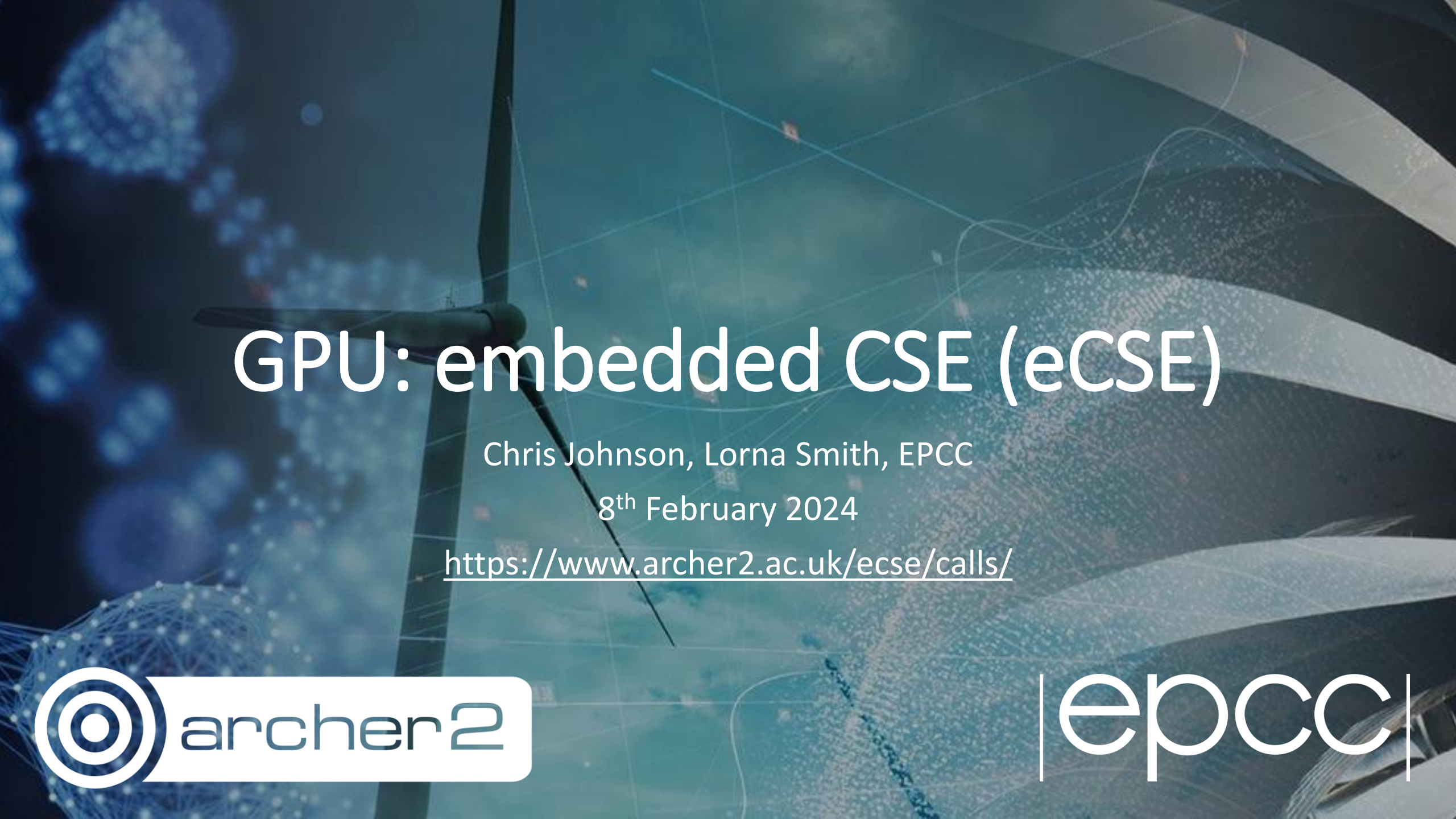

GPU: embedded CSE (eCSE)

Chris Johnson, Lorna Smith, EPCC

8th February 2024

https://www.archer2.ac.uk/ecse/calls/

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Partners

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Overview

- What is the eCSE funding programme?
- Who is eCSE funding for?
- Programme logistics
- Examples of eCSE work
- Applying for a project – walk through
- Summary
- Questions

What is the eCSE funding programme?

