ARCHER2
SP Quarterly Report

July - September 2025

EPCC
The University of Edinburgh

Document Information and Version History

Version:	1.0
Status	Release
Author(s):	Clair Barrass, Jo Beech-Brandt, Alan Simpson, Anne Whiting
Reviewer(s)	Alan Simpson

Version	Date	Comments, Changes, Status	Authors, contributors, reviewers
0.1	18/09/2025	Template created	Jo Beech-Brandt
0.2	02/10/2025	Added narrative, graphs, service statistics	Jo Beech-Brandt
0.3	07/10/2025	Added critical success metrics	Lorna Smith
0.4	08/10/2025	Added compliance related information	Anne Whiting
0.5	09/10/2025	Reviewed	Alan Simpson
1.0	15/10/2025	Version for UKRI	Alan Simpson, Jo Beech-Brandt

1 The ARCHER2 Service

This is the report for the ARCHER2 SP Service for the Reporting Period: 1 July – 30 September 2025.

1.1 Service Highlights

- Due to a significant Health and Safety risk, associated with the power supply to the site, action was required at the ACF, and there was a full power outage to the site from Friday 29th August - Monday 15th September. Specialised external contractors worked on a 24/7 basis for the outage period replacing switchgear. ARCHER2 was powered down at 0900 on Friday 29th August and was returned to service at 1400 on Wednesday 17th September.

- Utilisation remains high with the overall utilisation at 90% during this quarter. There was a slight impact due to the hot weather incidents which resulted in some nodes being switched off to ensure adequate cooling was available during unusually hot weather in the Edinburgh area. It should also be noted that the power outage period from 29th August – 17th September has been excluded for the utilisation calculations.

- The ARCHER2 User Advisory Group (UAG) meeting was hosted at the ACF in late September and it was nice to welcome the UAG to tour the facility.

- The Operating System update work has progressed and EPCC presented an options paper at the User Advisory Group which has since been distributed to the ARCHER2 Management Board and we are awaiting their approval. Once approved, the image will be deployed across the system compute nodes via a rolling reboot of the nodes thus removing the need for any downtime. User communications have been sent out and documentation has been updated.

1.2 Forward Look

- EPCC continue to work with HPE towards the deployment of a server running “View for Clusterstor” software. This should enable better understanding of work file system performance and a more immediate ability to identify the origin of problems on work file systems. EPCC have configured and provided a server for HPE to use for this deployment.

- EPCC have also been working closely with HPE to implement powersched on ARCHER2. This is now in testing phase and we hope to roll out across the service in the next quarter.

- Ongoing site review with University of Edinburgh estates team to look at the cooling infrastructure ahead of next summer. Given the current weather trends, we are expecting increased temperatures during summer periods and are continuing to improve our understanding and our processes around hot weather mitigation to the ARCHER2 service and supporting plant.

- ARCHER2 staff attending and representing the service at various meeting including HPC-AI, DRI Congress, HPC-SIG and international SuperComputing25.

- EPCC are working towards our annual Cyber Essentials certification. This helps ensure that best practice is being used to prevent security vulnerabilities in ARCHER2 and the other services we run. We are also looking to expand our ISO certification with a 14001 certification which is the international standard for environmental management.

- Planning continues for the upcoming festive period, including the Change Freeze and the development of the staffing schedules for cover the ACF, Service Desk and systems.

2 ARCHER2 Performance Report

This is the contractual performance report for the ARCHER2 SP Service for the Reporting Periods from 1 July until 30 September 2025.

2.1 Service Points and Service Credits

The Service Levels and Service Points for the SP service are defined by EPSRC in Schedule 2.2 of ARCHER2 SP Service Contract.

The Working Day (WD) for the ARCHER2 Service is 10 Working Hours (WH) as the Service operates from 0800-1800. The Median Time to Resolution is measured in WD.

