FLEET

ARC CENTRE OF EXCELLENCE IN FUTURE LOW-ENERGY ELECTRONICS TECHNOLOGIES

STRATEGIC PLAN 2021 - 2023

OUR STRATEGIC PRIORITIES

1 — Enable discoveries at the scientific frontier

2 — Develop next generation of science leaders

3 — Establish synergistic partnerships with industry, academia & government

**4** — Foster equity & diversity in Science Technology Engineering & Mathematics (STEM)

5 — Promote public science literacy

6 — Facilitate internal and external communica-tion to support FLEET's strategic goals

MISSION VISION

FLEET will develop the scientific foundation and intellectual property for a fundamentally new electronics technology, which will super-cede silicon. The Centre will build capacity in Australia for advanced electronics research, and train the workforce for the electronics industry of the future. FLEET will place Australia at the forefront of the international electronics industry through the development of innovative electronics technologies.
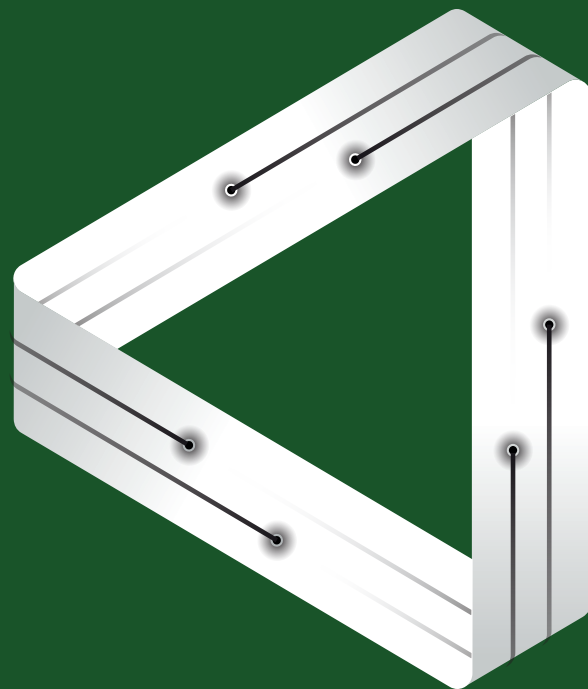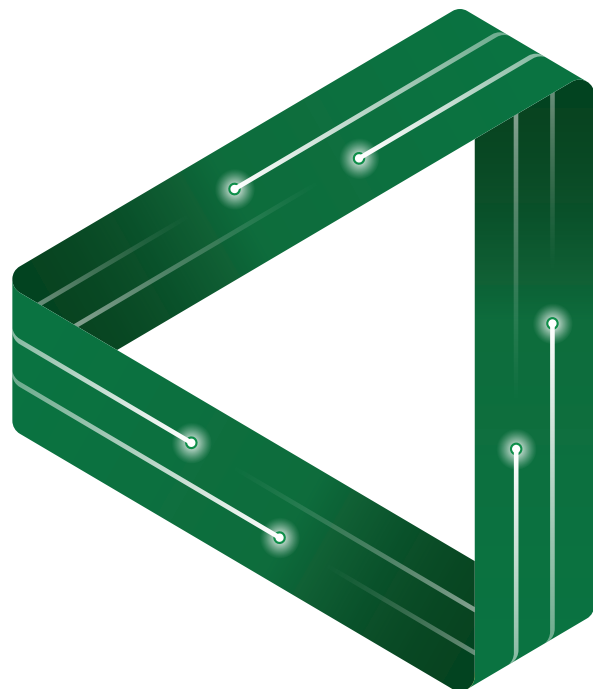
FLEET envisions extending the information technology revolution sustainably into the future through a new, more energy-efficient computing technology developed in Australia.

OUR VALUES

INNOVATE

FLEET nurtures a culture of scientific curiosity to advance knowledge

COLLABORATE

FLEET seeks to build synergistic partnerships across disciplines with international research, industry and educational networks

ENGAGE

FLEET encourages team cohesion and cultivates a growth mindset

STRATEGIC PRIORITY 1: ENABLE NEW DISCOVERIES AT THE SCIENTIFIC FRONTIER

KEY INITIATIVES	CENTRE PLANS	ACCOUNTABILITY	METRICS
1.1 Realise topologically-protected dissipationless transport of electrical current at room temperature, and novel devices based on the ability to switch on and off this dissipationless current	Research Plan Pages 12-14	Research theme 1 researchers Enabling technologies A and B researchers	Project milestones and research outputs
1.2 Demonstrate exciton superfluidity at elevated temperatures	Research Plan Pages 15-16	Research theme 2 researchers Enabling technology A researchers	Project milestones and research outputs
1.3 Investigate and realise systems that exhibit dissipationless transport by dynamically driving the systems out of equilibrium to explore new paradigms in electronics	Research Plan Pages 17-18	Research theme 3 researchers	Project milestones and research outputs

Research theme 1 - Topological dissipationless systems

Research theme 2 - Excitonic dissipationless systems

Research theme 3 - Dynamically-controlled dissipationless systems

Enabling technology theme A - Atomically-thin materials

Enabling technology theme B - Nano-device fabrication

STRATEGIC PRIORITY 2: DEVELOP NEXT GENERATION OF SCIENCE LEADERS

KEY INITIATIVES	CENTRE PLANS	ACCOUNTABILITY	METRICS
2.1 Develop world-class training & mentoring programs	Education & Training Plan Pages 24-25	Education & Training committee	Number of members participating in mentoring programs as mentors and mentees and number of external mentors Number of research and professional development courses Number of members and non-members participating in Centre training workshops Number of mentoring programs and number of organisational links in mentoring/training programs
2.2 Establish Centre succession planning	Succession Plan Page 19-20	Executive committee	A plan is in place
2.3 Facilitate opportunities for research collaboration 2.4 Establish a collaborative culture within the Centre	Education & Training Plan Pages 24-25	Research leaders	Number of travel grants to facilitate collaboration Number of FLEET-wide colloquia and research seminars and workshops held Number of collaborative visits between FLEET and partners and intra-Centre exchange of expertise Number of new organisations collaborating with FLEET
2.5 Identify opportunities for members to be recognised	Education & Training Plan Pages 24-25	Executive committee	Number of awards and grants received by members for their scientific and leadership achievements