- The Embedded CSE (eCSE) programme funds software development for codes to run on GPU architectures
- Allows software to be developed in a sustainable manner to improve research on GPU architectures
- Facilitate efficient use of GPU resources through enhanced code performance/functionality
- For developing software that facilitates research targeted at UKRI's digital research infrastructure
  - e.g. future Exascale services, UK national AI services, national Tier-2 HPC services
- Allows
  - employment of a Research Software Engineer (RSE) or PDRA
  - software development leading to research **anywhere within the UKRI's remit**

Who is eCSE funding for?

- Two ways to be directly involved
- As a Co-I / PI
  - e.g. a researcher who works with a code which runs (or potentially runs) on GPUs and requires an improvement
    - May not have the skills/availability to do the technical work
    - May/may not have expertise within own group
    - Someone else within group or elsewhere doing technical work
- As a technical member of staff
  - RSE or PDRA has, or is gaining, software development expertise within HPC
  - PhD student with similar role coming to the end of studies
- The panel will assess the teams ability to deliver on the project
  - e.g. staff skills, support from PI/Co-Is, training plan

GPU eCSE Programme administration

- Programme is administered by EPCC through ARCHER2, the UK National HPC Service
- However, applications are not limited to projects targeting the GPU component of ARCHER2
- Projects may utilise other GPU resources within the UK digital research infrastructure.
- Successful applications can get access to the ARCHER2 GPU cluster – or should arrange suitable access to other GPU resources
- Call is all about software development and not production runs
  - Other routes available to gain CPU time e.g. Access to HPC Calls

eCSE Programme Funding

- Funding for can be requested for staff located at
  - institution of the PI
  - staff from the ARCHER2 centralised CSE support team
  - third party institution(s)
  - any combination of the above
- A project funds 1 to 36 person months in total across all technical staff
  - Flexible: Effort can be spread over a longer period or employ multiple people simultaneously
  - Max duration 24 calendar months

eCSE Programme Funding (contd.)

- We run a regular series of calls for proposals, with three calls per year
- Support and encourage early career researchers
  - Many RSEs are early career
  - Good opportunity to develop software development skills – great for CV
- Observers
  - Early career researchers invited to on-line panel meetings as observers
  - Usually have 3-4 observers at each panel meeting
  - Good opportunity to see what reviewers are looking for
  - Call open alongside GPU eCSE call – deadline 27th Feb
- Proposals are selected by an independent diverse panel of experts

Example eCSE work

- Transforming CPU code -> GPU code
- Make improvements to existing GPU codes
  - portability to allow efficient running on wider range of architectures
  - performance
  - scalability
  - sustainability and maintainability
  - Implementing new algorithmics within code
- Improvements to GPU-based software to allow new research
- Adding new functionalities to existing GPU-based software
- Enhancing existing GPU software for use in new research areas/workflows

