

National Aeronautics and Space Administration

High-End Computing Capability

William Thigpen
HECC Component Manager
william.w.thigpen@nasa.gov

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Significant Accomplishments: Current & Future

Current

- Selected Monthly Accomplishments
- APP Team Significantly Speeds Up StellarBox IO
- Systems Experts Resolve DDN Issues, Implement Hot Pool Servers
- HECC Supports Unitary Plan Wind Tunnel, Red Rover
- HECC Supports 'Paradigm Shifting' Eclipse Modeling
- HECC Adds 100 Gbps Connectivity to CalREN Network
- HECC Achieves New Record Usage
- Accretion Disks Around Supermassive Black Holes
- Machine Learning for Convergence of SLS Simulations
- Automated Voronoi Meshing for Aero Simulations

Future

- Milan operational
- New hyperwall upgrade completed
- Virtual HECC user tour meetings

Selected Monthly Accomplishments

- **Improving Efficiency**
  - Successfully processed one day of Geostationary Operational Environmental Satellite (GOES-16) data using their open-source science pipeline management software, Ziggy, for the first time for GeoNEX. This work is funded by GeoNEX to incorporate Ziggy into their standard operations to simplify and incorporate robustness into GeoNEX processing of GOES satellite data. Future activities will include processing the entire 2023 GOES-16 dataset, instantiating automated processing operations, and extending the effort to other GOES satellites.
  - Completed a new automation script called Transmigration Prophecy, which generates a list of users whose accounts expired 90 days ago and sends an email to support@nas.nasa.gov. This triggers the process for Control Room analysts to archive the user data to the Lou archive filesystem. Automating this process ensures prompt removal of retired data from the Lustre filesystems, increasing capacity available to other users.
  - Began work on implementing Single Sign On (SSO) in the Remedy development environment to support multi-factor authentication for all nas.nasa.gov/ websites.
  - Fixed a bug with the MiniHUD (which delivers System Status on the HECC website) to ensure that it always loads completely on invocation. Previously, it would intermittently not load completely until the first refresh a minute later).
- **Improving System Stability**
  - Upgraded the Django web framework version 4.2 for the following: Reports API (internal tool for common configurations for Tools reporting); Reports (ad-hoc reports); Force Password Reset (internal tool for putting a user in a state that forces them to change their password on the next login); and the Data Portal download site. This brings the websites up to date with the current Long-Term Support (LTS) version of the Django web framework.
  - Tested a series of system configuration options on the Pleiades front-end system pfetest4, which has the potential to increase the stability of the PFEs. Several workloads were tested (NAS Parallel Benchmarks, MATLAB, Weather Research and Forecasting). Results showed that certain configurations seem successful in increasing front-end stability, yet concerns remain about the user experience in terms of which processes are culled and the error users will see—a “segfault,” which historically has been associated with a bug in the user code.

Selected Monthly Accomplishments (cont.)

- **Improving User Experience**
  - Worked with the Global Modeling and Assimilation Office (GMAO) to allocate more nobackupp28 storage; when the gmaofsct GID is over storage quota, users cannot run, leaving 850 Rome nodes idle in the reservations. The GMAO members are good stewards of the system and produce more data than can be archived daily. Implemented fail2ban service on the NAS Data Portal.
  - Worked with Altair to implement a stable workaround for Portable Bath System (PBS) reservations. The first test case is GMAO, and further reservations are waiting approval from their allocators. In addition, creating one large reservation for GMAO results in fewer buffer nodes, returning 64 Rome nodes to the general pool that would normally be left idle, equaling 260 SBUs per hour or 187,200 SBUs in a 30-day month.
  - Fixed a bug with the Data Portal user interface (UI) that was causing sorting to not work correctly with various file size abbreviations, (for example, MB, GB). Sorting now works as users have come to expect.
- **Release of RFP for Data Module**
  - The rescoped Data Module Request for Proposal was released to vendors on April 25. Next milestones are bidder questions are due May 16 and a module award on July 15.
- **Next-Generation hyperwall**
  - Following the March installation of the new displays in the hyperwall room, made progress on setting up the administrative infrastructure and developing application software and content.
- **Providing Access to Leading-Edge Systems**
  - Discussed with security staff various approaches to setting up a small prototype system(s) to test the Globus file management system. We plan to meet with a Globus representative to understand what is required to move forward with a prototype.
  - Released version 5.2.2. of the OpenMP Examples Document to the public on April 16. The document is available via Github. OpenMP is an important parallel programming model for multi-core CPUs and more recently for GPUs. Henry Jin serves as co-chair of the Examples subcommittee for the development of the OpenMP Examples Document, which is supplementary to the OpenMP specification.