- **Availability**: *Service Threshold: <=96.5%; Operating Service Level: >98.0%, ≤ 98.5%.*
- **ARCHER2_SP_Level1 (MTR)**: The Median Time to Resolution, of all SP queries falling within Level 1 resolved by the Contractor in the Reporting Period. *MTR Service Threshold: >1 WD; Operating Service Level: >0.3 WD, ≤ 0.45 WD.*
- **ARCHER2_SP_Level2 (MTR)**: The Median Time to Resolution, of all SP queries falling within Level 2 resolved by the Contractor in the Reporting Period. *MTR Service Threshold: >8 WD; Operating Service Level: >2 WD, ≤4 WD.*
- **ARCHER2_SP_Level3 (MTR)**: The Median Time to Resolution, of all SP queries falling within Level 3 resolved by the Contractor in the Reporting Period. *MTR Service Threshold: >25 WD; Operating Service Level: >12 WD, ≤16 WD.*
- **Initial Response to Queries (%):** The percentage of the total number of SP queries assigned to the Contractor in the Reporting Period responded to within 3 Working Hours. *Service Threshold: <96.00%; Operating Service Level: 98.00 – 98.99%.*
- **Query User Satisfaction (%):** The percentage of the total number of query satisfaction surveys completed in each Reporting Period, rating the quality of the resolution of Queries by the Contractor as "Good", "Very Good" or "Excellent". *Operating Service Level: 82.00 – 87.99%*

2.1.1 Service Points

Metric	Jul 2025		Aug 2025		Sep 2025		Q3 2025	
	Perf	Points	Perf	Points	Perf	Points	Perf	Points
Availability	100%	-3	99.9%	-2	99.8%	-2	99.9%	**-7**
SP_Level1 (MTR)	0.00	-2	0.00	-2	0.00	-2	**0.00**	**-6**
SP_Level2 (MTR)	0.07	-2	0.05	-2	0.05	-2	**0.06**	**-6**
SP_Level3 (MTR)	9.50	-0.5	0.00	-2	0.00	-2	**9.50**	**-4.5**
Initial Response (%)	100%	-1	100%	-1	100%	-1	**100%**	**-3**
Query Satisfaction (%)	100%	-2	100%	-2	100%	-2	**100%**	**-6**
Total		**-10.5**		**-11**		**-11**		**-32.5**

2.1.2 Service Credits

As the Total Service Points are negative (-32.5), no Service Credits apply in 3Q25.

2.2 SP Query Statistics

The metrics were specified by EPSRC in Schedule 2.2 of ARCHER2 SP Service Contract.

- **Assigned:** The number of SP queries assigned to the Contractor within each query resolution category in the Reporting Period.
- **Resolved:** The number of SP queries resolved by the Contractor within each query resolution category in the Reporting Period.
- **Backlog:** The number of SP queries assigned to the Contractor that remained unsolved within each query resolution category in the Reporting Period
- **Correspondence:** The average number of pieces of correspondence generated for SP queries in each query resolution category.
- **First Response:** The average time taken for the Contractor to first respond to the Originator of the SP query.

July 2025					
Service level	**Assigned**	**Resolved**	**Backlog**	**Correspondence**	**First Response**
SP_Level1	1790	1790	0	0.068	0:00:42
SP_Level2	96	95	15	7.337	0:14:11
SP_Level3	1	1	0	9	0:00:00
August 2025					
Service level	**Assigned**	**Resolved**	**Backlog**	**Correspondence**	**First Response**
SP_Level1	912	912	0	0.115	0:00:40
SP_Level2	93	89	19	7.798	0:11:06
SP_Level3	1	0	1	0	0:00:00
September 2025					
Service level	**Assigned**	**Resolved**	**Backlog**	**Correspondence**	**First Response**
SP_Level1	1451	1451	0	0.192	0:01:32
SP_Level2	86	88	17	7.114	0:53:38
SP_Level3	0	0	1	0	0:00:00
Q3 2025					
Service level	**Assigned**	**Resolved**	**Backlog**	**Correspondence**	**First Response**
SP_Level1	4153	4153	0	0.121	0:01:09
SP_Level2	275	272	17	7.415	0:25:56
SP_Level3	2	1	1	9	0:00:00

2.3 Query Resolution

Metric	**Jul 2025**		**Aug 2025**		**Sep 2025**		**Q3 2025**	
Service Level	**MTR**	**Resolved**	**MTR**	**Resolved**	**MTR**	**Resolved**	**MTR**	**Resolved**
SP_Level1	0:00:16	1790	0:00:01	912	0:00:39	1451	0:00:20	4153
SP_Level2	0:40:59	95	0:32:48	89	0:32:18	88	0:36:47	272
SP_Level3	94:58:21	1	0:00:00	0	0:00:00	0	94:58:21	1
Total		**1886**		**1001**		**1539**		**4426**

A total of 4426 queries were resolved by the ARCHER2 SP Service in the Reporting Period. The percentage of user queries responded to within 3 hours was 100%.

2.4 Query Feedback

During July, there were 31 feedback scores received during this period. 100% were Good, Very Good or Excellent with 87% given the highest score of Excellent.