STRATEGIC PRIORITY 3: ESTABLISH SYNERGISTIC PARTNERSHIPS

KEY INITIATIVES	CENTRE PLANS	ACCOUNTABILITY	METRICS
3.1 Facilitate partnership development for research collaboration, training and mentoring and outreach activities	Research Plan Pages 12-18 Industry Engagement Plan Page 23	Research leaders Education & Training and Outreach committees	Number of new research organisations collaborating with FLEET Number of organisational links in training & mentoring programs Number of organisational links in education & outreach programs
3.2 Establish links to industry and end users	Industry Engagement Plan Page 23	Industry relationships and Communications committees	Number of briefings to end-users and industry
3.3 Create a network to commercialise FLEET discoveries	Industry Engagement Plan Page 23	Industry relationships committee	Number of relationships with end-users established Number of industry engagement workshops held

STRATEGIC PRIORITY 4: FOSTER EQUITY AND DIVERSITY IN STEM

KEY INITIATIVES	CENTRE PLANS	ACCOUNTABILITY	METRICS
4.1 Foster a culture of equity and inclusiveness	Equity & Diversity Plan Pages 21-22	Equity & Diversity and Communications committees	Number of positive responses to annual surveys Level of compliance of all events organised or supported by FLEET with the Centre's Equity and Diversity guidelines Number of members completing required training on equity, diversity and inclusion topics Pathways established to report unacceptable behaviour
4.2 Increase diversity among all cohorts of researchers	Equity & Diversity Plan Pages 21-22	Equity & Diversity committee	Increased number of female researchers and HDR students across FLEET Level of compliance of FLEET HR policy in all Centre recruitments
4.3 Establish career support initiatives for women in FLEET	Equity & Diversity Plan Pages 21-22	Equity & Diversity committee	Ratio (M/F) of ECRs staying in FLEET and science careers beyond FLEET Increased participation of FLEET researchers with family / carer's responsibilities in FLEET and / or external events
4.4 Establish a women-specific mentoring network	Equity & Diversity Plan Pages 21-22 Education & Training Plan Pages 24-25	Equity & Diversity committee Education & Training committee	Increased uptake of mentoring opportunities by women in FLEET through individual mentoring arrangements and mentoring workshops

STRATEGIC PRIORITY 5: PROMOTE PUBLIC SCIENCE LITERACY

KEY INITIATIVES	CENTRE PLANS	ACCOUNTABILITY	METRICS
5.1 Promote a sustained understanding of FLEET's work	Outreach Plan Pages 26-27	Outreach and Communications committees	Number of FLEET education curriculum and scientific engagement events
5.2 Develop the scientific literacy of Australians through the use of teaching aids, classroom lessons and science demonstrations	Outreach Plan Pages 26-27	Outreach committee	Number of online and in person activities developed Number of FLEET members participating in STEM Professionals in Schools
5.3 Promote the uptake of STEM subjects in schools	Outreach Plan Pages 26-27	Outreach committee	Number of activities held in girls schools Number of students choosing STEM subjects in senior years at partner schools (John Monash Science School & future partner schools)

STRATEGIC PRIORITY 6: FACILITATE COMMUNICATION

KEY INITIATIVES	CENTRE PLANS	ACCOUNTABILITY	METRICS
6.1 Support Centre strategic goals through internal communication using tools such as monthly e-newsletters	Communications Plan Page 28-29	Communications committee	High member engagement in monthly e-newsletters - number of opens
6.2 Engage with scientific research community through research stories published on key online science platforms and stakeholders' newsletters	Communications Plan Page 28-29	Communications committee	Number of research stories Number of newsletter audience
6.3 Promote FLEET research and scientific literacy to public through web content and social media	Communications Plan Page 28-29	Communications and Outreach committees	Number of social media audience reached on priority channels Number of mentions of FLEET research in all media channels Number of mainstream media articles
6.4 Engage with key partners including the ARC, the government, participating nodes and collaborators through research stories, stakeholders' newsletters and social media	Communications Plan Page 28-29	Communications and Outreach committees	Number of briefings to government agencies and NGOs Number of public presentations annually

STRATEGIC PRIORITY 6: FACILITATE COMMUNICATION

KEY INITIATIVES	CENTRE PLANS	ACCOUNTABILITY	METRICS
6.5 Empower FLEET members to communicate their scientific work by providing communication skills training, resources and incentives	Communications, Outreach, Education & Training Plans Pages 24-29	Communications and Outreach committees	Number of non-peer reviewed articles Number of members sharing their science on social media Number of members presenting their research in a public forum Number of ECR and student members participating in Three-Minute Thesis, FameLab, Science in the Pub, and similar
6.6 Push the boundaries of what we're doing in communications, seeking and championing communications "best practice"	Communications Plan Page 28-29	Communications committee	Number of new initiatives each year

Strategic Statement: Research theme 1 aims to realise topologically-protected dissipationless transport of electrical current at room temperature, and to develop novel devices based on the ability to switch on and off this dissipationless current.

The key overall challenges are:
(i) to demonstrate external control of this topologically protected current, which would enable new forms of low power switches, and
(ii) to extend topological protection from low temperature demonstrations to high temperature operation.

Three approaches are being pursued to achieve these objectives:

Approach 1: Electric-field tuned quantum phase transition. The electric-field tuned quantum phase transition (QPT) from conventional to topological insulator provides the basis for a topological transistor in which the topological insulator represents the "on" state with conduction through dissipationless edge modes, and the conventional insulator represents the "off" state. The goal is to develop topological insulators with wide band gaps and robust dissipationless or extremely low energy surface states. The milestones associated with this approach are M1.1 - M1.5.

Approach 2: Topological Dirac Semimetals and other topological systems.
The aim is to engineer dissipationless or low energy states by combining different materials that can be used to store or process information. Several approaches have been identified, based on the following questions:

1. Is it possible to realise Quantum Anomalous Hall Effect (QAHE) in van-der Waals heterostructure systems that combine 2D topological insulators with ferromagnetic insulators? The challenge is that most magnetic systems are metallic, which is unsuitable for this application since it requires current to only flow in the topologically protected edge states.
2. Can the properties of ferro(ferri)magnetic oxide insulators be exploited and used as substrates to engineer topological states in atomically-thin 2D materials?
3. Can topological electronic or magnetic systems be engineered in oxide heterostructures?