Applying for an eCSE Project
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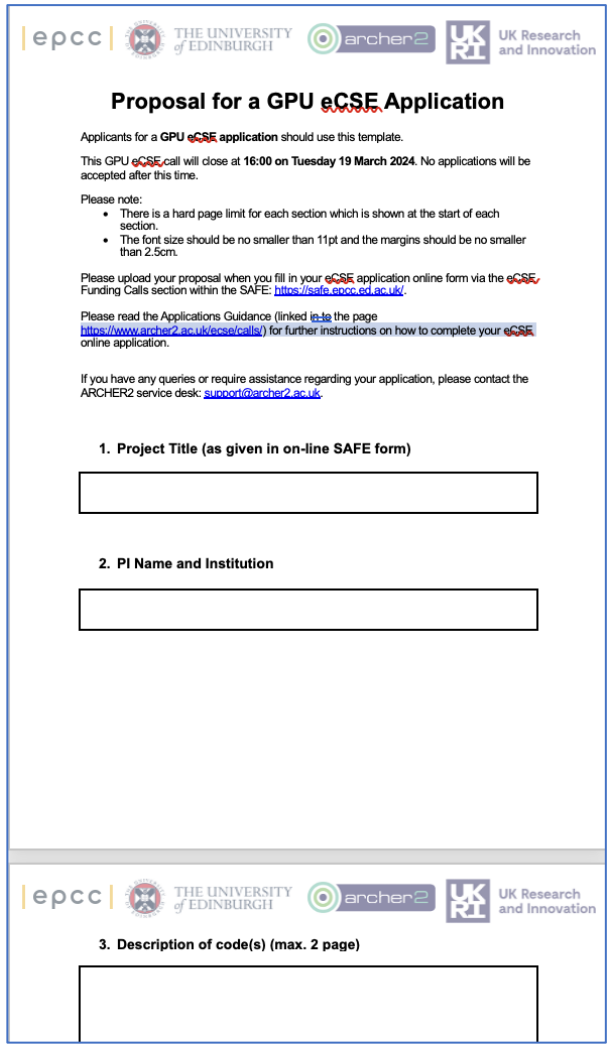
Steps for applying to eCSE call

- First steps
  - Start proposal in SAFE
  - Invite other team members
  - Start getting costing information
    - Costing not needed for ARCHER2 CSE team (we can get these internally)
    - Check financial arrangements
      - in particular if RSE not at institution of PI or part of ARCHER2 CSE team then money is paid to PI's institution who must arrange to pass this on
  - Look through proposal forms to fill in (both on-line form and Word document)
  - Check through Terms document with your department
  - Read the guidance document!
  - Start requesting letters of support (optional)
- Next steps
  - Complete main proposal form
  - Complete the on-line form – linking in completed proposal form, costing docs, CVs, letter(s) of support, etc.
- On-line form must then be completed with
  - All project members having accepted invitation
  - All relevant documents attached
  - Submitted by **16:00 19th March 2024**

Documents required

Proposal Document (required)



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Proposal for a GPU eCSE Application

Applicants for a **GPU eCSE application** should use this template.

This GPU eCSE call will close at **16:00 on Tuesday 19 March 2024**. No applications will be accepted after this time.

Please note:

- There is a hard page limit for each section which is shown at the start of each section.
- The font size should be no smaller than 11pt and the margins should be no smaller than 2.5cm.

Please upload your proposal when you fill in your eCSE application online form via the eCSE Funding Calls section within the SAFE: https://safe.epcc.ed.ac.uk/.

Please read the Applications Guidance (linked in to the page https://www.archer2.ac.uk/ecse/calls/) for further instructions on how to complete your eCSE online application.

If you have any queries or require assistance regarding your application, please contact the ARCHER2 service desk: support@archer2.ac.uk.

1. **Project Title (as given in on-line SAFE form)**

2. **PI Name and Institution**

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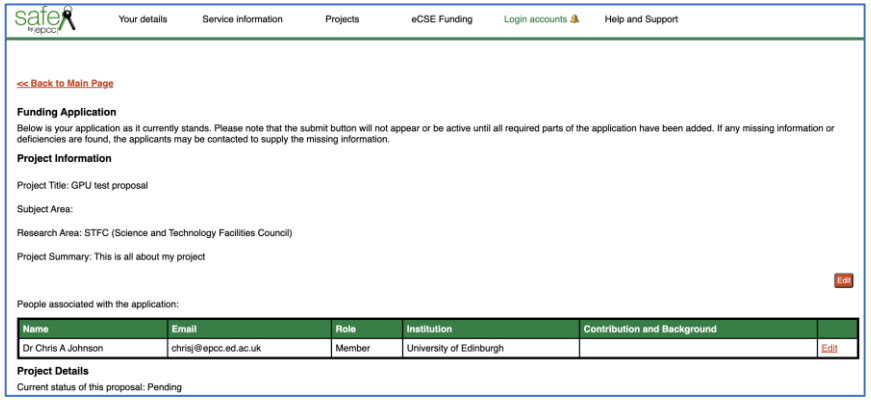
3. **Description of code(s) (max. 2 page)**

SAFE form



safe by epcc | Your details | Service information | Projects | eCSE Funding | Login accounts | Help and Support

<< Back to Main Page

Funding Application

Below is your application as it currently stands. Please note that the submit button will not appear or be active until all required parts of the application have been added. If any missing information or deficiencies are found, the applicants may be contacted to supply the missing information.