During August, there were 24 feedback scores received during this period. 100% were Good, Very Good or Excellent with 96% given the highest score of Excellent.

During September, there were 14 feedback scores received during this period. 100% were Good, Very Good or Excellent with 100% given the highest score of Excellent.

£69 donation was made to our chosen charity Save the Children with £1 donated per query feedback item received.

2.5 Maintenance and Outages

Type	Start	End	Duration	User Impact	Reason	Attributable
Partial	2025-07-11 1000	2025-07-14 0800	3 days 10 hrs	Increased queue times and reduced node availability	Unusually hot weather in Edinburgh area. Reduced number of compute nodes to allow adequate cooling	Accommodation
Partial	2025-08-07 1400	2025-08-07 1415	15mins	Users unable to submit new jobs or query job status	Slurm controller restart to resolve ongoing issue	SP
Partial	2025-08-11 1350	2025-08-11 1420	30 mins	Users cannot connect to login nodes; SAFE not accessible	Due to work on the SAFE database, SAFE and ARCHER2 login MFA are currently unavailable	SP
Partial	2025-08-12 1200	2025-08-14 2200	2 days 10hrs	Increased queue times and reduced node availability	Unusually hot weather in Edinburgh area. Reduced number of compute	Accommodation

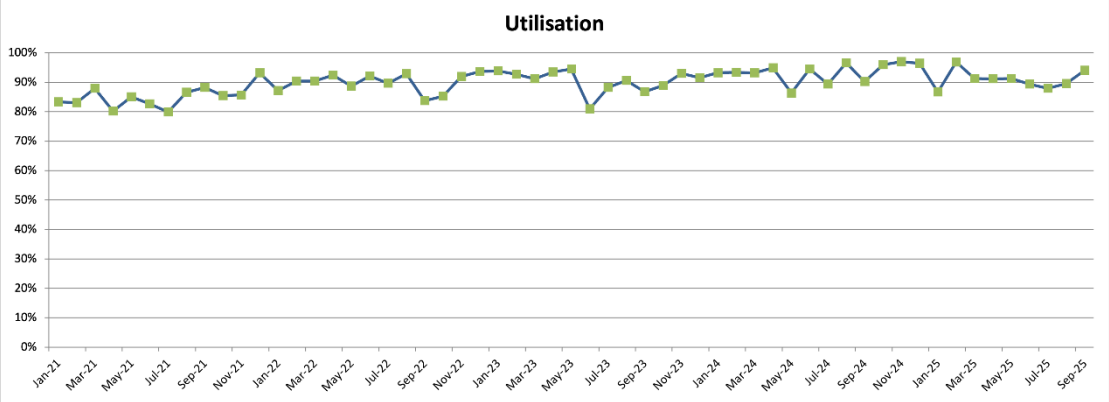
					node to allow adequate cooling	
Partial	2025-09-17 1400	2025-09-18 1030	20 hrs 30 mins	No licence server available; licenced software is not available	Licence node is currently unavailable	HPE
Partial	2025-09-17 1400	2025-10-01 1220	13 days 22 hrs 30 mins	GPU nodes are unavailable	Replacement part required	HPE (not covered within contract)
Partial	2025-09-30 1400	2025-09-30 1430	30 mins	Users unable to submit new jobs or query job status	Slurm controller restart to allow for testing for power monitoring upgrade	SP