The milestones associated with this approach are M1.6 - M1.8 and M1.17.

Approach 3: Engineering artificial topological systems

The aim of this approach is to use advanced nanopatterning techniques to create artificial graphene and artificial topological insulators from different heterostructure material systems.

The milestones associated with this approach are M1.9 - M1.12.

Approach 4: To develop novel wide-gap topological insulators with robust dissipationless surface state and 2D magnetic topological insulators for QAHE. Single crystal growth and thin film deposition will be used to synthesise high quality topological insulator materials.

The milestones associated with this approach are M1.3 - M1.16.

RESEARCH THEME 1: TOPOLOGICAL DISSIPATIONLESS SYSTEMS

	MILESTONES & DELIVERABLES	YEAR	RESEARCHERS RESPONSIBLE
M1.1	Develop techniques for electrical probing of ultra-high vacuum (UHV)-prepared topological materials (Fuhrer/Schiffrin labs), such as capping, mesoscopic electrode fabrication, gate structures	2017-2021	Fuhrer, Edmonds, Schiffrin
M1.2	Electric field tuning of bandgap in van der Waals topological materials (with Enabling technology themes A and B)	2017-2022	Fuhrer, Medhekar, Hamilton, L. Wang, Kalantar-zadeh
M1.3	Understand phase of 2D Bismuth on various substrates - a possible 2D quantum spin Hall system with large bandgap on oxide FM layers (with Enabling technology theme A)	2017-2021	Medhekar, Fuhrer, Edmonds
M1.4	Understand prospects of electric-field switching of QPT for low-voltage switching	2017-2022	Fuhrer, Culcer, Cole, Medhekar
M1.5	DFT-validated effective tight binding models, preliminary transport models for a prototype material (few layer polytypes of Bismuth)	2019-2021	Medhekar, Cole
M1.6	Understand magnetic proximity effects at the interfaces of vdW heterostructures	2020-2023	Medhekar, Cole, Edmonds, Fuhrer, L. Wang
M1.7	Investigate proximity effects for realising Quantum Anomalous Hall Effect and other topological devices (with Enabling technology theme B)	2017-2022	Fuhrer, L. Wang, X. Wang, Cortie , Edmonds, Karel
M1.8	Develop theoretical models that include effects of disorder (effective Hamiltonian, DFT, Density matrix)	2017-2022	Cole, Medhekar, Culcer
M1.9	Fabricate artificial lateral superlattices in heterostructure materials such as GaAs, BFO/LAO/STO (with Enabling technology theme B)	2017-2019 completed	Klochan, Valanoor, Seidel, Hamilton, Karel
M1.10	Demonstrate artificial bandstructure effects controlled by engineered lateral superlattices in conventional materials	2017-2022	Klochan, Valanoor, Seidel, Hamilton, Sushkov, Karel

RESEARCH THEME 1: TOPOLOGICAL DISSIPATIONLESS SYSTEMS

	MILESTONES & DELIVERABLES	YEAR	RESEARCHERS RESPONSIBLE
M1.11	Realise artificial topological systems by adding spin-orbit interactions to artificial graphene	2017-2022	Klochan, Valanoor, Seidel, Hamilton, Sushkov, Karel
M1.12	Investigate whether 2D metal-organic nanomaterials can exhibit nontrivial topological properties	2017-2022	Schiffrin, Medhekar, Fuhrer, Tadich, Edmonds
M1.13	Synthesise and optimise a wide-band gap topological insulator (with Enabling technology theme A)	2017-2019 Completed	X. Wang
M1.14	Synthesise and optimise a 2D Ferromagnetic Material with a high Curie temperature (with Enabling technology themes A and B)	2017-2021 Completed	L. Wang, Cortie
M1.15	Achieve Anomalous Hall Effect, ideally Quantum Anomalous Hall Effect in a new magnetic system (with Enabling technology themes A and B)	2017-2022	X. Wang, L. Wang, Z. Li, Xiang, Cortie, Karel
M1.16	Create materials for Research themes 1 -3	2017-2023	Z. Li, X. Wang, Kalantar-zadeh
M1.17	Understanding topological protection in interacting topological insulators	2017-2023	Fuhrer, Paglione, Eo, Sushkov

Strategic Statement: Research theme 2 aims to demonstrate dissipationless behaviour of excitons and exciton-polaritons at room temperature.

Approach 1: Indirect exciton condensates in atomically-thin bilayer semiconductor heterostructures. Atomically-thin semiconductor layers separated by atomically-thin dielectrics will be fabricated in order to realise spatially indirect excitons with large binding energy (much greater than room temperature). We will study optical and electrical injection of excitons in these structures. The ultimate goal is to demonstrate exciton superfluidity at elevated temperatures (up to room temperature) with electrical signatures in interlayer tunneling and electron hole counterflow.

The milestones associated with this approach are M2.1.1 - M2.1.4.

Approach 2: Exciton-polariton condensates and superfluidity in atomically-thin semiconductors at room temperature. Atomically-thin transition metal dichalcogenides (TMDs) will be integrated into high-Q microcavities enabling strong light-matter coupling and formation of polaritons. The ultimate goal is to demonstrate condensation and superfluidity of polaritons in the monolayers at room temperature, as well as a useful device (ultrafast switch).

The milestones associated with this approach are M2.2.1 - M2.2.8.

Approach 3: Topologically protected states of exciton-polaritons in atomically-thin monolayers. The spin-valley degree of freedom in TMDs holds hope for enabling topologically protected transport in microfabricated artificial lattice potentials (hexagonal, kagome, etc) for exciton-polaritons without the need for a magnetic field. Fabrication of microstructured samples for this research would rely on reliable production of high-Q microcavities with embedded large-area (several tens of micrometers) monolayers. The experimental possibilities have to be re-assessed at mid-term. The realistic mid-term milestone is to investigate this system theoretically.

The milestone associated with this approach is M2.3.1.