Project Information

Project Title: GPU test proposal

Subject Area:

Research Area: STFC (Science and Technology Facilities Council)

Project Summary: This is all about my project

Edit

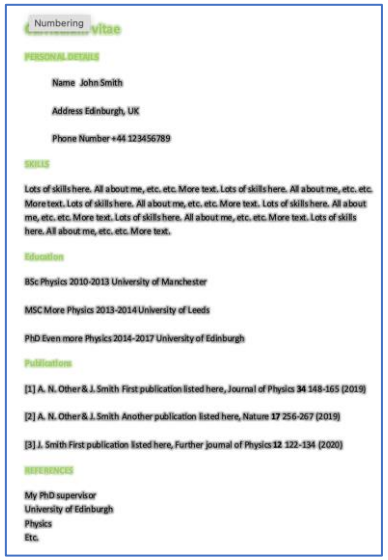
People associated with the application:

Name	Email	Role	Institution	Contribution and Background	
Dr Chris A Johnson	chrisj@epcc.ed.ac.uk	Member	University of Edinburgh		Edit

Project Details

Current status of this proposal: Pending

CV (required for each RSE)



Numbering ...vitae

PERSONAL DETAILS

Name John Smith

Address Edinburgh, UK

Phone Number +44 123456789

SKILLS

Lots of skills here. All about me, etc. etc. More text. Lots of skills here. All about me, etc. etc. More text. Lots of skills here. All about me, etc. etc. More text. Lots of skills here. All about me, etc. etc. More text. Lots of skills here. All about me, etc. etc. More text. Lots of skills here. All about me, etc. etc. More text.

Education

BSc Physics 2010-2013 University of Manchester

MSC More Physics 2013-2014 University of Leeds

PhD Even more Physics 2014-2017 University of Edinburgh

Publications

[1] A. N. Other & J. Smith First publication listed here, Journal of Physics 34 148-165 (2019)

[2] A. N. Other & J. Smith Another publication listed here, Nature 17 256-267 (2019)

[3] J. Smith First publication listed here, Further journal of Physics 12 122-134 (2020)

REFERENCES

My PhD supervisor
University of Edinburgh
Physics
Etc.

Letter of Support (optional)

THE UNIVERSITY of EDINBURGH

EPCC
The University of Edinburgh
The Bayes Centre
47 Potterrow
Edinburgh
EH8 9BT

Tel +44 (0) 131 650 5030
Fax +44 (0) 131 650 6555

Mr J Smith
Street Name
Town

Thursday, 01 February 2024

Dear Professor J Smith,

This letter confirms our support of your eCSE GPU project "Improving the scalability of BigGPUCode". At present our research is limited due to the relatively poor scaling of the code meaning we are at present unable to run really big and exciting simulations. The work to be carried out in your upcoming project will enable us to, etc., etc. More text

More text giving more detail about what we will use the code for. More text and more text. Lots more text. Some more text, etc. Maybe a bit more about what we do and why it's really important

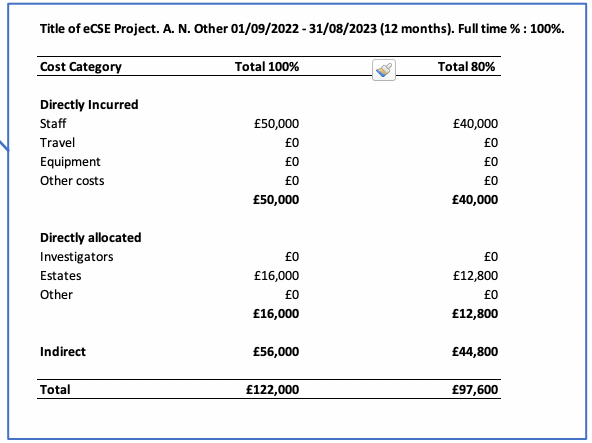
Even more text. More stuff. More info. More, more, lots more.