3 ARCHER2 Service Statistics

3.1 Utilisation

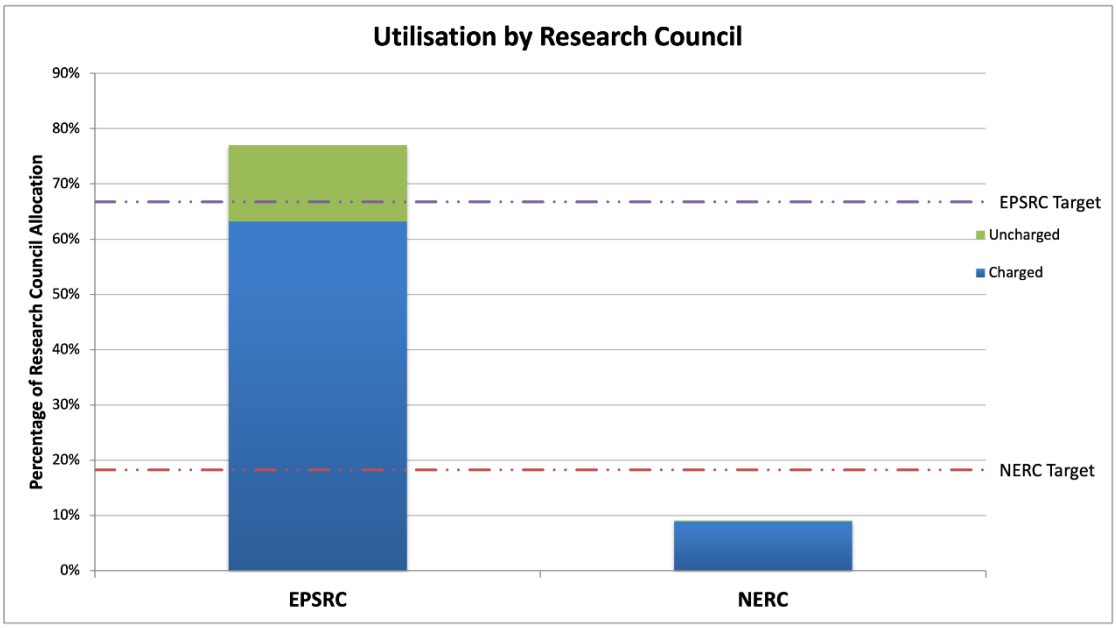
The utilisation for ARCHER2 remains high for 1 July – 30 September at 90% which compares with last quarter which was 91%. Utilisation for July was 88%, for August 90% and for September 94%. The slightly lower utilisation in July and August is due to hot weather incidents during unusually high temperatures in the Edinburgh area over the summer period which resulted in the removal of some of the compute nodes to allow the cooling infrastructure to cope with the additional load.

It should be noted, for the purpose of the utilisation calculations, we have removed the extended power outage period which allowed for the switchgear replacement from August 29th – September 17th.

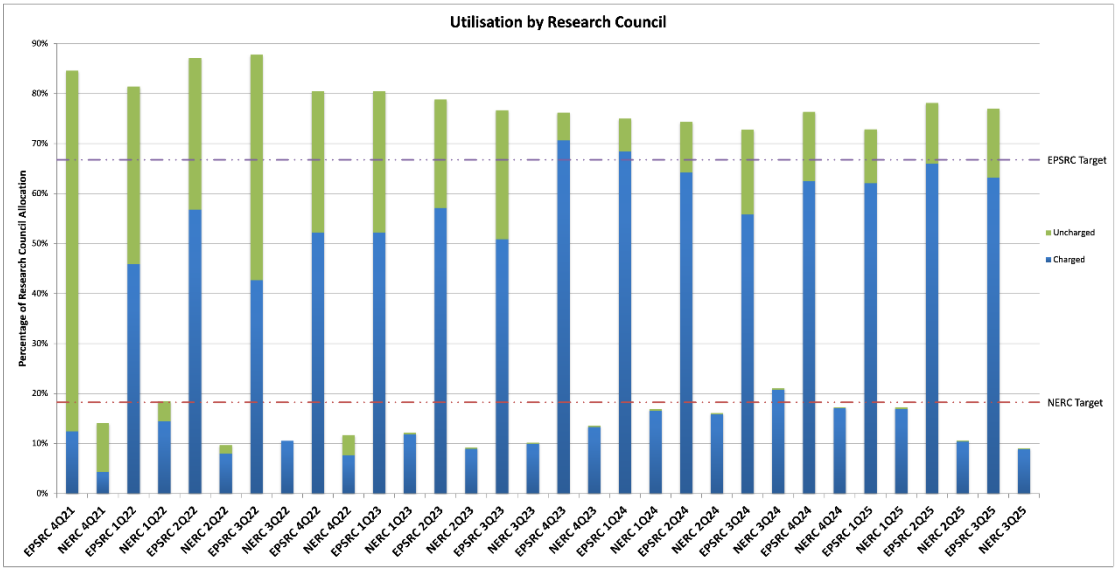


The utilisation by the Research Councils, relative to their respective allocations, is presented below. This bar chart shows the usage of ARCHER2 by the two Research Councils presented as a percentage of the total Research Council allocation on ARCHER2. It can be seen that EPSRC exceeded their target this quarter with their usage being at 77% (against their target of 66.8%). It should also be noted that the proportion of EPSRC's uncharged utilisation has slightly increased this quarter from 12% in 2Q25 to 13.8% in this quarter.

