

NSW DEFENCE INNOVATION NETWORK

NSW DEFENCE INDUSTRY QUANTUM RESEARCH CONSORTIUM

GUIDELINES FOR APPLICANTS

1. Background and context

There is growing domestic and international interest in quantum technologies. NSW has distinct international leadership in the field of quantum science and technologies. Our objective with the NSW Defence Industry Quantum Research Consortium is to harness and deepen the leadership position in NSW through targeted investment in areas of overlap between our capabilities and defence interests. This activity is aligned with the quantum technologies focus area of the Next Generation Technologies Fund administered by DST Group, and with DST Group's STaR Shot Mission in Quantum Technologies, with its focus in Position, Navigation and Timing (PNT). This particular Mission, one of eight identified by Defence as key areas for future investment, has very strong sponsorship across the various domains of the Australian Defence Force.

The purpose of the NSW Defence Industry Quantum Research Consortium is to enable multidisciplinary teams to produce two demonstrator units (prototypes) with encapsulated quantum devices, to create lasting links to defence industry in the area of quantum technologies and to catalyse additional investment in R&D in NSW. A key objective is to build capability in the State by funding collaborative research that will enable a prototype to be built within a 12-24 month timeframe, suitable for a 'demonstration' of the new capability of the integrated system. The first tranche of engagement and projects will relate to quantum sensing, PNT and related technologies that fall outside of quantum computing. The Quantum Consortium will foster global leadership and grow capability in quantum technologies in New South Wales, and through domestic intellectual property will catalyse the commercialisation of quantum technologies in the State.

Demonstrator units will be fully functioning prototype devices that include quantum components, and which demonstrate the applicability of quantum components to specified applications in targeted areas. It is expected that this approach will require the collaborative efforts of multidisciplinary teams. By way of example, such a team might include practitioners in nitrogen vacancy diamond quantum components, artificial intelligence, data analytics, data/image processing, systems engineering, communications, and materials science, fusing classical sensor technologies with quantum sensing.

It is expected that the creation of such prototype demonstrator units will enable a clearer commercialisation pathway for quantum technologies, will draw attention and intent from defence and other companies for whom quantum technologies form an integral part of their product delivery pipeline and facilitate significant domestic investment through, for example, the Defence Innovation Hub.

2. About the Grant

- 2.1. The aim of the grant is to support multi-disciplinary collaborations between academic researchers (who should be the applicants) and industry to leverage the quantum innovation capability across DIN member universities and accelerate the translation of quantum technologies to Defence capability.
- 2.2. DIN seeks to fund projects with the highest potential to be incorporated into demonstration devices (TRL 4-5 prototypes) that have a clear commercial application.
- 2.3. Project Proposals should be scoped only within the following themes:
 - A. Bright source single photon emitters with applications in distributed quantum keys for secure communications.
 - B. Nitrogen vacancy diamonds for magnetometry with specific applications in
 - i) NavigationOR
 - ii) Detection of small aberrations in magnetic fields, potentially for maritime deployment (e.g. persistent static sensors)

Notes

- a) *For Project B)i (Navigation), an option exists to develop a sensor fusion product including cold atom gravimetry for navigation. We strongly encourage this approach.*
- b) *Applicants should consider fusing the prototype with classical systems to optimise the new capability.*

- 2.4. The funding scheme is administered by the NSW Defence Innovation Network and funded by the NSW Government and Defence Science and Technology Group.

3. Funding

- 3.1. There is \$1.5 M of funding available to support two R&D projects as described above. Funding will not necessarily be split evenly between the two projects and budgets will be assessed on merit. Defence Innovation Network reserves the right to amend budgets.
- 3.2. Scheme will support two projects with eligible costs to a maximum of \$800,000 scoped for duration of 12–24 months.

4. Eligibility

- 4.1. Project proposals must demonstrate multi-disciplinary and multi-institutional collaboration with a DIN Member University as the lead organisation. Proposals must include substantive inputs from at minimum two DIN member universities. However, the wider engagement across DIN member universities is strongly encouraged and such will be assessed more favourably.
- 4.2. DIN can assist teams to source relevant team members.
- 4.3. Teams may include industry or academics from other states or other research organisations. DIN funds may not be used to fund such collaborations. Where appropriate, DIN will work with successful teams to source funding for interstate collaborations but cannot guarantee success. Accordingly, projects involving non-member institutions or interstate collaborations should rely on key person contributions only in exceptional circumstances and where the capability is demonstrably absent from our member universities.
- 4.4. Industry involvement and co-funding is strongly encouraged but is not necessary for a successful proposal.
- 4.5. The lead organisation submits the application on behalf of project partners and is responsible for the project management on behalf of the Consortium.
- 4.6. Eligible Lead organisations