Finally, more to sign off with. A bit more.

Yours sincerely,

Letter sender,
Job Title

Costing document(s) (required for each RSE)



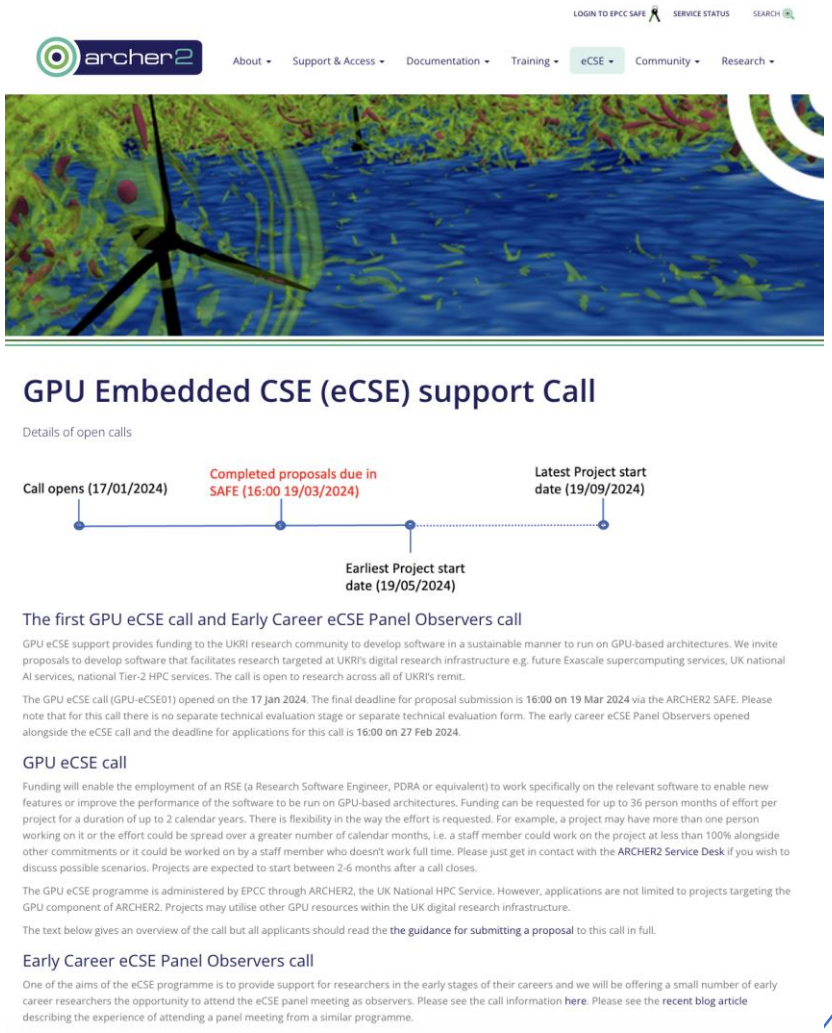
Title of eCSE Project. A. N. Other 01/09/2022 - 31/08/2023 (12 months). Full time % : 100%.

Cost Category	Total 100%	Total 80%
Directly Incurred		
Staff	£50,000	£40,000
Travel	£0	£0
Equipment	£0	£0
Other costs	£0	£0
	£50,000	**£40,000**
Directly allocated		
Investigators	£0	£0
Estates	£16,000	£12,800
Other	£0	£0
	£16,000	**£12,800**
Indirect	**£56,000**	**£44,800**
Total	**£122,000**	**£97,600**

Beginning an eCSE Application

- Visit call page https://www.archer2.ac.uk/ecse/calls/
  - links to templates, guidance and terms
- Start in the SAFE
  - https://safe.epcc.ed.ac.uk/
- Enter Project Title, subject area and research area (remit)

GPU eCSE Calls on-line



If your proposal is selected for funding, you will be provided with an award letter and will be asked to agree to the eCSE Terms.