Selected Monthly Accomplishments (cont.)

- **Outreach and Collaboration**
  - Worked with NASA Ames Office of Communications on the first of several planned articles on the Predictive Science real-time eclipse runs, Scientists Use NASA Data to Predict Solar Corona Before Eclipse. Submitted this work as an Orbit highlight and posted on the NAS homepage.
  - Released an announcement for the 2024 Virtual User Tours, scheduled for May 14 and May 22. Users also have the ability to reserve a one-on-one meeting with staff or ask questions in advance. Prepared presentation materials for the two events.
  - Reviewed and updated the HECC user communication digest procedures and templates and reposted the updated documents.
  - Visualization specialist Nina McCurdy, in collaboration with Ames research scientist Dan Witt, developed a visualization of the Estimating the Circulation and Climate of the Ocean-Darwin ocean biochemistry model showing nitrate transport via the Atlantic Meridional Overturning Circulation from 1992-2019. The visualization was presented at the 2024 ECCO Annual Meeting at the University of Texas and was well received. Witt said: "…your work is not only mind blowing, but visualizes a crucial feature of the Earth system in a novel way, which is remarkable given that this feature—the Atlantic Meridional Overturning Circulation—already played a leading role in a feature length film (The Day After Tomorrow). Either way, you certainly brought my science—and my scientific process—to life. Thanks".
  - The Surface Water Ocean Topography (SWOT) mission's data processing feasibility study, which is tasked with assessing hybrid computing approaches using AWS cloud computing and cloud services coupled with on-prem HPC computing at NAS, successfully integrated the Jet Propulsion Laboratory's cloud system with an on-prem NAS testbed. The team, which included Systems, Networks, Security, and the R&D groups, deployed a networking component (site-to-site VPN) along with a modified PBS (specialized directives). This allows the specialized cloud environment and the NAS testbed to work together, facilitating the optimization of workload placement across the two environments.

Selected Monthly Accomplishments (cont.)

- Other/NAS Operations
  - Completed the Remedy Parser script development, testing, and code review. When implemented, the script will parse the Remedy tickets master file and ensure that each user that has tickets will get the most current comma separated value (CSV) file to be displayed within the myNAS website. The next steps are to build the UI and complete the Jenkins deployment pipeline.
  - Completed the transition of the www server (and associated live backup hosts) and RMS from the 198.9.3.x VLAN to the new 198.9.8.x VLAN. These were the final hosts on the 198.9.3.x VLAN. This gets NAS one step closer to MAS separation.
  - Continued work on getting Aitken Milan nodes added to accounting and the various reports.
  - Fixed the data pipeline that produces the system utilization for Pleiades, Electra and Aitken that appears in the daily System Status email. Documented missing pieces from the existing documentation on the pipeline.
  - PIV-M MBE reached 100% with ASCS compliance above 99%.

APP Team Significantly Speeds Up StellarBox IO

- The Application Performance and Productivity (APP) team obtained a significant speed up of StellarBox by building and running with OpenMPI 4.1.3, which uses the Open MP IO (OMPIO) collective MPI IO algorithms.
- Stellarbox, developed in the NASA Advanced Supercomputing (NAS) Division, is a 3D magnehydrodynamics code used to simulate the upper part of the convection zone and the lower part of the atmosphere of the Sun and other stars.
- HECC workloads typically use the vendor-supplied MPT version of MPI, which is superior for many MPI-based applications, but uses the slower ROMIO for collective IO.
  - MPT 2.28 uses only the ROMIO algorithm for collective writes (MPI_File_write_ordered).
- The APP team chose to use the OMPIO algorithm, which is significantly faster for the IO routine (MPI_File_write_ordered) in OpenMPI.
  - Several variants of OMPIO were tried but the default parameters were fastest. OpenMPI 4.x uses the OMPIO algorithm by default and has options for various algorithms including ROMIO.
- Parallel IO takes over 80% of the run time using MPT and around 20% of the time using OpenMPI..