NERC did not meet their target utilisation of 18.2% and it was significantly less at 9%. This is slightly lower than their usage in the previous quarter which was 10%.

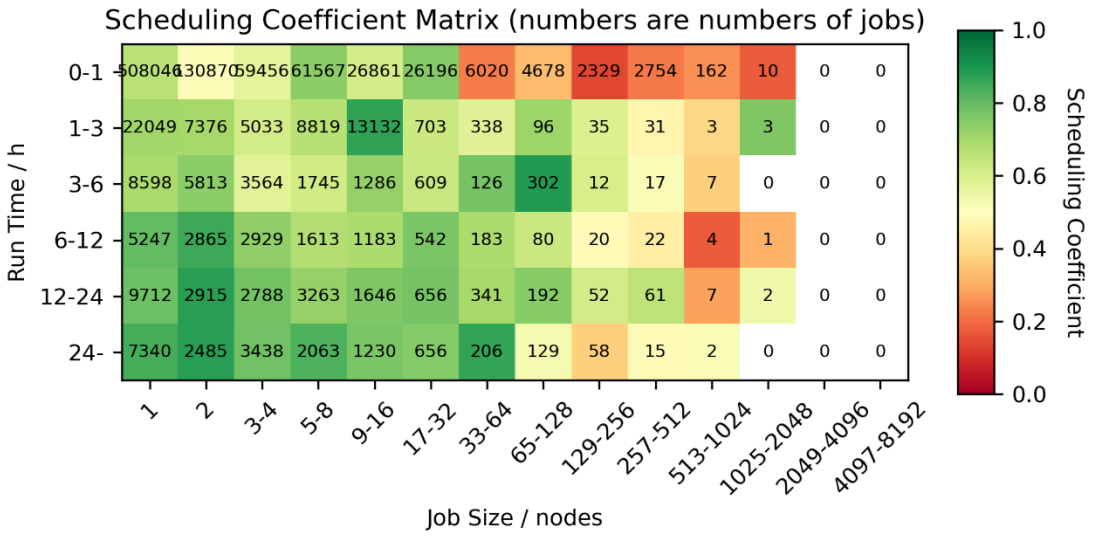


The stacked graph below shows the trend of charge and uncharged utilisation since the start of the service.



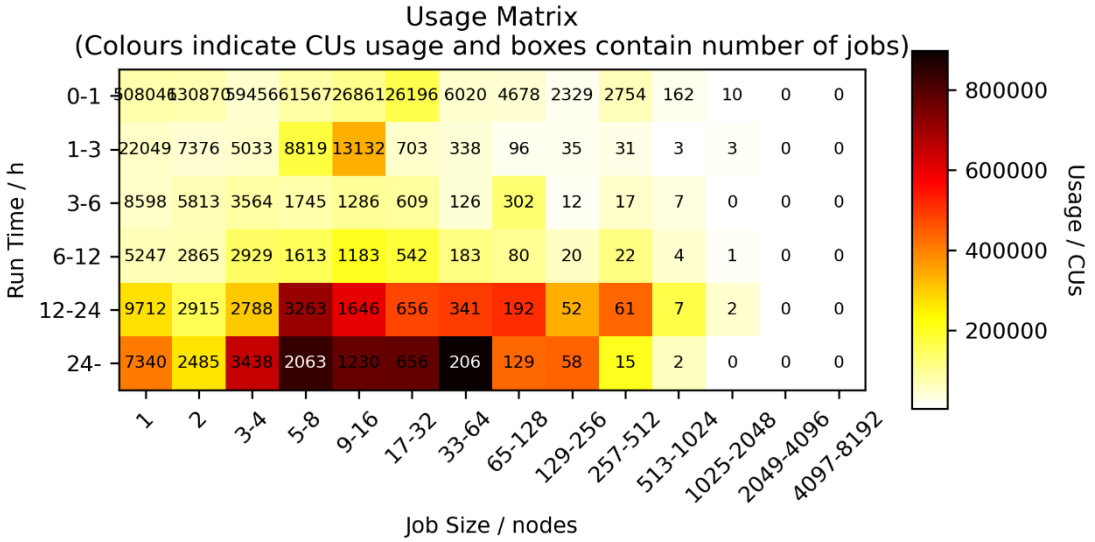
3.2 Scheduling Coefficient Matrix

The colour in the matrix indicates the value of the Scheduling Coefficient. This is defined as the ratio of runtime to runtime plus wait time. Hence, a value of 1 (green) indicates that a job ran with no time waiting in the queue, a value of 0.5 (pale yellow) indicates a job queued for the same amount of time that it ran, and anything below 0.5 (orange to red) indicates that a job queued for longer than it ran.