Please view the Terms in advance of submitting the proposal.

Proposal templates

- The eCSE form has an online form to which documents should be attached before submission
- MS Word templates available for proposal document
- Proposal template
    1. Project Title
    2. PI Name and Institution
    3. Description of code(s)
    4. Project Objectives and success metrics
    5. Project Overview, Technical Information and Workplan
    6. Sustainability, maintenance, validation and availability of code(s)
    7. Impact and Benefits

Description of codes(s)

Up to 2 pages

- Tell us about the code! What is it for? what does it do? Who uses it?
- How big is it? How is it structured (how complex)?
- What language(s) does it use and any dependencies (libs, compilers, other software)?
- What is the code's status in terms of usage and performance?
- Performance data may include scaling (if multi-GPU), profiling data, or comparison of GPU code with CPU code
- Can include links but include summary in text

Project Objectives and success metrics

Up to 1 page

- Number of objectives and associated success metrics expected
  - 1-2 objectives for a proposal requesting <6 PMs of effort
  - 5-6 objectives for a proposal with the maximum requested effort of 36 PMs
  - This is just a guide!
  - Expect each objective to have an associated success metric
- Success metrics should be specific and measurable. E.g. the following sounds reasonable
  - *"We will significantly improve the scaling of the GPU code compared with the existing code on a set of benchmark codes"*
- but isn't really specific or measurable
  - Which codes? How many? What improvements are expected? For what problem sizes?

Project Overview, Technical Information and Workplan

Up to 2 pages

- This is where you describe what you will do in the project
- Describe from a technical viewpoint
  - But should be understandable to someone who doesn't know the code specifically
- Should include
  - associated timescales
  - Gantt chart (or equivalent) of the workplan with milestones and effort broken down by RSE (if > 1 RSE)
  - Risk – with likelihood and possible mitigation

Sustainability, maintenance, validation and availability of code(s)

Up to 1 page

- Should describe how code(s) will be
  - made available to users
  - maintained
- State what coding standards will be used, etc.
- Should include any information on the licensing model
- Describe both for users
  - wishing to run the code(s) and
  - wanting access to the underlying source code(s)

Impacts and Benefits

Up to 1 page

- Describe potential impact of the science enabled by the project
- How will impact be achieved?
  - Some impacts may be realised after the end of the project
- Consider
  - both the computational and scientific benefits
  - who will benefit

Applying for an eCSE Project

- Final deadline for full proposals submitted to the SAFE is then **16:00 19th March 2024**
    - Late proposals will not be considered!
- Previous eCSE calls had a separate technical evaluation, this is now part of the main proposal
- Any project team members must be invited to a proposal and have accepted the invitation via the SAFE before final submission
    - Otherwise they will not be considered part of the team
    - Allowable roles are PI, Co-I, technical staff, Contact, Member
    - Technical staff add their own CVs
    - **All** other team members must provide track record and describe what they will bring to project
    - When inviting people, please use the email address they use in the SAFE
    - Note that you **cannot submit without technical staff** (or unnamed staff selected)

Costings

- Please provide 100% FEC value for each member of technical staff
  - We pay 80% FEC for funded proposal
  - Funding only includes technical staff
  - Include direct and indirect costs but not additional costs (e.g. PI/Co-I costs)
  - Provide breakdown of costs as a PDF (Worktribe of equivalent)
  - No need to provide costings for ARCHER2 CSE staff
- Travel is given separately from above
  - Funds are limited – see guidance
  - Can include project members traveling with UK to meet each other
  - Additionally each RSE can be funded to attend one national/international conference
- If your institution does not use FEC please contact us in advance
- We pay the PI's institution via invoice
  - Any payment to third parties is paid via the PI's institution
- Recommend you use named staff where possible
  - Ability of technical staff to complete the work is assessed
  - Considered together with PI/Co-I expertise

eCSE Costing document

- Example costing for 12-month project
- Made up numbers
  - This is not a real document!
- Shows the information we need

Title of eCSE Project. A. N. Other 01/09/2022 - 31/08/2023 (12 months). Full time % : 100%.