IMPACT: StellarBox is one of the most used codes running on HECC systems. This speedup significantly increases simulation productivity and provides more efficient use of HECC systems.

Cluster	MPI	Total	Comm.	IO	Speed up
Cascade Lake Atikin	MPT	2468	289	2133	
	OMPI	535	372	120	4.6
Rome Aitken	MPT	7281	NA	6003	
	OMPI	786	595	152	9.3
Sky Lake Electra	MPT	6132	300	5786	
	OMPI	538	376	119	11.4

Total wall-clock time, communication time, and MPI-IO time in seconds for 1,000 iterations of a StellarBox example run on various HECC platforms using two different versions of MPI: MPT 2.28 and OpenMPI 4.1.3.

Systems Experts Resolve DDN Issues, Implement Hot Pool Servers

- The HECC Systems team worked with vendor engineers to troubleshoot and resolve several performance and stability problems that occurred on the DataDirect Network (DDN) filesystems. These storage systems are high-performance, low latency filesystems that serve all of HECC's large-scale HPC environment, with many thousands of compute nodes communicating with the DDN systems and unique user storage access patterns.
- DDN/Lustre filesystem instability: The DDN systems are designed to be fault tolerant, with the filesystem servers being configured in a redundant, "failover" fashion. This allows a filesystem server to fail without interrupting its availability. The HECC DDN systems were experiencing a failure to fail over. DDN engineers resolved the instability issue by suggesting the use of specialized hot pool servers and the filesystems are stable once again.
- DDN Hot Pools migration: The DDN systems offer 18 petabytes (PB) of spinning disk with 1 PB of faster, solid state drives (SSDs). When users write data to the filesystems, it is first written to the fast SSDs and later transferred to the spinning disk. The work of determining which data needs to be moved at what time is a processor-intensive process. Due to HECC's unique combination of storage access patterns when users write data, the solution has been to provide DDN Hot Pool migration servers to offload this analysis work, which stabilizes the filesystem servers.

IMPACT: The improved DDN storage systems have increased filesystem stability and performance, significantly increasing availability for agency users.

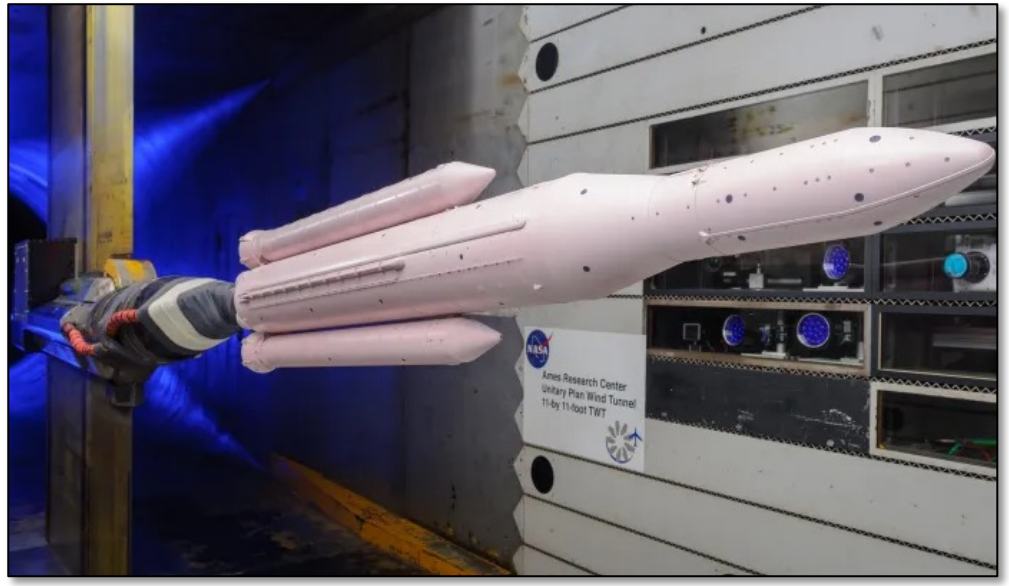


Photo of the DataDirect Networks (DDN) storage hardware at the NASA Advanced Supercomputing facility. *Don Story, NASA/Ames*