- Macquarie University
- University of New South Wales
- University of Newcastle
- University of Sydney
- University of Wollongong
- University of Technology Sydney
- Western Sydney University

4.7. Eligibility of individual researchers

- All project participants are restricted to citizens of the Five Eyes Alliance (Australia, Canada, New Zealand, the United Kingdom, the United States) and NATO member countries.
- Citizens of possibly allied countries not covered by the named treaties are subject to approval by the Defence Innovation Network.
- All project participant must prove their citizenship by providing a copy of their passport or other acceptable form of citizen identification.
- Individual researchers may participate in only one funded project.

4.8. Eligible Industry partners

Defence Innovation Network encourages industry participation in these university-led projects. Project funds may not be employed for industry partner expenses or participation.

- To be eligible industry partners must have an Australian Business Number and must be registered as a company (individuals, a partnerships and trusts are not eligible industry partners).
- Industry partners must have physical presence in Australia.
- Individual employees of the industry partner associated with this project will be subjected to the same restrictions as listed in 4.7 above and 5 below, and any other restrictions imposed by the Australian Defence Force or the Defence Innovation Network.
- IP arrangements with industry partners must be of such a nature that the IP and manufacturing of any manufactured good flowing from the project remain in Australia, more preferably in NSW.
- Allied defence organisations may be eligible to participate and will be considered on a case by case basis.

5. Obligations of project partners

- All project participants must sign a restricted circulation Non-disclosure Agreement that limits access to the R&D data and other Intellectual Property (IP) to the nominated team members.
- Any new team members must be approved by the Defence Innovation Network and must become signatories to the Non-disclosure Agreement.
- Intellectual Property (IP) and manufacturing must remain in Australia unless otherwise agreed.
- All participants must assign or have assigned IP to the institution either by virtue of employment contracts or by separate agreements.
- Participants must gain a minimum of Entry Level Membership through Defence Industry Security Program (DISP) within twelve months of commencement of the project.

6. Use of funds

- 6.1. Funding from the DIN will take the form of a cash contribution following the execution of a legally binding Agreement between applicants and Defence Innovation Network (Administered by the University of Technology Sydney).
- 6.2. DIN funding will be paid to the lead organisation in a single tranche. The leading organisation is responsible for distribution of the funds to Collaborating organisations.
- 6.3. Project funding can be spent towards expenses incurred at DIN member universities only. Industry cash contributions have to be transferred and spent at the universities.
- 6.4. Funds must be used to directly support the research project described in the application and can include following items:

- *Direct salary costs* for employees working on the project including chief investigators, early career researchers, research assistants etc. Where chief investigator salaries are claimed, this must be specifically justified and is subject to approval. Our preference is that the funds be used for research associates and –fellows working directly on the project rather than for CI salaries.
- *On-cost salary expenses* up to maximum of 30% of direct salary costs and consistent with the university policy. On-costs must be itemised in the application and can only include the following items: superannuation, payroll tax, payroll tax on superannuation, workers compensation, long service leave, and maternity leave. Universities must submit their on-cost salary expenses itemised by each category as the attachment of the application form, demonstrating compliance with this directive.
- *Computers* that are network and internet incapable or fully excluded from networks and the internet. Each participating team must make provision for a minimum of one secured computing item per team, more preferably one per participating university institution within a team.
- *Equipment, software, material and consumables* essential for the project. Funding will not be provided for equipment and consumables that are considered to be for broad general use or already held by the university.
- *Travel costs* essential to the project for the employees working on the project.
- *Stipends for HDR students* working on the project. However, given the term of the projects (12-24 months), budget line items for PhD stipends must be specifically justified and are subject to approval.

6.5. Budget items which are not supported by the Pilot Project funding and should NOT be requested in the budget include:

- *Infrastructure (overhead) costs* related to general operations of the university shared among projects and functions
- *Salaries of industry partners* working on the project, or any expenses of whatsoever nature incurred by industry partners.
- *Costs not directly related to the project* including but not limited to conference fees, workshop expenses, entertainment costs, professional membership fees, professional development courses, visas, relocation costs, insurance and other indirect costs

6.6. All expenses must be itemised in a budget section of the grant application. Grant funds must be spent in accordance with this budget and any requests for variations must be made to the Defence Innovation Network Manager and approved in advance.