Cost Category	Total 100%	Total 80%
Directly Incurred		
Staff	£50,000 ✗	£40,000
Travel	£0	£0
Equipment	£0	£0
Other costs	£0	£0
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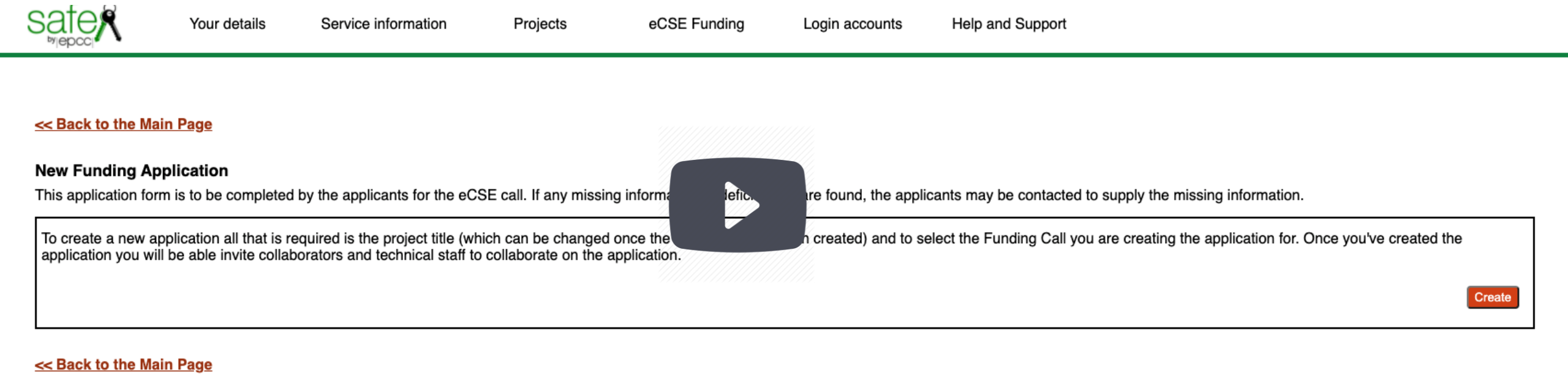
Other	£0	£0
	£16,000	**£12,800**
Indirect	**£56,000**	**£44,800**
Total	**£122,000** ✓	**£97,600** ✗

Enter **100% total** costing in proposal form
Form then calculates 80%

eCSE – Submitting a proposal



eCSE – things to watch out for

- Doesn't look technically feasible (either within the timescale or at all)
- Poor estimate of effort - may be over or under ambitious for effort requested
- Sometimes just missing the basic "why", "how"
- Proposal may technically desirable but missing the "why"
  - E.g. project has clear plan for reducing time taken for a code by large percentage...
  - …but why does that matter? Who uses code? For what? Why is the code important?
- Staffing not suitable
  - Missing needed expertise with code or GPU skills – or a plan to obtain these skills
- Missing suitable analysis of risk
  - E.g. how will WP4 work if WP3 isn't successful?
- Success metrics not quantified
- Letters of support not specific
- Do proof-read (or get a colleague to)!
- Sometimes nothing specifically wrong but details just not well enough explained

Summary

- The first GPU eCSE call is open – see time timetable for future calls
  - Expect further calls over the year
- Final deadline for full proposals: **16:00 19th March 2024** -> SAFE
- Early Career Observers call open alongside (deadline 16:00 27th Feb 2024) -> ARCHER2 service desk
- Details of calls
  - https://www.archer2.ac.uk/ecse/
  - Any questions please ask here or via the ARCHER2 service desk support@archer2.ac.uk

Any Questions?
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