HECC Supports Unitary Plan Wind Tunnel, Red Rover

- With support from HECC, the NASA Ames Unitary Plan Wind Tunnel (UPWT) team successfully performed initial large-scale testing of the Unsteady Pressure Sensitive Paint (uPSP) application, culminating a multi-year, complex project called Red Rover.
- The HECC Systems and Security teams, along with the NASA Advanced Supercomputing (NAS) Division Research & Development team and the UPWT team, jointly developed and deployed the complex data streaming and analysis system, which performed as expected during the first full wind tunnel test.
- The test streamed data from wind tunnel cameras to the UPWT data cache system, from which sensor data flowed to the NAS facility for further analysis and evaluation in the HECC environment.
- The work enables the UPWT team to leverage the agency's high-end computational, storage, and visualization capabilities efficiently and in two modes: coupled mode, which collects test results and sends those results to the NAS facility in near-real-time, or standalone mode, which collects test results and copies those results to NAS at a later time.

IMPACT: Coupling the physical wind tunnel facility with the NAS facility to stream sensor data to the HECC enclave and data visualization environment may enable rapid analysis of results and potentially assist in driving experimentation in real time.

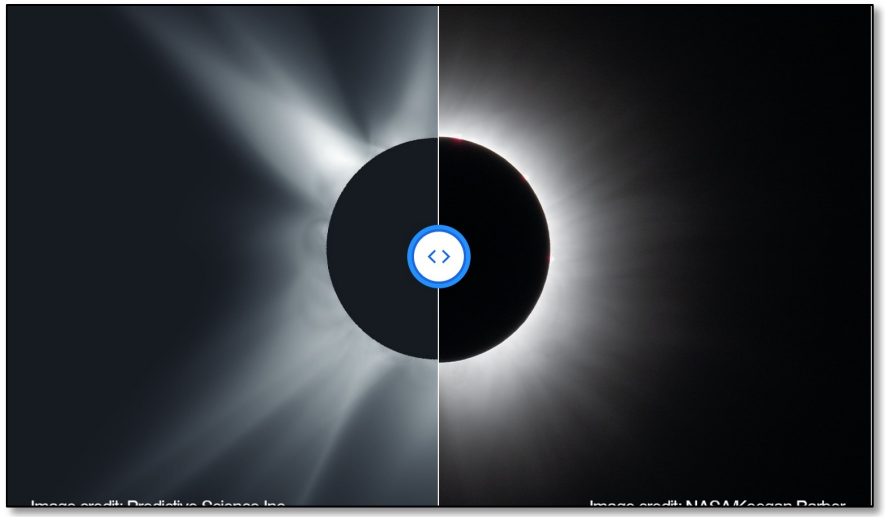


The Space Launch System model in the 11-by 11-foot TWT Wind Tunnel facility. *Dominic Hart, NASA*

HECC Supports ‘Paradigm Shifting’ Eclipse Modeling

- In March and April, the User Services and Systems teams worked closely with Predictive Science, Inc. users to establish a special queue with flexible architecture and heightened priority to ensure near-real-time runs on the HECC resources ahead of the April 8 Total Solar Eclipse, the centerpiece of NASA's Big Year in Heliophysics.
  - The work required near real-time access to dedicated computing resources, so contention for architectures could have been an obstacle. To mitigate this risk, HECC analysts set up a special queue with highest priority to allow the eclipse team to have versatility in the computer architectures.
  - Computational jobs ran continuous, real-time calculations on 100 of the Electra supercomputer’s Intel Xeon Gold 6148 (Skylake) nodes, with access to the other systems available as backup.
  - HECC User Services experts closely monitored jobs and stayed in contact with the users to ensure the project meets its milestones.
- The Predictive Science team published updates starting three weeks prior and up to the totality on April 8. The key for this effort was the ability to start/restart jobs quickly to maintain the continuous model providing updates in real-time. The model accurately predicted several details, including long streamers with minor misalignment, likely due to new activity on the far side of the Sun which could not be seen, affecting the appearance of the corona. Once the new activity was incorporated, the model more closely matched observational photos of the corona.