6.7. While the budget must be justified, special attention should be paid to justifying items specifically mentioned for justification in 6.4 above.

6.8. DIN will have sufficient flexibility to tailor funding support according to what it believes is required to assist with the project delivery.

7. Assessment criteria

7.1. DIN will evaluate applications against information and evidence provided in relation to the following selection criteria. Applicants should also take note of the instructions and guidance to reviewers, below.

- **Vision, Ambition & Innovation-** the proposal must articulate how the project will address the significant step change in translating Quantum Science and Technology, and should be ambitious and transformative. Novelty and potential to become world leading will be demonstrated by Technical / Scientific Merits.
- **Leadership & Team Quality-** the proposal must bring together the best team available. It should present a strong, multidisciplinary partnership of researchers (and industry partners as relevant) with the necessary skills and established track record of relevant technology research. This is supported by an accurate, comprehensive and compelling analysis of requisite skills and capabilities.
- **National Importance-** the project must demonstrate how the research will contribute to addressing key challenges and needs of Defence.
- **Impact-** The proposal must demonstrate who will benefit from the research and how they will benefit. Plans should be described to disseminate results (subject to any security or IP restrictions), exchange knowledge, attract further investment and build collaborations.
- **Commitment of collaborators-** the proposal must demonstrate strong commitment from involved parties.

8. Application process

8.1. The application for the DIN Pilot Project Grants is a one stage process.

8.2. Applicants must submit their proposals in response to the topics published in the open call on the website www.defenceinnovationnetwork.com

8.3. Application forms are available on request at info@defenceinnovationnetwork.com. **Completed proposals must be submitted in electronic form by 5pm, 11 March 2020 to info@defenceinnovationnetwork.com.**

8.4. Defence Innovation Network will provide the names and contact details of intended participants, on request, to enable engineers and quantum scientists to link together.

9. Selection process

- 9.1. Applications that have conformed to the requirements of the application process and are deemed to be within the scope of the call will be subjected to a competitive review process. Peer reviewers, including DST Group experts, provide their recommendations to the DIN.
- 9.2. The DIN will constitute a Technical Review Panel comprised of selected DIN Steering Committee Members, DST Group experts, NSW Chief Scientist and Engineer, and any co-opted members as deemed fit by the DIN.
- 9.3. The DIN Steering Committee (or its delegated sub-committee) will make final decisions relating to the funding of projects, based on recommendations of the Technical Review Panel.
- 9.4. All applicants will be informed of the outcome of their applications, whether or not they are successful.
- 9.5. The indicative timeline of the selection process is as follows. Defence Innovation Network reserves the right the amend timelines as required.

30-Jan-20	Call for Proposals- Applications open
11-Mar-20	Applications close
03-Apr-20	Expert Panel Assessment
17-Apr-20	DIN Steering Committee Approval
22-Apr-20	Successful Applicants announced
May-Jul-20	Contracting & Start of projects

10. Funding Agreement, Reporting Requirements & Acknowledgement

- 10.1. Successful applicants, through the lead organisation, who accept the offer of a grant will be required to enter into a legally binding grant agreement. The Agreement will specify obligations and accountabilities of the recipients, and will include a stipulation that IP and manufacturing flowing from the project must remain in Australia. This will not preclude the exporting of products, subject to any export controls.
- 10.2. Payment cannot be made until the agreement is executed. Projects must not start until agreements are executed.
- 10.3. The lead organisation will be required to provide a final report to the DIN (Administered by the University of Technology Sydney) at info@defenceinnovationnetwork.com within 2 months of the end date of the project.
- 10.4. For projects with a duration of 12 months or less, only a comprehensive non-confidential final report is required. For projects longer than 12 months, a mid-term milestone report is required.
- 10.5. Final and mid-term reports consist of Technical report and Financial acquittal. The lead organisation submits the Financial acquittal for project as a whole including financial acquittal of Collaborating organisations.

- 10.6. All expenditure must be in accordance with the project description and broad structure of the proposed project cost detailed in the proposal. Lead organisation must retain the evidence of the expenditure.
- 10.7. All changes to project costs or roll-over of the funds must be justified and approved by the DIN (Administered by the University of Technology Sydney).
- 10.8. Any material or research findings published in respect of a DIN funded activity must include acknowledgement of DIN funding in a form: "We thank the NSW Defence Innovation Network, the NSW State Government and the Defence Science and Technology Group for financial support of this project through grant DINQC-1x-xx."

