability are the primary drivers of growth and impact.

Other significant factors include a healthy Technology Ambassador (TA) Fellowship program, deep engagement with long-term research programs, expansion of the JV and retention of a skilled and motivated workforce.

We will nurture and develop the TA program to generate impact stories and foster engagement with research programs such as ARC Centres of Excellence (COEs). TA fellow selection will focus on early to mid-career researchers committed to developing new processes and engaging locally within their home organisations. Awards will be a mark of high distinction and will invigorate the user community through a revamped annual seminar series and research showcase. We will explore options for flexible TA appointments to maximise value to JV partners. In parallel, we will continue to use MCN's industry residency program to engage with start-ups and spin-offs.

ANFF-VIC has been successful in engaging large research programs because of a commonality of purpose and collaborative spirit. Going forward, we will utilise MCN's Grant Participation Policy to drive further involvement with COEs, Cooperate Research Centres (CRCs), the Medical Research Future Fund (MRFF), Frontier Health, Modern Manufacturing Initiative (MMI) and the Breakthrough Victoria Fund (BVF). A key ambition is to lead such a proposal with both JV and industry partner co-investment. New ANFF Client Engagement Facilitators, one of which is based at MCN, will engage local researchers and SMEs to help build new partnerships and commercial opportunities in the medtech, energy, space and defence arenas.



An expansion of the MCN, as described in SO2, will provide additional space and capabilities (including bolstering scale-up) to support new industry partnerships. MRFF and Frontier Health funding (implants, bionics, diagnostics, tissue engineering) will bring the different facets of expertise in the hubs together.

A key element of this objective will involve increasing the node's overall visibility within senior executive structures of member organisations. Council representatives will engage DVC-level personnel within home institutions, ensuring clear communication of the node's purpose and strategy as well as opportunities for future investment. We will workshop how the node's hub and spoke model might further develop over the next 10 years to enhance its translational medtech focus. Bringing in an additional JV partner such as DSTG would be an interesting avenue for growth that has Victorian State Government support and is in line with DST's Strategic Plan which seeks to establish new partnerships facilitating access to state of the art equipment.

We will create opportunities staff to be more directly involved in translational development such as with the forthcoming medtech scale-up facility at CSIRO (see SO2). In this GMP environment, staff will support our industry clients in scaling their production whilst developing valuable new skills in the process. Staff will also work more closely with TAs on projects that seek to establish new capabilities/processes for the user community.

An engaged and growing user base, an expanded JV and a prestigious TA fellowship program will secure a steady supply of highly trained users from the node which will attract new partnerships and investment. Upskilling of staff via increased exposure to scale-up manufacturing environments and participation in development projects will allow the node to better support its users and attract future partnerships and investment. Achieving this objective will contribute to all three of ANFF's Strategic Pillars: Infrastructure Excellence, Capturing the Benefits and National Resilience.

SO6

RAISING OUR PROFILE AND INCREASING ENGAGEMENT

Primarily through the collaborative MCN facility, ANFF-VIC is supporting a wide range of world leading academic and industrial research.

The node's unique JV framework is arguably the best example of university and government collaboration in Australia with respect to provision of research infrastructure. Still, it must be a collective aspiration to raise our profile and garner further national and international recognition. We will do this by: showing international leadership in the delivery and support of research infrastructure, demonstrating best practice in operations and governance of a complex JV collaboration and by clearly articulating our intent and evidence of impact.

In order demonstrate leadership in micro- and nanofabrication we will work closely with ANFF to represent the network at international summits, building upon existing relationships in Taiwan, Singapore and Japan. This will strengthen these partnerships, raise awareness of ANFF and provide critical exposure to international best practice. We will work to establish a community of practice locally and nationally via ANFF-themed conferences and workshops. We will spearhead a Designer In Residence appointment, based at the MCN, who will help create a "design uplift" approach to research and development which will yield more considered technologies that are fit for purpose and better suited to manufacture.

THE NODE'S UNIQUE JV FRAMEWORK IS ARGUABLY THE BEST EXAMPLE OF UNIVERSITY AND GOVERNMENT COLLABORATION IN AUSTRALIA

To demonstrate best practice in operational matters we will explore reducing overheads and enhance customer engagement. We will revisit node access & pricing models to ensure that services are priced appropriately and that a sufficient range of access options exists to meet the needs of our diverse user base. We will dedicate marketing and outreach resources to ensure all impact and outputs from the node are captured and presented to stakeholders. We will increase focus on local STEM outreach, providing students with critical exposure to state-of-the-art labs and professionals. We will continue to review and improve the professional development framework for our own staff with an emphasis on LEAN 5S, customer service and communications training. We will curate training workshops aimed at sharing lived experience, responding to social issues and improving workplace cohesion. Finally, we will improve our mechanisms for collection and dissemination of user feedback to better identify areas for improvement of service and capability.

To demonstrate best practice in governance and allow a 360˚ evaluation, we will establish an International Advisory Board for ANFF-VIC with a mix of academic and industry-based members. The Node Director and Council Chair will deepen engagement with the ANFF Board.

An area of improvement for our node is how we articulate our strategic direction and evidence of impact (internally and externally). This is difficult particularly for the MCN which is catering to the needs of the hubs as well as a diverse user community comprised of research academics and industry. To address this, we will direct additional resources to those activities that contribute directly to the long-term stability of the node. For example, in the medtech space, we will draw on linkages with the clinical community such as the new Victorian Heart Hospital. We will proactively adjust our engagement focus with respect to research centres and pursue verticals based on funding trends, research direction, collective partner interest and areas of competence.

A sustained focus on raising our profile is important for the health and longevity of the JV collaboration. Doing so will help ensure that the capability and output of ANFF-VIC and the MCN are visible and valued. Giving greater visibility to what is available within the node in terms of infrastructure and expertise and spreading awareness of the types of projects taking place is critically important to being seen as a leading light on a global stage. With support from the Designer In Residence, ANFF's Client Engagement Facilitators and the resources of ANFF-C, we will be well placed to help clients critically assess markets and help set them on a path to commercialisation.

Success in achieving this objective will also support ANFF's Strategic Pillar on Infrastructure Excellence and will contribute to ANFF HQ's focus on the area of international leadership over the years to come.

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