IMPACT: This work aims to demonstrate a paradigm shifting capability in solar coronal modeling, leveraging new capabilities to produce a continuously running time-dependent prediction model that is updated in real time with the latest measurements of the Sun's magnetic field from NASA’s Solar Dynamics Observatory spacecraft.

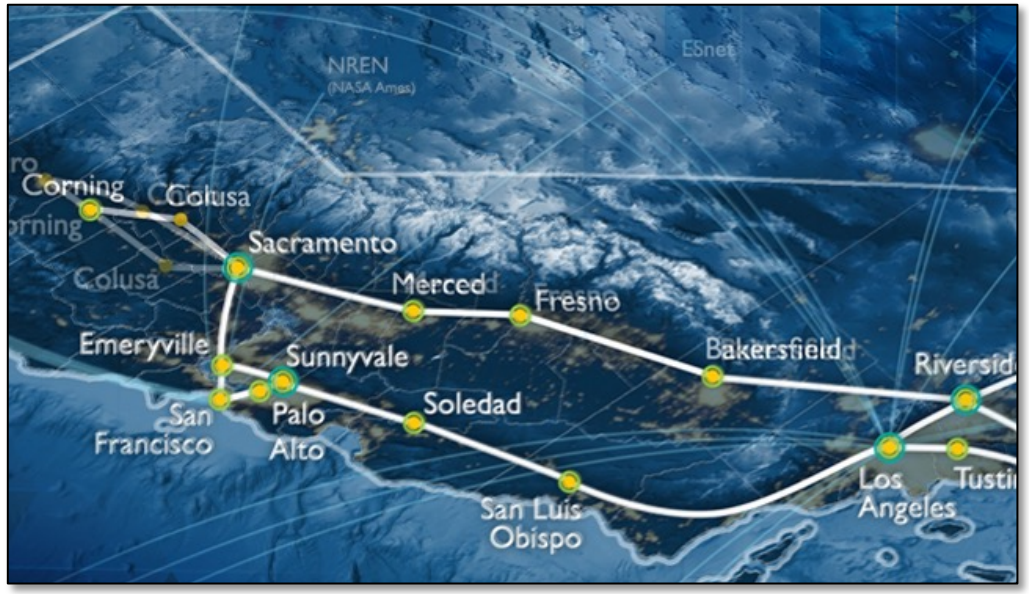


Snapshot of the Predictive Science coronal forecast compared to actual eclipse. *Image credit Predictive Science and Keegan Barber, NASA*

HECC Adds 100 Gbps Connectivity to CalREN Network

- The HECC Networks group established new 100 Gigabit per second (Gbps) connectivity to the high-speed California Research and Education Network (CalREN) network operated by the Corporation for Education Network Initiatives in California (CENIC).
  - The CalREN network provides high-speed network connectivity to research and educational institutions throughout California, as well as to other institutions nationwide via the Internet2 network.
  - The CalREN-Internet2 network path also provides high-speed connectivity to cloud providers such as Amazon Web Services (AWS).
- Building on previous work to upgrade the NAS facility's internal network to support 100 Gbps, this is the first 100 Gbps connection between NAS and an external network.
- As other existing partner networks increase their capacity, the Networks group will also be able to increase the NAS connections to 100 Gbps.

IMPACT: HECC users now have increased network bandwidth to many partner institutions, enabling faster file transfers.