ANNEXURE A: GUIDELINES FOR EXPERT PANEL REVIEWERS

Reviewers will be asked to agree to confidentiality terms. Reviewers must not correspond with applicants or interested parties relating to the proposal during or after the review process.

DIN attempts to select reviewers with no conflict of interest. Where a reviewer believes he/she has a conflict of interest, no review is required but an explanation of the conflict of interest is requested. An alternate reviewer will be sourced by the DIN. Conflicts of interest may be:

- **Direct**; i.e. you are an interested party in a proposal;
- **Indirect**; i.e. you have an association with one or more of the institutions involved in the proposal;
- **Involvement in a competing proposal or business**; i.e. you have an involvement that is direct or indirect with a competing proposal or business activity.

Reviewers are asked to apply judgement when assessing science excellence and impact, relative to the stage of research and the area of impact. In principle, the DIN will co-fund research at any TRL, which can be thought of as generating new ideas, developing emerging ideas, and leveraging proven ideas.

Reviewers should assess the proposal against the supplied criteria, and are expected to provide an objective appraisal of the proposal against these criteria, i.e. undertake your assessments in accordance with the guidance in these guidelines. An assessment template is provided and reviewers are asked to assess only against the specific criteria identified for their institutional type (DIN, DST Group or University). Reviewers should use information contained in the application and the supplied supporting documentation, and may in addition employ any other information of relevance to make the assessment.

Reviewers should provide explanatory text to support your assessment, which can include reference to supporting key evidence, such as scientific publications, strategic guidance documentation, patent information, etc. It is important that your comments support your score and fairly reflects the assessment, and is accurate, professional, and honest.

ANNEXURE B: ASSESSMENT CRITERIA

For Pilot Projects, the following criteria will apply, falling into IMPACT and EXCELLENCE

- Novelty and potential to become world leading
- Technical / Scientific Merits, Scientific and Technical Risk, Best Collaborative Team
- Potential for impact and implementation pathway

NOVELTY AND POTENTIAL TO BECOME WORLD LEADING; TECHNICAL FEASIBILITY AND RISK; BEST COLLABORATIVE TEAM (EXPERT REVIEWERS)

What is the quality of the proposed research, science, or technology, or related activities?

You may wish to particularly consider:

- The novelty and originality of the proposal.** The idea itself does not have to be novel, but the sum of the idea and the application must be distinctive. We are looking for 'fresh thinking' rather than an obvious extension of existing research. If you are aware of similar work please provide a reference. Similar work will not necessarily disqualify a proposal. Please bear in mind that the proposals seek to produce a prototype, i.e. advancing the technology, not specifically the science.
- The scientific credibility of the idea and its logic.** Is the scientific basis for the idea established well in the proposal?
- The quality of the science, description of critical steps** (including go/no-go steps), and methodology. Is the proposed research fit for purpose for the proposed outcome and impact sought?
- The degree of scientific rigour**, e.g., the accuracy of the approach and hypothesis. Please provide advice on how either might be improved.
- The scientific risks and uncertainties identified in the proposal.** Any omissions and how they are managed. Are the timescales realistic? Is the size of risk, and plans to mitigate that risk, consistent with the stage of research?
- Team composition.** Is the analysis of necessary skills and competencies complete and satisfactory? Does the team represent a collaborative effort between DIN member universities? Do the team members possess the necessary expertise consistent with the needs of the project? Does the team have the necessary *level* of skills and track record to deal with the project? Is the analysis of the skills required and team composition compelling and complete?

When reading the proposal it would be valuable if you can consider the following questions in your scoring and commentary:

- Comment on the strengths and highlights of the proposed research.
- Highlight the deficiencies or weaknesses of the proposed research.
- Were there any concerns or issues around the proposed research, relating to technical, team, prior events, existing technologies, existing knowledge/ research?

POTENTIAL FOR IMPACT AND IMPLEMENTATION PATHWAY (STEERING COMMITTEE)

You may wish to consider:

- Has the applicant clearly articulated how this opportunity can be transformative for Defence or the defence industry / company in the future?
- Is the proposed implementation pathway credible relative to the proposed stage of research, bearing in mind the TRL or the research?
- Are the scale and breadth of proposed benefits credible given the area of impact and are these consistent with the outcomes of the proposal?

'Implementation pathways' are expected to demonstrate that the proposal has considered specifics or mechanisms by which outputs may eventually become implemented or commercialised.

The credibility of indicative implementation pathway(s) to deliver benefit to Australia will be assessed, and may not be limited to a single industry partner or end user, and may be uncertain in nature. A 'credible' implementation pathway analysis will consider the characteristics of the end use area and is not a generic description.