The usage heatmap below provides an overview of the usage on ARCHER2 over the quarter for different job sizes/lengths. The colour in the heatmap indicates the number of CUs expended for each class, and the number in the box is the number of jobs of that class.

It should be noted that there was an increase in the number of larger sized jobs during this quarter as users were encouraged to submit larger jobs during the data centre network maintenance session.



Appendix: Critical Success Factors

1. Context

EPCC have been asked by UKRI to provide quarterly data for a number of critical success factors:

- CSF04 Implementation of environmentally considerate energy policies
- CSF07 Deliver and maintain a reliable data I/O function
- CSF08 Be cost-effective, cost-efficient and drive towards lowering of operational costs

In the sections below, please find the relevant metrics and data.

2. CSF04 Implementation of environmentally considerate energy policies

Implementation of environmentally considerate energy policies with a drive to reducing costs and environmental impacts.

All electricity provided to the ACF and ARCHER2 is on a 100% green, renewable energy tariff.

Environmentally considerate policies: 4

Since the start of full Service, EPCC have worked on implementing the following policies:

- Move from High Performance Mode to Low Power Mode: reduced average power draw from 3.2 MW to 2.9 MW (9%) with negligible input on performance [May 2022]
- Reduced default processor frequency: further reduced average power to around 2.5 MW (19%) [December 2022]
- Increase in coolant temperatures: this will result in an increase in passive cooling ("free cooling") [ongoing]
- Developed a set of new tools to help users estimate the environmental impact of their computing simulations and workloads [November 2024]

Power Usage

	4Q 21*	**1Q 22**	**2Q 22**	**3Q 22**	**4Q 22**	**1Q 23**	**2Q 23**	**3Q 23**	**4Q 23**
Average Power	3.31	3.16	3.15	2.86	2.90	2.51	2.56	2.46	2.53
	1Q 24	**2Q 24**	**3Q 24**	**4Q 24**	**1Q 25**	**2Q 25**	**3Q 25****		
Average Power	2.58	2.54	2.64	2.57	2.55	2.55	2.52		

* Partial

**Does not include period of site downtime

So far, the average power draw has been reduced by around 0.7MW (21%) which will reduce electricity usage by up to 6M kWh per annum, significantly reducing annual running costs.

3. CSF07 Deliver and maintain a reliable data I/O function

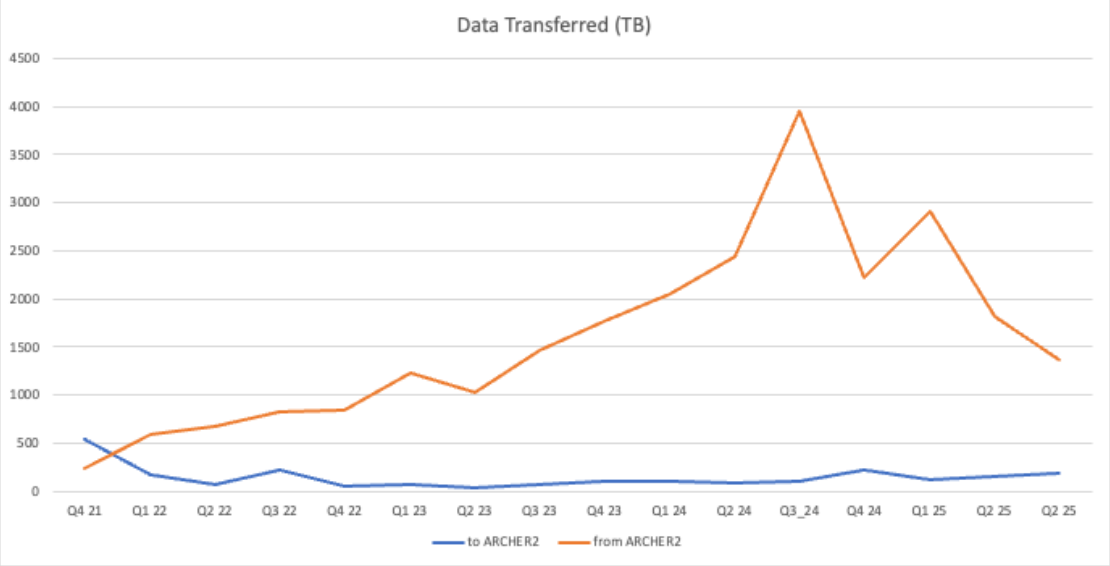
The compute resource will deliver and maintain an efficient, effective and reliable data I/O function which meets the requirements of users and their software. It will evolve and expand to accommodate new software or hardware architectures as required by the Service or its user base.

Data Transferred

EPCC monitor the data transfer rates in and out of the ARCHER2 system. Based on this, we now estimate the total amount of data transferred on and off ARCHER2 each Quarter.

Data Transferred…	**4Q21***	**1Q22**	**2Q22**	**3Q22**	**4Q22**	**1Q23**	**2Q23**	**3Q23**	**4Q23**
…to ARCHER2 (TB)	534	163	68	220	44	67	42	65	99
…**from** ARCHER2 (TB)	236	582	667	822	834	1231	1022	1472	1771
Data Transferred…	**1Q24**	**2Q24**	**3Q24**	**4Q24**	**1Q25**	**2Q25**	**3Q25**		
…**to** ARCHER2 (TB)	108	93	98	228	114	150	191		
…**from** ARCHER2 (TB)	2056	2443	3956	2227	2915	1815	1359		

* Partial



The amount of data moved off ARCHER2 has reduced from the previous quarter, however it remains higher than any point previous to 2024.

Parallel IO Write Performance

We regularly monitor the parallel write performance between the compute nodes and the parallel Lustre (/work) file systems. We use the benchio synthetic IO benchmark application[1] and report the MPI-IO write performance with the following settings:

- Global data structure of 2048^3: writes a single file of 65,536 MiB (64 GiB).
- Uses 16 compute nodes and 128 MPI processes per node.
- Uses UCX as the MPI transport protocol.
- Sets the following environment variables:
  - FI_OFI_RXM_SAR_LIMIT=64K
  - MPICH_MPIIO_HINTS="*:cray_cb_write_lock_mode=2,*:cray_cb_nodes_multiplier=4"

These settings have been found to maximise the IO performance for parallel writes using MPI-IO on the ARCHER2 file systems. Writes using the default settings on ARCHER2 typically have median write values 2-3 GiB/s lower than the optimised values.

Original reporting of this data (Q1 and Q2 2023) used the means from a small number of runs on the HDD-based Lustre file systems. From Q3 2023 onwards we have been monitoring performance regularly on both HDD and NVMe-based Lustre file systems throughout the quarter and report median (Q2) and lower (Q1) and upper quartile (Q3) performance and provide boxplots illustrating the performance variation. (On the boxplots, the green triangles mark the mean value and the whiskers extend to the last datapoint within the range 1.5 x IQR.)

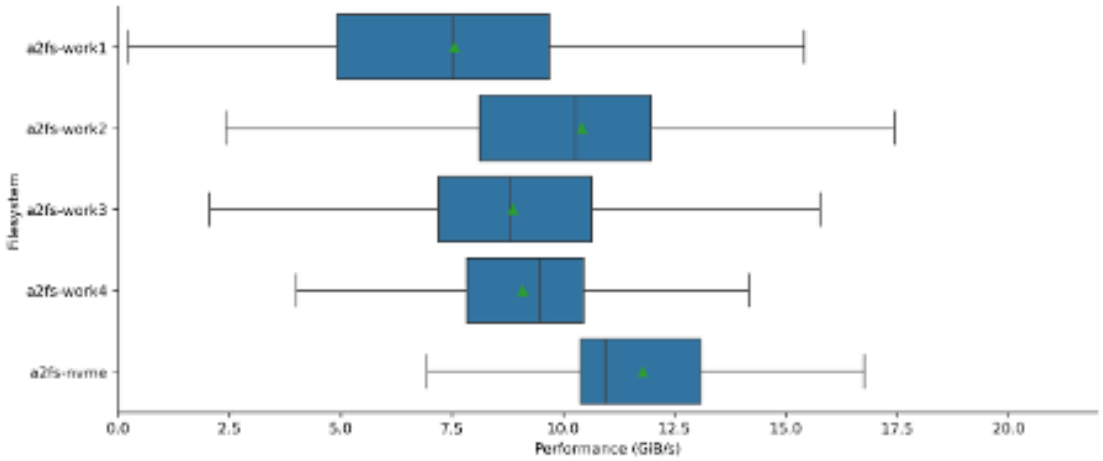
During Q1 2025, we have worked to remove data from a2fs-work1 as much as possible. With the usage of the file system now below 80% we see a significant improvement in performance compared to Q4 2024 where the usage on the file system was over 80%. We are working to ensure that usage on any of the ARCHER2 Lustre file systems does not go above 80% to try and maintain good performance for users on the service.