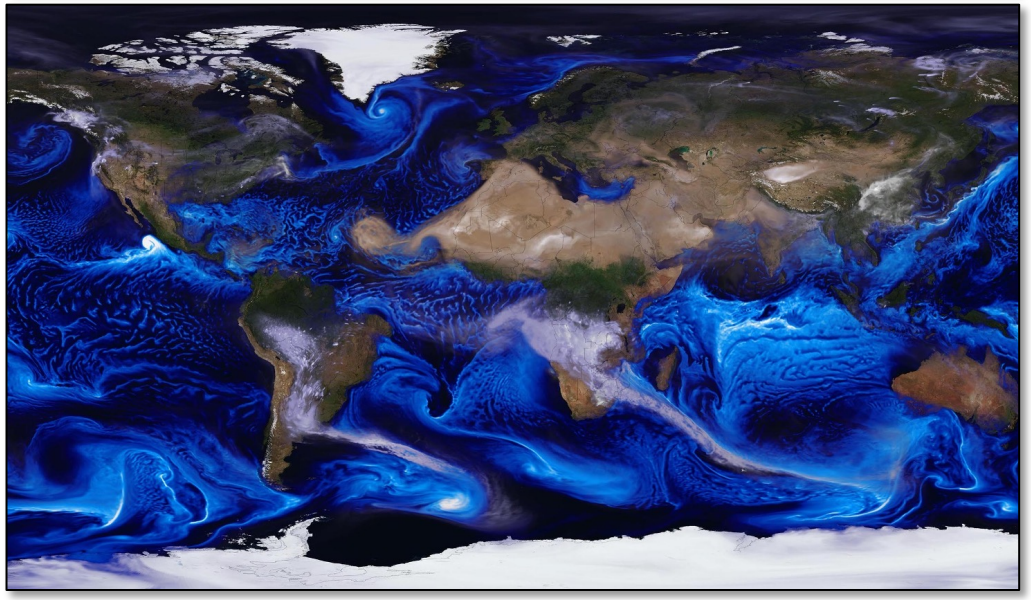
Overview of the CalREN Network.
https://cenic.org/network/operations/maps/network-maps

HECC Usage Sets New Normalized Record

- In April, the combined usage of HECC supercomputers set a new normalized record of 17,418,475 Standard Billing Units (SBUs*).
- The usage by 382 of NASA's science and engineering groups exceeded the previous normalized record of 16,059,855 SBUs set in February 2024 by 1,241,315 SBUs.
- The record was achieved in great part by the Science Mission Directorate supporting many high-resolution simulations with the Goddard Earth Observing System (GEOS) for future observing system development. These simulations approach 1.5 kilometers globally, and focus has been placed on extreme events and storm-scale processes in these simulations.
- Usage of Aitken, Pleaides, Electra, Endeavour, and Cabeus contributed to this record. The new record is greatly attributed to the Aitken Rome nodes, with 128 cores per node and increased use of Cabeus Milan A100 GPUs.
- The top 10 projects' usage ranged between 318,717 and 2,367,138 SBUs, and together accounted for over 47% of the total usage.
- The HECC Project continues to evaluate and plan resources to address the future requirements of NASA's users.

**1 SBU represents the work that can be done in 1 hour on a Pleaides Broadwell 28-core node.*

IMPACT: The increased capacity of HECC systems and expert support to help users optimize their run capacities provide mission directorates with more resources to accomplish their goals and objectives.