RESEARCH THEME 2: EXCITONIC DISSIPATIONLESS SYSTEMS

	MILESTONES & DELIVERABLES	YEAR	RESEARCHERS RESPONSIBLE
M2.1.1	Establish vdW fabrication facilities and produce bilayer structures	2017-2020 completed	Fuhrer
M2.1.2	Observe indirect excitons and tunnel-coupling in optical experiments	2017-2021	Fuhrer, J. Davis
M2.1.3	Fabricate samples and perform low-temperature measurements of interlayer tunnelling in 2D-2D structures	2017-2021	Fuhrer, Hamilton
M2.1.4	Fabricate samples and observe indirect/bilayer exciton transport at low/room temperature	2017-2023	Hamilton, Fuhrer
M2.2.1	Fabricate microcavities with TMDs, observe strong light-matter coupling	2017-2019 completed	Bao, Lu, Ostrovskaya
M2.2.2	Characterise carrier dynamics	2017-2021	J. Davis, Schiffrin
M2.2.3	Characterise low-energy interactions in exciton systems	2017-2019 completed	Parish, Levinsen, Ostrovskaya
M2.2.4	Observe condensation and superfluidity in a monolayer at cryogenic/room temperature	2017-2023	Ostrovskaya
M2.2.5	Investigate transition to Bardeen-Cooper-Schrieffer (BCS) regime, prospect for BCS superfluidity	2017-2021	Ostrovskaya, Parish, Levinsen
M2.2.6	Develop new theoretical formalisms for condensation in nonequilibrium superfluids	2017-2023	M. Davis
M2.2.7	Demonstrate (theoretically) emergent flow states of superfluids between reservoirs	2017-2021	M. Davis
M2.2.8	Develop strategies for design of channels and manipulation of vortices in 2D superflows to enhance critical currents	2021-2023	M. Davis
M2.3.1	Demonstrate, theoretically and experimentally, topologically protected states in an exciton-polariton system	2017-2021	Ostrovskaya

Strategic Statement: The goal of Research theme 3 is to investigate and realise systems that exhibit dissipationless transport when driven out of equilibrium, using periodic driving (Floquet) and/or single/few-cycle strong fields.

Approach 1: Dynamically engineered topological states. Utilising 2D semiconductors and cold atoms driven in different ways, complementary approaches are being pursued to realise, understand and control Floquet topological insulators.

The milestones associated with this approach are M3.1.1 - M3.1.8

Approach 2: Dynamically engineered dissipationless transport. Investigating strategies beyond the generation of Floquet states for dynamically engineering nonequilibrium conditions that lead to dissipationless transport. The strategies include nonequilibrium superfluidity through modification of quasiparticle spectra using time-dependent potentials, and topological superfluidity.

The milestones associated with this approach are M3.2.1 - M3.2.5

RESEARCH THEME 3: DYNAMICALLY CONTROLLED DISSIPATIONLESS SYSTEMS

	MILESTONES & DELIVERABLES	YEAR	RESEARCHERS RESPONSIBLE
M3.1.1	Demonstrate control of Floquet Bloch bands	2017-2021	J. Davis, Kalantar-zadeh, Fuhrer
M3.1.2	Develop approaches to identify topological state	2017-2021	J. Davis, Fuhrer, Schiffrin, Helmerson
M3.1.3	Identify dynamic topological phase transitions	2017-2023	J. Davis, Schiffrin, Helmerson, Fuhrer
M3.1.4	Image current distribution in Floquet 2D material	2017-2022	Helmerson, J. Davis
M3.1.5	Investigate topological states in the delta-kicked (Floquet) system with spin-orbit coupling	2017-2021	Helmerson, Parish, Levinsen, M. Davis
M3.1.6	Investigate topological states in multi-dimensional Floquet system	2017-2022	Helmerson, Parish, Levinsen, M. Davis
M3.1.7	Develop theory of driven (Floquet) dissipative superfluid to improve understanding of nonequilibrium transport	2017-2021	M. Davis, Parish, Levinsen
M3.1.8	Demonstrate field-enhancement for optical control of band structure	2021-2023	M. Davis, Parish, Levinsen
M3.2.1	Measure sound/transport in 2D Fermi gas	2017-2020 completed	Vale, Levinsen
M3.2.2	Investigate lifetimes, impurities physics, pairing in 2D Fermi gases near s-wave and p-wave Feshbach resonances	2017-2021	Vale, Levinsen
M3.2.3	Construct quantum gas microscope facility to study dipolar atoms in optical lattices	2017-2021	Vale, Helmerson, Parish, M. Davis
M3.2.4	Develop new theoretical approaches and numerical methods to treat dynamics of quantum impurities and quasiparticles	2017-2020 completed	M. Davis, Parish, Levinsen, Sushkov
M3.2.5	Control material's topology via single cycle electromagnetic waveforms	2017-2022	Schiffrin, J. Davis, Parish, Levinsen, Krawsz, Schultze, Karpowicz

SUCCESSION PLAN

Planning for continuity in leadership roles is an important element in ensuring success of FLEET's mission. FLEET's succession plan has the following goals:

• to ensure continuity of leadership: a plan is in place for Centre Director, Chief Operating Officer, Theme Leaders, Governance Committee Chairs, Communications Coordinator, and Education and Training Coordinator

• to mentor future leaders in FLEET through Centre facilitated programs and involvement in Centre leadership postions - Associate Investigators (AIs) and Chief Investigators (CIs) in governance Chair and Deputy Chair roles

• bring new talents into FLEET through the addition of new investigators, and

• promote equity in leadership roles: additional female investigators, consider diversity when FLEET leadership opportunities arise.

To accomplish the succession plan, FLEET has adopted the following strategies:

Milestone 2.2.1 Ensure continuity of leadership

A plan is in place for Centre Director, Chief Operating Officer, Theme Leaders, Governance Committee Chairs, Communications Coordinator, and Education and Training Coordinator.

Director. In the event that the Director resigns or leaves FLEET, the Deputy Director of FLEET will be appointed as interim Director. Monash University will undertake an international search for a new Director with appropriate research credentials and leadership ability.

Chief Operating Officer (COO). In the event that the COO resigns from FLEET, Monash University will search for a new COO. In the interim, the Centre Executive Officer, Communications Coordinator and Education & Training Coordinator will work together to carry out the COO's tasks.

Communications Coordinator and Education and Training Coordinator. In the event that a Coordinator resigns from FLEET, Monash University will search for a replacement. The business team will work with relevant Special Governance Committees to carry out the Coordinator's tasks in the interim.

Theme Leaders and Committee Chairs. To ensure a broad base of potential future leaders in FLEET, the Centre will provide leadership opportunities to its members, for example Deputy Theme Leader or Deputy Committee Chair roles. Additionally, FLEET will encourage members to engage in its career development program for mid-career researchers, as outlined below in milestone 2.2.2.

Milestone 2.2.2 Mentor future leaders in FLEET through Centre facilitated programs and involvement in Centre leadership positions

This includes Associate Investigators (AIs) and Chief Investigators (CIs) in governance Chair and Deputy Chair roles.

FLEET will offer multiple roles within the Centre which provide responsibility and an opportunity to build leadership skills. These include Chairs of the Special Governance Committees (Education & Training, Equity & Diversity, Outreach, Communications, and Industry Relations) and Node Coordinator positions where appropriate.

FLEET will facilitate four different mentoring programs for members at various stages of their careers:
• Academic mentoring program: for established researchers pursuing leadership positions in academia
• Early Career Researcher (ECR) mentoring program: for young researchers seeking mentorship from established researchers
• Women in FLEET mentoring program: for members seeking mentorship in overcoming challenges that are unique for women in the STEM sector
• Industry mentoring program: for members seeking insight from industry experts.

Milestone 2.2.3 Bring new talents into FLEET through the addition of new investigators

We anticipate that some CIs may depart FLEET or move to another eligible organisation within or outside of FLEET during the funding period of the Centre. The Executive committee will review the research program and evaluate a strategy. This can include one or more of the following:
• working with a node to recruit a new CI at the node;
• adding a new CI or CIs to FLEET;
• adding new nodes to FLEET;
• rebudgeting to accommodate change in CIs; and/or
• changing the strategic plan to remove or add research directions.

To ensure that there are potential future FLEET participants, FLEET should encourage those with synergistic activities to become Associate Investigators in FLEET and to participate in FLEET activities. FLEET will establish a competitive Seed Fund for Associate Investigators with the following goals:
• support emerging research ideas and new collaborations with the promise to advance FLEET's goals;
• support Associate Investigators and approaches that have promise for incorporation into FLEET or into a future Centre of Excellence funding bid; and
• increase diversity in FLEET.

Milestone 2.2.4 Promote equity in leadership roles in FLEET: additional female investigators, consider diversity when FLEET leadership opportunities arise

The FLEET equity and diversity policy should be considered when carrying out the above strategies. In particular, the current FLEET makeup falls short of the goals for gender equity, i.e. 3 of 20 CIs are female, 1 of 5 Theme Leaders is female, and 1 of 5 Special Governance Committee Chairs is female.
In particular, FLEET will:
• seek female Partner and Associate Investigators as a way to bring more women into the FLEET research environment;
• encourage Associate Investigators to apply to the Seed Fund when available;
• consider diversity when leadership opportunities arise within FLEET; and
• identify and recruit new female CIs to FLEET.

EQUITY AND DIVERSITY PLAN

FLEET aims to ensure fair policies and workplace practices that comply with the equal opportunities policies at all participating organisations, eliminate all forms of discrimination, and increase diversity among all cohorts of FLEET researchers. The FLEET Equity and Diversity committee, which has representatives at each node, oversees the implementation of this plan.

Strategic goals:

4.1 Foster a culture of equity and inclusiveness

The FLEET Equity and Diversity (E&D) committee will monitor and implement the best practices in equity and diversity across the STEM sector, and will actively work to increase awareness of the gender equity issues (e.g., through encouraging the uptake of the implicit bias test), as well as of broader access and inclusion issues (e.g., promoting and encouraging uptake of the LGBTIQA Allyship training). All new personnel are referred to an online induction package that includes information on FLEET E&D policy and practices. The FLEET website should show a broad range of diversity that closely matches that of its members but all seeks to include representation of minority groups. These include E&D guidelines for all events organised or supported by FLEET.

The Equity and Diversity committee will monitor levels of satisfaction with equity and diversity culture in FLEET through annual surveys.

Targets:
• more than 30% response rate to annual surveys
• high levels of satisfaction with FLEET workplace culture: >90% agree or strongly agree in annual survey
• 100% compliance of all events organised or supported by FLEET within the E&D guidelines
• all members to complete one hour of education/training in equity and diversity annually
• establish pathways to report unacceptable behaviour, with members of the committee receiving appropriate training in 2021.

4.2 Increase diversity among all cohorts of researchers

In particular, FLEET will focus on gender diversity by:
• encourage participation of young women in STEM subjects through outreach activities overseen by the FLEET Outreach committee (see Outreach Plan)
• implement recruitment strategies to attract women scientists at all career stages to FLEET (see Recruitment Policy, Appendix A)

• offer "Women in FLEET" scholarships and fellowships for outstanding higher-degree research (HDR) students and early-career researchers (ECRs), strategic grants (new AIs)
• have 50/50 gender balanced representation on selection panels, where practical, ensure presence of FLEET E&D committee member on each selection panel; ensure that all members of the selection panel are aware of the implicit bias issues and gender-coded language
• implement the "50/50 if not then why not" policy for shortlisting (see Recruitment Policy)
• actively encourage family-friendly work arrangements across FLEET, such as part-time appointments, flexible hours and project sharing.
• direct appointments and contract extensions need to be approved by the FLEET Executive committee.

The above recruitment strategy is reflected in the FLEET HR Recruitment Policy within the Centre Multi-Institutional Agreement.

Target:
• 30% women researchers and HDR students across FLEET
• 100% compliance of FLEET HR Recruitment Policy (Appendix A) in all Centre recruitments.

4.3 Establish career support initiatives for women in FLEET

FLEET aims to create and maintain a working environment that eliminate the conflict between research and family commitments. Career support initiatives for women scientists within FLEET aim to create gender equity in the workplace and retain female scientists. While addressing the gender equity problem, these measures are designed to improve the working environment for researchers of all genders:

• aim to retain women after the first postdoc, e.g., through the Women in FLEET Fellowship

• offer strategic support to a project if a leader is on maternity or paternity leave

• assist with family travel and childcare expenses associated with a FLEET member attending a conference

• promote and encourage positive family-friendly working practices across FLEET, such as:

- flexible working hours

- focus on the outcomes rather than physical attendance.

Targets:

- Increased retention rates of ECR women in FLEET and science careers beyond FLEET, with retention rates for women to be at least equal to retention rates for men

- Increased participation of FLEET researchers with family/carer's responsibilities in FLEET and/or external events as monitored by attendance and the workshop survey.

4.4 Establish a women-specific mentoring network

FLEET offers individual mentoring opportunities for women through matching of mentors and mentees within the mentoring program run by the Education & Training committee (see Education & Training Plan).

To ensure inclusion of women researchers in broader professional networks, FLEET will seek and involve external mentors. In particular, the continued involvement of FLEET researchers in the national Mentoring and Guidance in Careers Workshop (MAGIC) for women ECRs.

Targets:

- More than 80% uptake of mentoring opportunities by women in FLEET through individual mentoring arrangements and mentoring workshops.

FLEET aims to deliver tangible outcomes in the development of low energy electronic components, for commercial applications. As such, engagement with industry partners, end-users and entrepreneurs are essential for FLEET members to achieve research translation outcomes.

FLEET's ambitions in industry engagement and achieving IP/commercial outcomes are expressed in the following strategic statements:
• help FLEET members understand the commercial value of their products and identify the commercial opportunities of their developments
• work with the Education & Training committee to offer industry-focused training to FLEET members such as workshops on research impact, entrepreneurship, commercialisation, business acumen, intellectual property (IP) management etc...
• train and nurture PhD students and early career researchers so that they are industry-ready by:
- building ECR's network to help them engage with end-users, offering opportunities for them to attend related industry workshops and meetings
- promoting entrepreneurship: encouraging participation in business plan workshops and competitions, working with ECRs through IP commercialisation process.

• promote engagement with end-users and commercial entities
• develop strategic industry relationships with a focus on commercial outcomes
• promote patent publications and close engagement with research and industry divisions at node universities and follow a pro-active approach
• on an annual basis, survey FLEET members' current engagement with industry and their input to who else FLEET should engage with
• align some specific development activities across FLEET with industrial partners
• facilitate engagement with industry for supporting future ARC Linkage, NHMRC development, Acceleration commercialisation type grants - for many of such grants, universities have to include 25 - 50% of the money and this should be lobbied for. FLEET will also strategically fund seed activities when needed
• maintain and expand relationships with current industry liaisons
• access industry liaisons' expertise through FLEET organised workshops, mentoring program and governance committee meetings.

Performance Target	2021-2023
Patents applied	2
Technical briefings presented to targeted industry groups	2
Number of industry engagement workshops held	1
Number of presentations / briefings to industry / business / end-users	4
Total number of end-user relationships established	10

FLEET members will be provided with high quality training opportunities so that they become well-rounded researchers and be successful in whichever field they choose. These training opportunities are targeted at Early Career Researchers (ECRs), including Higher Degree Research (HDR) students and postdoctorate fellows, but may also be offered to senior members if required.

Strategic goals:

2.1 Develop world-class training & mentoring programs

FLEET will provide training above and beyond what is offered at individual universities, by identifying different types of training available or needed, and circulating these around the nodes. Where possible, these training sessions will be aligned with university requirements and counted as professional development hours. In addition to training at individual nodes, high quality training prior to the Annual Workshop will be provided, taking advantage of all ECRs and students being together in the same place at the same time. Courses offered will include research development (such as grant writing skills), and professional development (such as media training). Training in equity and diversity will also be provided. Training that provides skills for members that will increase their employability

will be provided, targeting skills desirable within industry. **Target:** FLEET will offer a minimum of eight development courses in research or professional development, and one workshop in equity and diversity per year.

FLEET will partner with EQUS to offer the Idea Factory, a yearly event bringing ECRs together to learn communication skills in pitching and presenting work, working collaboratively with other ECRs, culminating in a presentation designed to obtain a grant. **Target:** Yearly

FLEET will leverage the established Summer School program at ANU, aligning the topic to FLEET research approximately every two years. This will introduce a wider community to FLEET topics, and give ECRs an opportunity to build their knowledge base. **Target:** Every two years

FLEET will provide mentoring programs, matching Centre mentees with mentors within and external to FLEET. Guidelines and expectations for mentoring relationships will be communicated to participants and the Education & Training committee will monitor these relationships

over a period of time. Mentoring relationships will be organised based on the mentees' desire to obtain new skills and have someone in a particular area to talk to. **Target:** All ECRs and HDRs participate in at least one mentoring program by 2023, with all new members assigned a mentor as they become part of FLEET.

2.3 Facilitate opportunities for research collaboration

Internships of 1-6 months will be offered to PhD students to complete at partner organisations. The Education & Training committee, together with CIs, will identify potential projects from partners, and determine appropriate HDR students to complete these projects. These can be completed at different stages of the students' candidature, based on university requirements.

Target: PhD students should have the opportunity to complete a 1-6 month internship at partner organisations, either nationally or internationally, prior to the completion of their candidature.

The FLEET Education & Training committee will offer a grant scheme whereby members, particularly ECRs, will apply for funding to complete training at other institutions. For example, a researcher desiring training on a specific piece of equipment could identify another group working with that equipment. This will be a competitive process that would also provide the ECR an opportunity to practice their grant writing skills and receive feedback.

Target: Two grant rounds per year, offering up to a total of $20,000 in total, up to $5,000 per person; whereby members, particularly ECRs, will apply for funding to complete training at other institutions).

2.4 Establish a collaborative culture within the Centre

A regular series of colloquia will be established where ECRs present their research, which will be live-streamed to all nodes. This FLEET-wide colloquia series will give all members an opportunity to interact with FLEET members from other nodes while learning more about the work going on in other laboratories.

Target: Up to 10 seminars per year.

The Education & Training committee will offer the opportunity for researchers, particularly HDR students, to visit labs at other nodes for 2 - 5 days for the purpose of determining how these labs run and the work being completed. They will participate in the day to day activities in these labs for this purpose.

Target: All completing PhD students should have completed a 2 - 5 day visit to another lab before their thesis submission.

OUTREACH PLAN

FLEET is committed to science outreach to further public awareness of science and its growing role in society, and to contribute to building a STEM-proficient workforce, achieved by increasing the number of students (particularly female) undertaking STEM at senior secondary and tertiary levels. FLEET will connect with school students, teachers and the public, seeking out opportunities to inspire a passion for science and awareness of FLEET research to students and the wider community.

Audience: FLEET outreach is aimed at school students, teachers and the broader public. This may also include more specialised groups such as industry, government, NGOs, etc.

FLEET Members: FLEET members are required to complete a minimum of 20 hours per year. This will take a number of forms, including presenting to the public, organising events, designing and developing educational resources, etc. FLEET members will be supported in this, and will be provided with training in ways to deliver outreach. FLEET prizes for outstanding efforts in outreach will be awarded as an incentive to members.

Strategic goals:

5.1 Promote a sustained understanding of FLEET's work
FLEET will be involved in public events as a way of bringing FLEET research to the public. These can include Melbourne Knowledge Week, Sydney Science Fest, Scienceworks Astrolights and regular public lectures.
Target: Increased involvement in public events, FLEET aims to have a National Science Week event in all node states by 2023:
• participate in at least one National Science Week activity in one state each year, with an increase in the number of states/territories we participate in by 2023.
• hold a minimum of two public outreach events per year.
Target: Increased awareness of FLEET's work in the school curriculum. FLEET will further develop the pilot Year 10 science elective unit at John Monash Science School and implement it at minimum one other school by 2023.

5.2 Develop the scientific literacy of Australians
FLEET will develop resources such as animations, demonstrations, teaching aids and classroom lessons for Australian schools.

Target: Ongoing development of activities, demonstrations and animations, linked to scientific concepts and FLEET research. These can be hands-on activities and/or online resources that can be used in classrooms and demonstrations for use at events, such as university Open Days and National Science Week.

FLEET will develop relationships with Australian schools through STEM Professionals in Schools. FLEET members can participate as a "scientist in residence" at the school, present their own work or run activities for students based on the curriculum.
Target: minimum of 10 FLEET members signed up with STEM Professionals in Schools each year.

FLEET will develop ways to increase public awareness of scientific concepts
Target: ongoing development of home-science activities and other demonstrations. At least 5 new activities per year and an increase in the number of people accessing FLEET resources.

5.3 Promote the uptake of STEM subjects in schools

FLEET will connect with partner schools to offer outreach programs. For example, a 3-day, lab-based program for students to complete in school holidays, based on the Growing Tall Poppies campaign. This will be facilitated in FLEET labs in Term 3 holidays for Year 9 and 10.

To increase the number of female students doing STEM subjects, with a focus on physics. FLEET will develop methods to track the number of female students choosing physics in senior years at partner schools. This can be based on questionnaires given to the students before/after engaging with FLEET facilitated activities in our partner schools.

Target: Expand the FLEET science unit trialled at John Monash Science School to at least one girls school by 2022.

COMMUNICATIONS PLAN

FLEET's communications plan aims to facilitate internal and external communication to support the Centre's strategic priorities.

Strategic goals:

6.1 Support Centre strategic priorities through internal communication - using internal communication tools to support the following priorities:
2.1 Develop world-class training & mentoring programs
2.4 Establish a collaborative culture within the Centre
4.1 Foster a culture of equity and inclusiveness.

Using tools such as internal monthly e-newsletter to reinforce Centre cohesiveness and collaborations between nodes and disciplines.
Target: Maintain high member engagement in monthly e-newsletters - measured by number of opens at minimum 50%.

6.2 Communication to science/research community - supporting the following goals:
3.1 Establish international partnerships
3.2 Establish links to industry and end users
Using stakeholders' newsletter, social media, briefings, research articles on key online science platforms and science media to raise awareness of FLEET research and

discoveries, increasing opportunities for collaboration and raising profile of FLEET researchers. Engage with thought leaders in semiconductors, "beyond CMOS", ICT energy technologies.
Tools: supported by dual-purpose accessible/detailed content on website, research and other news stories
Target: Number of research stories, to be maintained at 15 for future years - grow total newsletter audience to 390 by the end of 2021 and increasing 5% annually.

6.3 Promote FLEET research and scientific literacy to public
- through web content and social media that supports the following goals:
5.1 Promote a sustained understanding of FLEET's work
5.2 Develop the scientific literacy of Australia
5.3 Promote the uptake of STEM subjects in schools
Using social media and mainstream media to raise awareness of the background to FLEET research (namely, ICT energy use), societal value, and the research undertaken at FLEET. More widely, reinforcing the value of fundamental and applied science, and increasing science literacy (supporting goal 5.2). Supported by accessible content on website, research and other news stories.
Target: Increase social media audience on each priority channel: 1250 on Twitter by end of 2021 and increasing 15% annually. 700 on Facebook by end of 2021 and increasing

10% annually.
Increase vision of FLEET research in all media channels: at least 300 mentions per year
Feature FLEET work in mainstream ("old media") channels: at least 10 opportunities per year.

6.4 Engage with key partners
- including the ARC, the government, participating nodes and collaborators through research stories, stakeholders' newsletters and social media supporting the following goal:
5.4 Communicate background and results to partners and wider society.
Communicate cutting-edge nature of research, and scientific/societal value of discoveries. Demonstrate FLEET's collaborative way of working, and Centre's commitment to science leadership, including development, equity, STEM literacy.
Tools: stakeholders' newsletter, social media, research articles.
Target: Opportunities for members to give NGO and government briefings: at least 4 annually.
Opportunities for members to present their work at public forums: at least 30 public presentations annually.

6.5 Empower FLEET members to communicate their scientific work

- by providing communication skills training, resources and incentives, supporting the goal:

2. Developing next generation of scientific leaders

Provide skills training, incentives, resources in order for FLEET members to communicate their own research, developing future science leaders and improving authenticity of communications.

Target: Publish at least 12 non-peer reviewed articles annually.

• encourage members and affiliates to engage on social media platforms: at least 50 members sharing their science on social media by end of 2021 and increasing by 5% per year

• encourage participation of ECR and student members in Three-minute thesis, FameLab, Science in the Pub and similar: at least 2 annually.

6.6 Push the boundaries of what we're doing in communications, seeking and championing communications "best practice"

Target: at least 2 new initiatives each year.

All recruitments must follow FLEET's Equity and Diversity Guidelines. If chief investigators intend to recruit or appoint a FLEET postdoctoral fellow, they must first notify FLEET Chief Operating Officer with the following information: Supervisor(s) of postdoctoral fellow, node where fellow will be appointed, FLEET project the fellow will be responsible for, and FLEET fund supporting the fellow.

When recruiting and employing personnel, the recruiting organisation will ensure the following conditions are met:

a. Selection panels will include representation from the FLEET Equity committee.
b. All members of the selection panel should be aware of implicit bias issues. The FLEET Equity committee will develop an appropriate training module on implicit bias suitable for selection panel members in cases where such training is not already available through the participating organisation.
c. Selection panels should endeavour to produce shortlists with equal representation of women and men. In cases where this is not possible, a justification must be provided to the Equity committee.
d. Induction for new personnel will include online induction

modules that will promote awareness of gender equity issues (e.g., the Implicit Bias test), as well as broader access and inclusion issues (e.g., LGBTIQA allyship training).
e. FLEET actively encourages the family-friendly work arrangements such as part-time appointments or project sharing

Direct And Partial Appointments

• Direct appointment of FLEET postdoctoral fellows without a competitive search is strongly discouraged. If CIs wish to appoint a postdoctoral fellow by direct appointment, they must first seek approval of the FLEET Executive Committee.

• Partial appointment of postdoctoral fellows (to work part-time for FLEET and part-time for another project) is discouraged. If CIs wish to appoint a postdoctoral fellow to partially to FLEET, they must seek approval of the FLEET Executive Committee.

Failure to comply with FLEET's rules for recruitment as established by the Executive Committee is a breach of FLEET's multi-institutional agreement, and FLEET will

take appropriate action up to and including withholding of funding.

APPENDIX A: FLEET HR RECRUITMENT POLICY

Centre Acknowledgement in Position Descriptions

When recruiting personnel funded by the Centre including, but not limited to, administrative staff, research staff and students, the recruiting organisation must ensure that the following acknowledgement is included in the Position Description.

"The ARC CoE in Future Low-Energy Electronics Technologies (FLEET) is an international innovator in novel electronics technologies. Enabled by the new science of atomically thin materials, FLEET brings together over 40 world-leading experts to develop a new generation of ultra-low power devices. Headquartered at Monash University, the FLEET network comprises of 20 chief investigators at seven Australian institutions, >20 partner investigators at 18 institutions worldwide, and over 120 HDR students and postdoctoral fellows. The team is highly interdisci-plinary with high-profile researchers from atomic physics, condensed matter physics, materials science, electronics, nanofabrication and atomically thin materials.

With over $40M investment from the ARC and contrib-uting organisations, FLEET is poised to make significant global impact in the electronics and energy sectors. By building strategic and strong partnerships with Australian and international industry, research institutions and government, FLEET aims to build capacity for advanced electronics research in Australia and train the workforce for the next generation of electronic materials researchers and future semiconductor industry. To learn more about FLEET, please visit our website: fleet.org.au.

At FLEET, we are committed to gender equity. Our goal is to achieve at least 30% women researchers and higher degree by research (HDR) students across FLEET. Please visit fleet.org.au/equity to learn more.

We are also passionate about building future leaders in the field. All of our early career researchers and HDR students will take part in a comprehensive training program incorporating excellent supervision and professional development. To learn more about benefits of working with us, please visit fleet.org.au/collaborate."

An event supported and/or organised by FLEET has to ensure that it is sufficiently diverse, inclusive, and complies with the FLEET gender equity policy and targets. These guidelines aim to assist the organising committees for such events in designing their event's Equity and Diversity policy.

The guidelines are non-rigid: a committee does not have to do 100% but has to demonstrate a genuine effort in order to obtain FLEET support and/or funding. In the event that the guidelines are not taken into consideration, the FLEET support and/or funding will not be provided.

Members of FLEET invited to speak at or serve on committees for externally organised events are strongly encouraged to promote the use of these guidelines.

The following resources (and references therein) were used in preparing these guidelines:
ncbi.nlm.nih.gov/pmc/articles/PMC4238945
cubistcrystal.wordpress.com/2016/12/09/show-me-the-policy-part-2

EQUITY AND DIVERSITY (E & D) GUIDELINES FOR FLEET-SUPPORTED* EVENTS

1. The composition of the organising committee should comply with the "50/50 and if not then why not" rule.
2. The organising committee should have at least one member of FLEET E&D committee in the "E&D Champion" role.
3. As part of application for FLEET support/funding, the organising committee should formulate an E&D strategy and policy for the event and submit it to the FLEET E&D committee. The policy should be made public on the event's website.
4. The organising committee should identify the baseline representation of female researchers in the particular field of research and aim to have at least the base rate representation on the list of invited speakers.
5. The committee should consider 50/50 gender balanced list of plenary speakers (as opposed to invited speakers), which is more easily achieved.
6. The committee should compose a list of invited female speakers well in advance, allow for significant redundancy, invite them first, and not replace with male speakers if they pull out.

7. The committee should recognise that, given that gender balance currently declines significantly with seniority, a more equal balance in the future can only be achieved if female ECRs are invited in greater numbers.
8. The committee should carefully consider the costs of travel to location, venue hire, and social events. The funds saved, e.g. by staying away from luxury resorts in isolated locations, should be redirected to make the event family-friendly.
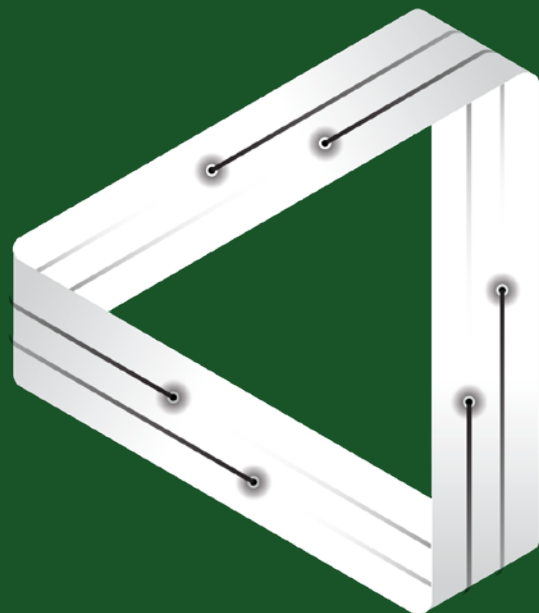9. The event should offer childcare and travel assistance to families, which will enable more women (and other primary carers) to attend.
10. The location should be family-friendly (i.e. have a family room, childcare/activities on-site) and social events should be inclusive.

* 'Support' means sponsorship, full or partial funding, co-branding, or significant participation of FLEET members.

FLEET

ARC CENTRE OF EXCELLENCE IN
FUTURE LOW-ENERGY
ELECTRONICS TECHNOLOGIES