Benchio MPI-IO medium (GiB/s)	1Q23	2Q23		3Q23	4Q23	1Q24	2Q24	3Q24	4Q24
a2fs-work1	8.2	7.6±0.5		10.5 (8.8:11.8)	10.9 (8.3:12.5)	N/A	10.1 (7.0:11.8)	9.7 (6.7:11.9)	4.0 (2.0:9.6)
a2fs-work2	8.5	7.3±0.6		10.4 (7.2:12.4)	10.4 (7.7:13.0)	N/A	11.1 (8.0:12.5)	11.1 (8.1:13.1)	11.3 (7.1:15.0)
a2fs-work3	8.3	9.6±0.7		10.0 (8.2:11.6)	10.7 (8.1:11.9)	N/A	9.6 (8.4:11.8)	9.6 (7.5:11.8)	9.3 (7.0:11.6)
a2fs-work4					9.7 (9.1:10.2)	N/A	10.0 (9.2:10.8)	10.6 (9.4:11.6)	10.7 (9.5:11.7)
a2fs-nvme				10.1 (9.6:11.5)	10.1 (9.5:12.4)	N/A	11.1 (10.5:12.4)	11.6 (11.1:12.7)	10.7 (10.0:11.8)

Benchio MPI-IO medium (GiB/s)	1Q25	2Q25	3Q25
a2fs-work1	8.6 (5.0:11.1)	8.6 (6.4:11.7)	7.5 (4.9:9.7)

a2fs-work2	10.7 (8.1:12.7)	11.4 (8.9:12.6)	10.3 (8.1:12.0)
a2fs-work3	9.3 (7.7:11.6)	9.5 (7.3:11.7)	8.8 (7.2:10.6)
a2fs-work4	10.1 (8.8:10.9)	10.5 (9.0:11.3)	9.5 (7.8:10.5)
a2fs-nvme	11.3 (10.4:13.3)	11.0 (10.4:13.5)	10.9 (10.4:13.)

[1] https://github.com/davidhenty/benchio



4. CSF08 Be cost-effective, cost-efficient and drive towards lowering of operational costs

The Service shall be cost-effective and cost-efficient across its elements during its lifetime and drive towards lowering of operational costs by seeking efficiencies in delivery such that TCO presents an acceptable and cost-effective solution for the public. The Service will monitor and report its Power Usage Effectiveness (PUE) and strive to make efficiency savings where possible.

Relative Research Output

Measure	11/2021 – 5/2022	5/2022 – 12/2022	01/2023 – 12/2023	1Q 24	2Q 24	3Q 24	4Q 24
Relative Research Output per kWh	100	109	115	115	115	115	115
Measure	1Q 25	2Q 25	3Q 25				
Relative Research Output per kWh	115	115	115				

We define the initial measure of research output per KWh on ARCHER2 to be 100 and then estimate how this has changed with the introduction of the various environmentally considerate policies discussed under CSF04. This is estimated using applications benchmarks similar to those defined by UKRI for the procurement.

Energy Used per CU Delivered

	4Q21*	1Q22	2Q22	3Q22	4Q22	1Q23	2Q23	3Q23	4Q23	1Q24	2Q24	3Q24	4Q24	1Q25	2Q25
Energy per CU (kWh)	0.719	0.713	0.728	0.715	0.650	0.545	0.669	0.590	0.568	0.582	0.585	0.595	0.546	0.518	0.578

Energy Cost per CU Delivered

	4Q21*	1Q22	2Q22	3Q22	4Q22	1Q23	2Q23	3Q23	4Q23	1Q24	2Q24	3Q24	4Q24	1Q25	2Q25
Cost per CU (£)	£0.089	£0.090	£0.098	£0.096	£0.088	£0.074	£0.162	£0.143	£0.136	£0.140	£0.160	£0.164	£0.149	£0.142	£0.131

* Partial

The two tables above are calculated using the total CUs delivered by ARCHER2, the total kWh of electricity consumed, and the unit cost for kWh. The increase in “Energy Cost per CU Delivered” from 2Q23 is caused by a significant increase in the unit cost of electricity from April 2023. For 2Q23, there is also an impact on the “Energy Used per CU Delivered” from the major software upgrade that took 3 weeks. There was also an additional increase in the unit cost of electricity from April 2024.