The information sought is indicative only but should nonetheless impart confidence that the research team has considered this aspect, even though the information may be tentative and uncertain. It is recognised that early stage investigations are likely to have less concrete implementation pathways with higher level information at the generic beneficiary and end-user level, while more advanced (i.e. higher TRL, near-to-market) studies will present a clearer view of a pathway to impact and implementation.

'Impact' will be measured by one or more of scale, extent, and urgency of Defence need or transformative nature of the outputs (i.e. creating altogether new technologies or solutions).

'Scale' means the size, or how much, the outcomes will benefit Australia and Defence.

'Extent' means how widely the outcomes will benefit Australia or Defence.

For example, a given technology may require only five specimens in any given Defence Force. This will have small size (unless it is of very high value). If the technology is of such a nature that it is likely to be taken up by every Defence Force in which it is able to be implemented, then it will have a wide extent of coverage.

'Urgency of Defence need' can be measured against expressed priority areas, such as in the Defence Innovation Hub or via other mechanisms.

A proposal that demonstrates high impact would receive the following type of comment:

The potential benefits are extremely large and with impacts that are nationally significant across the whole of a sector or several sectors. The estimates of benefits are credible and clearly described. The proposed implementation pathways are of an extremely high standard, completely credible and the supporting information is satisfactory in scope.

RANKING SYSTEM

IMPACT

1. Potential for impact and implementation pathway

- **[0] None:** The proposal demonstrates low impact and/or a poorly articulated implementation pathway.
- **[1] Low:** The proposal shows some impact and/or a reasonably well-developed implementation plan.
- **[2] Good:** The impact is likely to be significant and the implementation plan credible.
- **[3] Outstanding:** There is likely to be high impact if successful and the implementation plan is clear, credible and contains specific and detailed end use information.

EXCELLENCE

2. Novelty and potential to become world leading – bearing in mind the intentions to produce a prototype device

- **[0] None:** Is routine and presents little or no novelty.
- **[1] Low:** Displays some novelty but the outcomes are likely to be incremental.
- **[2] Medium:** Is differentiated, will lead to notably improved technology.
- **[3] High:** Distinctive approach that is highly likely to produce leading innovations or capability.

3. Technical/Scientific Merits; Scientific and technical risk (science component) – bearing in mind the intentions to produce a prototype device

- **[0] Low:** The Proposal is uncompetitive and has significant weaknesses or flaws, such as a poorly developed or costed plan, no demonstrated ability that the investigators can deliver on the proposed research, or a lack of novelty or value. Risks are poorly articulated or are unmitigated.

- **[1] Moderate:** An interesting proposal. Developing expertise amongst investigators. Some concerns about either the resource estimate or the ability of the researchers to deliver based on their understanding of the state of the art or their track record. The proposal may lack a compelling element. Risks are partly identified or inadequately mitigated. Risks outweigh benefits.
- **[2] Good:** High quality research and a strongly competitive proposal. Investigators have provided evidence of previous ability to deliver. Risks have been well articulated and mitigated although some residual risks might remain. The potential benefits outweigh potential risks.
- **[3] Outstanding:** Of the highest quality and at the forefront of research in the field. Well budgeted for the proposed statement of work. Sound track record of investigators. Risks have been adequately identified and mitigated.

4. Team Technical/Scientific Merits; Collaboration and Track Record – at minimum, the team must comprise of collaborators from four member universities.

- **[0] None:** The team does not meet the minimum eligibility requirement
- **[1] Low:** The team has inadequate expertise to lead to a successful outcome or is significantly flawed in its composition.
- **[2] Good:** The team consists of lead researchers from the different institutions (with or without students, research associates) with fit for purpose expertise.
- **[3] Excellent:** The team clearly has been assembled to encapsulate the best expertise from across the DIN.

PILOT PROJECT ASSESSMENT FORM

Application Number: DINQC-1x-xx

Title:

Reviewer Name: _____

Reviewer's Institution: _____

Criterion 1 – **Impact and implementation pathway**

Ranking (circle one): 0 1 2 3

Comments:

Criterion 2 – **Novelty and potential to become world leading**

Ranking (circle one): 0 1 2 3

Comments:

Criterion 3 – **Technical and Scientific Merit/ Scientific and Technical Risk**

Ranking (circle one): 0 1 2 3

Comments:

Criterion 4 – **Team Collaboration and Expertise, including analysis of requisite skills**

Ranking (circle one): 0 1 2 3

Comments: