Structure

1. Welcome and introduction
2. Strategic context and Round Priorities
3. Application and assessment process
4. Open Q&A
INVESTMENT PRIORITIES

DELIVERING SECURE AND RELIABLE ELECTRICITY

ACCELERATING SOLAR PV INNOVATION

IMPROVING ENERGY PRODUCTIVITY

EXPORTING RENEWABLE ENERGY
ACCELERATING SOLAR PV INNOVATION

THE CHALLENGE
Making solar more efficient and affordable through research and development.

By supporting ongoing research, development and demonstration, ARENA will help to further drive innovation in solar PV in Australia and internationally.
ACCELERATING SOLAR PV INNOVATION

WHAT WE WANT TO ACHIEVE
Make solar PV more affordable and competitive.

We want to find further innovations in solar PV and help fulfil the Australian Government’s commitment to double clean energy R&D spending by 2020.

Continuing to reduce the cost of solar PV could see solar produce more than 30 per cent of Australia’s electricity within 15 years.
Agenda

1. Welcome and introduction
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4. Open Q&A
Round 3 of ARENA’s R&D Program: Solar PV Research

R&D Round 3 builds on ARENA’s history of funding for solar PV research

The Round Priorities are to:

*Reduce the future cost of solar PV deployment through research and development on:*

- established and emerging solar cell technologies, including lower cost materials, and/or improved efficiency and/or stability and/or reliability and/or scalability; and
- established and emerging solar module technologies, including lower cost materials, and/or improved efficiency and/or reliability and/or durability.
A long-term Australian LCOE goal for solar PV

- Australian solar PV research contributes to a global research effort
- ARENA is aligned with the US DoE Sunshot goal of US3¢/kWh for utility scale solar PV by 2030
- This translates to a long-term goal of under AU4¢/kWh, a 48% decrease from the current LCOE of Australian large scale solar, currently around $AU75-95/MWh
- By funding innovative Australian solar PV R&D that can cascade through global manufacturing supply chains, we hope to meet and exceed this target.
Cell and module cost account for a significant proportion of total solar PV costs

Cost elements of PV systems in Asia (>100kW)

Sustainable cell and module cost reductions and performance improvements are therefore crucial meeting LCOE targets.

Sunshot: A pathway to US 3 cents per kWh

Lower module costs could account for 30% of the total cost reductions necessary to achieve the Sunshot 2030 goal - Australian R&D can help achieve this.
ARENA funding for solar PV R&D to date

Since 2012, ARENA has provided $109.3 million in funding for solar PV R&D, including institutional funding for ACAP, and legacy Australian Solar Institute (ASI) projects.

ARENA-funded projects have produced:

- 14 solar cell efficiency world records
- At least 142 patents
- Development of prototype and pilot solar PV technologies that are being taken up by manufacturing companies in Australia and China
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Funding expectations

- All ARENA funding will be in the form of grants
- ARENA grants are expected to be between $500,000 and $5 million for each project
- No grant can exceed $10 million - would need to be justified
- Projects are expected to match ARENA funding on 1:1 basis. Cash and in-kind contributions count towards matched funding, but all projects must include a cash contribution.
- Higher cash contribution = higher merit
- Contributions from industry partners = higher merit
Application Process

- Simpler - more specific questions - less precise budget
- Must read the R&D Program Round 3 Guidelines.
- The Guidelines are available for download on the Round 3 webpage: https://arena.gov.au/funding/programs/research-development-program/round-3-solar-pv-research/
## ARENA’s assessment process

| Two stage process | Expression of Interest and Full Application (invitation only)  
|                   | Same process for both stages (Full Application more detailed and firm budget).  
|                   | Must use ARENAnet  
| Eligibility Criteria | Seven eligibility criteria  
|                     | All must be met to proceed to merit assessment  
| Merit Criteria | All 5 merit criteria equally weighted  
|                  | ARENA Advisory Panel will assess applications against merit criteria.  
|                  | 1-5 rating scale to score each criteria. Total score out of 25  
|                  | Projects ranked – top ranked projects progress  
| Portfolio Approach | Considers how a project uniquely contributes to the Programme objectives, or as part of a suite of complementary ARENA projects  
|                    | May not to fund if similar to existing ARENA project or other project under assessment  
| Value for money | Applications assessed for overall value for money and risk against the merit criteria |
Application and Assessment Process

<table>
<thead>
<tr>
<th>Party</th>
<th>EOI Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicant</td>
<td>Submit EOI → Clarifications →</td>
</tr>
<tr>
<td>ARENA</td>
<td>Eligibility Assessment → Provide</td>
</tr>
<tr>
<td>Advisory Panel</td>
<td>Ineligible letter → Notify</td>
</tr>
<tr>
<td>CEO</td>
<td>Merit Assessment → Invited to</td>
</tr>
<tr>
<td>Tools</td>
<td>Full Application → Provide</td>
</tr>
<tr>
<td>ARENAnet</td>
<td>Unsuccessful letter → Notify</td>
</tr>
<tr>
<td></td>
<td>Applicant</td>
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<tr>
<td></td>
<td>Receive Notification</td>
</tr>
</tbody>
</table>
Application and Assessment Process

- **Party**
  - Applicant
  - ARENA
  - Advisory Panel
  - CEO

- **EOI Assessment**
  - Submit EOI
  - Receive Application
  - Clarifications
  - Eligibility Assessment
  - Provide Ineligible letter
  - Provide Unsuccessful letter
  - Notify Applicant
  - Invited to Full Application
  - Notify Applicant
  - Receive Notification

Tools: ARENA.net
Application and Assessment Process

1. Applicant submits Full application to ARENAnet.
2. ARENA receives Application.
3. Advisory Panel assesses Eligibility.
4. If Eligible: Proceed to Merit Assessment.
5. If Not Eligible: Provide Ineligible letter and Notify Applicant.
6. If Eligible: Merit Assessment.
7. If Merit assessment passes: Provide Successful letter and Notify Applicant.
8. If Merit Assessment fails: Provide Unsuccessful letter and Notify Applicant.
10. Notify Applicant of Approval or Unsuccessful.
Application and Assessment Process

**Party**
- Applicant
- ARENA
- Advisory Panel
- CEO

**Full Application Assessment**
- Submit Full application
- Receive Application
- Clarifications
- Eligibility Assessment
- Merit Assessment
- Provide Ineligible letter
- Provide Unsuccessful letter
- Approval
- Notify Applicant
- Contract negotiation

**Tools**
- ARENA.net
## Application and Assessment Process

### Full Application Assessment

<table>
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<tr>
<td>CEO</td>
<td>Merit Assessment</td>
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<tr>
<td>Tools</td>
<td>Provide Eligible letter</td>
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<td>Provide Unsuccessful letter</td>
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<td>Notify Applicant</td>
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<td>Contract negotiation</td>
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</tbody>
</table>

**Diagram:**
- **Step 1:** Applicant submits full application to ARENA.
- **Step 2:** ARENA receives the application.
- **Step 3:** ARENA assesses eligibility. If ineligible, notify applicant. If eligible, proceed to merit assessment.
- **Step 4:** Advisory Panel assesses merit. If unsuccessful, notify applicant. If successful, proceed to contract negotiation.
- **Step 5:** CEO approves the application. If approved, proceed to contract negotiation. If not approved, notify applicant.

**Tools:** ARENAnet
## Timeline for application and assessment process

<table>
<thead>
<tr>
<th>Months</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
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<tbody>
<tr>
<td>EOI open</td>
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<td>EOI assessment</td>
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<td>Full application open</td>
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<td>Notification of outcome</td>
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<td>Contract negotiation</td>
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</table>

*Note: Dates are approximate and subject to change.*
## Eligibility Criterion

<table>
<thead>
<tr>
<th>A - eligible applicant</th>
<th>Must be an Australian research institution OR Australian entity incorporated under the Corporations Act 2001 (Cth)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B - eligible project</td>
<td>Must meet definition of “R&amp;D” and “Renewable Energy Technology” in the Guidelines</td>
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<tr>
<td></td>
<td>Must be between TRL 2-4 (inclusive) at time of application (can move from this during the project)</td>
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<td>Must meet the round priorities</td>
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<tr>
<td>C - take place in Australia</td>
<td>Majority of activities must take place in Australia</td>
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<td></td>
<td>No more than 10% of ARENA funds may be spent overseas, with exception of purchase or use of equipment and materials. ARENA will consider requests in increase this cap at EOI stage.</td>
</tr>
<tr>
<td>D - intellectual property</td>
<td>Must have ownership or access to any IP necessary to complete the project, and provide evidence to that effect at full application as necessary.</td>
</tr>
<tr>
<td>E - workplace gender equality</td>
<td>Applicant must not be named as being non-compliant with the Workplace Gender Equality Act 2012 (Cth)</td>
</tr>
<tr>
<td>F - knowledge sharing</td>
<td>Must agree to publicly share knowledge about, and resulting from, the project</td>
</tr>
<tr>
<td>G - compliance with other requirements</td>
<td>Completeness and comprehensiveness of application against merit criteria</td>
</tr>
<tr>
<td></td>
<td>Disclose any legal proceedings</td>
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<td></td>
<td>Accept all requirements in Part 6 of the Guidelines</td>
</tr>
</tbody>
</table>
Technology Readiness Levels (TRLs) 2-4

- **TRL 2:** Practical applications of basic principles (applied research)
- **TRL 3:** Active research and development involving both analytic and lab-scale studies to validate analytical predictions.
- **TRL 4:** Technological components integrated to establish that all the pieces work together as a system in the lab.

Further explanation at Appendix A of the Guidelines.
Merit criterion A - Applicant capability and capacity (EOI)

**Capability**
- Project team’s (applicant and partners) track record of research excellence and skills as relevant to the proposed Project *(200 words)*

**Capacity**
- Demonstrate the applicant organisation and any partner organisations and key personnel have the resources, skill, expertise and research infrastructure (or that these will be accessible or made available) to achieve the Project outcomes. *(200 words)*

Guidelines pp. 16-17
Merit criterion A

Key Personnel and Resources

The resources (including personnel, physical resources and facilities) the applicant will use to deliver the project including confirmation that they will be available for the duration of the project.

Name
Title | Given name | Family name | Position | Organisation

Contact details
Phone number | Email | Gender

Qualifications and experience

WARNING: information pasted from other programs, such as Word or Excel, will paste text only. All formatting (tab stops, underline, italics etc.), images and tables will be lost.

Add
## Merit criterion B - Contributes to Program objectives and Round priorities (EOI)

<table>
<thead>
<tr>
<th>Round Priorities</th>
<th>● How the project will contribute to the Round Priorities (200 words)</th>
</tr>
</thead>
<tbody>
<tr>
<td>World Class</td>
<td>● How the Project is world class or innovative compared to research already being done in this field (domestic and international) (200 words)</td>
</tr>
</tbody>
</table>
| Path to Market   | ● Outline the pathway to market for the technology including a timeframe to commercialisation.  
                    ● How does the Project facilitate or accelerate movement along that pathway?  
                    ● What is the potential size of the market for the technology? (200 words) |
| Other            | ● Other contributions the Project will make in the achievement of Program objective(s) not already mentioned (150 words) |
Merit criterion C - Project design and methodology

- Technical design or methodology that will be employed to achieve the Project outcomes.
- Timeline for the Project, including milestones, stage-gates, dependencies and deliverables associated with the Project.
- Main risks to achieving the outcomes of the Project and how these risks will be mitigated (e.g. risk in - technological, project planning, infrastructure and equipment access, personnel and WHS).

(500 words)
Merit criterion D - Financial viability and co-funding commitment

- **Budget Table**
  - Simple budget table in ARENANet
  - Budget may vary up to 25% between EOI and Full Application

- **Written Justification**
  - Written justification for the requested funding *(300 words)*
Knowledge sharing

- What knowledge will be shared from the Project to support research excellence beyond the Project, and support commercialisation of the technology being developed through the Project?

(300 words)
Other important points

- Part 5 - Funding Agreements
- Part 6 - Further Program Information
- Appendix B - Eligible expenditure
Key links

R&D Round 3 webpage

ARENANet

Guidelines

FAQ
Open Q&A
Cell and module performance improvements also reduce costs further down the solar PV value chain.

Improvements in the performance of cells and modules create savings that flow through balance of systems, site costs, financing, O&M and other hard and soft costs. These interdependencies are shown in the shaded buckets in this NREL analysis.

Source: Jones-Albertus et al., 2016, “Technology advances needed for photovoltaics to achieve widespread grid price parity”, Progress in Photovoltaics

A Pathway to 3 Cents per kWh
Benchmark 100 MW Utility Scale Systems With 1,480 kWh/kW First-Year Performance. No ITC but Five-Year MACRS is Included

2015 Real LCOE (U.S. Cents/kWh)

December 9, 2015

2015 Benchmark
Lower Module Price: $0.65 to $0.30/WDC
Improve Module Efficiency: 16% to 25%
Improve Reliability and Lifetime: 0.75% to 0.2%/yr, 30 to 50 yr. system
Reduce O&M: $15 to $10/kW yr.
Reduce Hardware and Labor Costs: $0.70 to $0.35/WDC
Obtain Lower Financing Rates: 7.0% to 6.0%
Beyond 2020

10
1.2
(1.8)
1.6
(2.4)
1.3
(2.1)
0.4
(0.8)
1.2
(1.8)
1.3
(2.0)
3
Why Australia’s contribution is important

Australia solar PV research has made a major contribution to the global research effort that underpins the current low cost of deployed solar PV:

- ACAP estimates that by the early 2020s, 60% of the world’s solar cells will use technology developed by Australian researchers
- Strong connections between Australian researchers and international manufacturers, particular in China, have seen Australian innovation cascade into global supply chains
- This foundation sets up Australian research to continue to make an outsized contribution to global solar PV cost reductions: ARENA seeks to support this through further funding.