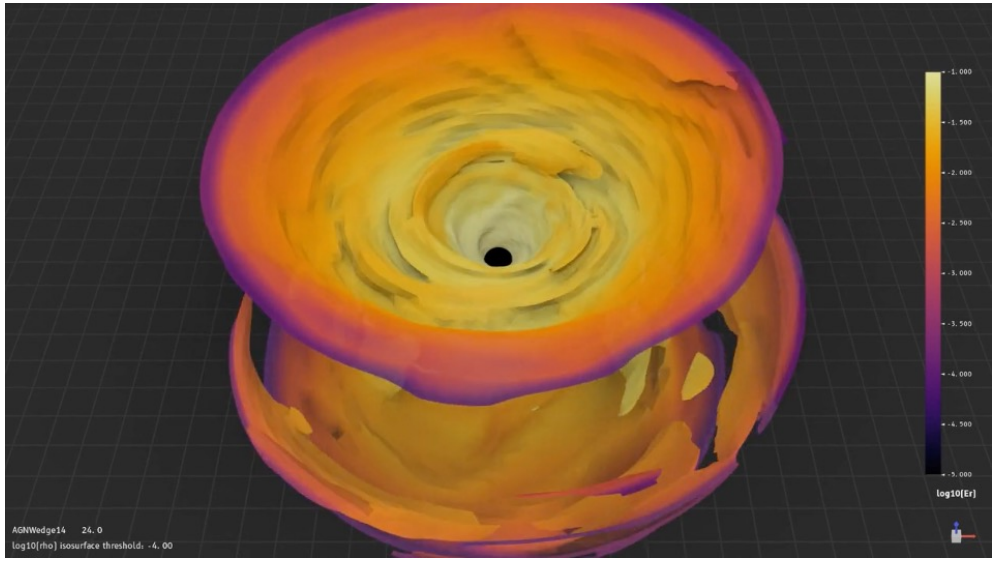


Snapshot of forecasted aerosol optical depth from the GEOS model at 12-kilometer horizontal resolution, with blue plumes representing sea salt; white, carbon; and brown, dust. Features visible are dust plumes streaming from the Sahara into the Atlantic, carbon emissions from fires in Africa, and cyclones traced by sea salt in the Pacific.
William Putman, NASA/Goddard

Accretion Disks Around Supermassive Black Holes*

- Scientists from the Flatiron Institute's Center for Computational Astrophysics ran 3D magnetohydrodynamics simulations on HECC's Aitken supercomputer to study accretion disks around active galactic nuclei (AGNs)—luminous phenomena containing supermassive black holes at the center of many galaxies.
- Results demonstrated, for the first time, that accretion disks around AGNs likely have a thin accretion layer near the disk midplane and a much more extended optically thick layer on top of the disk due to rotationally amplified magnetic fields.
- The simulations revealed the important role of magnetic fields for transporting angular momentum and for supporting the vertical structure of the accretion disk; showed how UV/optical photons are generated; and may explain various phenomena seen when AGN observations are compared with the traditional disk models.
- Based on these simulations, the researchers will calculate broadband spectra and compare them with observed spectra of AGNs—a critical step for verifying the simulation results.

IMPACT: The simulation results can help build the next generation of accretion disk models for AGNs to help astrophysicists study the structure of galaxies—supporting NASA's strategic objective to understand the Sun, solar system, and universe.



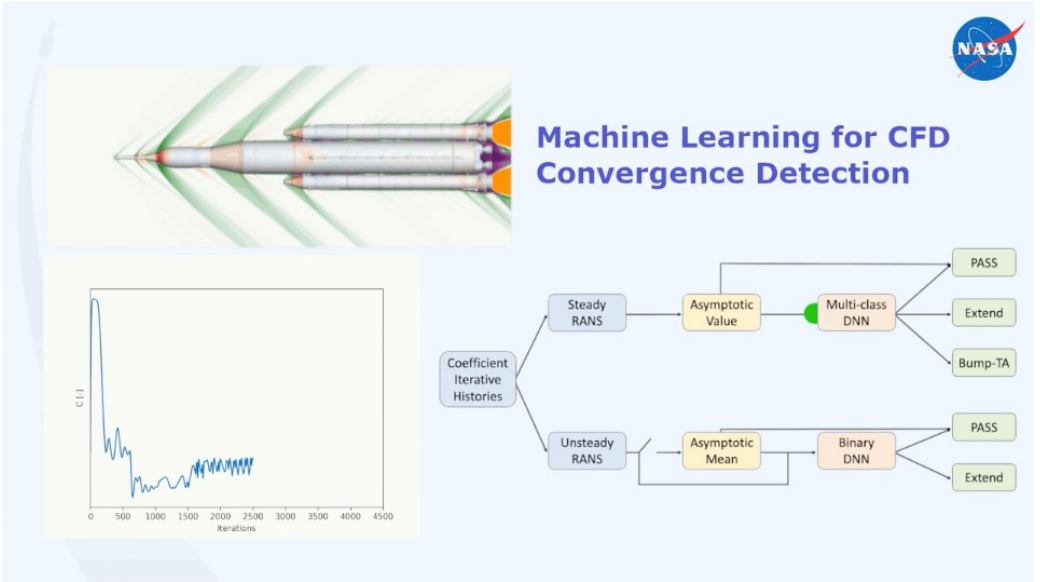
Visualization showing density evolution of an accretion disk around a supermassive black hole. Density isosurface corresponds to color. Gas heats up when it flows toward the black hole, photons are emitted from the disk surface, and magnetic fields are amplified. *Yan-Fei Jiang, Flatiron Institute; Patrick Moran, NASA/Ames*

** HECC provided supercomputing resources and services in support of this work.*

Machine Learning for Convergence of SLS Simulations*

- A team of aerodynamics engineers at NASA Ames used HECC resources to conduct thousands of computational fluid dynamics (CFD) simulations for ascent and booster separation of the Space Launch System (SLS). A critical and challenging component of their work was determining when the simulation has sufficiently converged on a solution.
- The team trained deep neural networks using aerodynamic databases to classify CFD simulations in the same way as expert human engineers.
- Each neural network was trained on thousands of CFD simulations that were run on the Pleiades, Electra, and Aitken supercomputers over the duration of the SLS program, using the NASA's CFD code FUN3D.
- Results extracted from CFD simulations run by an engineer and CFD simulations run by the artificial intelligence models are nearly identical.
- Future work is focused on generalizing the neural networks to work on a broad range of aerodynamic problems, as well as with multiple CFD solvers such as OVERFLOW and Cart3D.

IMPACT: Automating CFD convergence detection with deep neural networks marks a transformative leap toward precision and efficiency in NASA's Artemis Program, and sets a foundation for larger implementation of artificial intelligence in the daily work of engineers.



Animation showing the classification of computational fluid dynamics iterative history. *Joshua Diaz, Derek Dalle, NASA/Ames*

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Automated Voronoi Meshing for Aero Simulations*

- Recent advancements in high-performance computing have accelerated the adoption of wall-modeled large-eddy simulations (WMLES) as a tool for practical applications in the aerospace industry. However, creating the large-scale, high-quality meshes required for the simulations prevents more widespread usage.
- To tackle this issue, computational fluid dynamics (CFD) experts at NASA Ames are developing an unstructured solver-mesher pair for the agency's Launch Ascent and Vehicle Aerodynamics (LAVA) software using unstructured Voronoi grids to greatly reduce the computational and human resources needed to generate these high-quality meshes while producing accurate results on par with hand-tailored meshes.
- Using this method, the team was able to resolve differences in cells that were four millimeters apart in the flow field surrounding half of a 60-meter-wingspan aircraft. The simulations ran over two days and required 100 Rome nodes on the Aitken supercomputer.
- The LAVA team is working on increasing the performance of the new mesher by introducing a load-balanced parallel computation of the unstructured Voronoi mesh, as well as improving the solver by using GPUs to reduce the time each simulation needs to run.

IMPACT: This work is part of an effort to meet NASA's goal of having the capability to certify aircraft readiness through the analysis of simulations, in addition to helping engineers decrease design uncertainties of new vehicles and configurations.



Surface contours of the friction coefficient experienced by NASA High-Lift Common Research model at an angle-of-attack of 19.7 degrees, where small-turbulent fluctuations are visible. Dark regions highlight locations where flow separation is likely to occur. *Victor Sousa, Emre Sozer, NASA/Ames*

** HECC provided supercomputing resources and services in support of this work.*

Papers

- "**A Streamline Coordinate Analysis of a Turbulent Boundary Layer Subject to Pressure Gradients and Curvature on the Windward Side of a Bump**," A. Prakash, et al., *Journal of Fluid Mechanics (Cambridge)*, vol. 984, April 1, 2024. * https://www.cambridge.org/core/journals/journal-of-fluid-mechanics/article/streamline-coordinate-analysis-of-a-turbulent-boundary-layer-subject-to-pressure-gradients-and-curvature-on-the-windward-side-of-a-bump/3BF81449CD43030A6EF0B756DBB48EBA
- "**Electron Heating in 2D Particle-in-Cell Simulations of Quasi-Perpendicular Low-Beta Shocks**," A. Tran, L. Sironi, *The Astrophysical Journal*, vol. 965, no. 1, published online April 2, 2024. * https://iopscience.iop.org/article/10.3847/1538-4357/ad1f69/meta
- "**NGTS-30 b/TOI-4862 b: An 1 Gry Old 98-Day Transiting Warm Jupiter**," M. Battley, et al., arXiv:2404.02974 [astro-ph.EP], April 3, 2024. * https://arxiv.org/abs/2404.02974
- "**Design and Optimization of an Intensified Sustainable Plant to Produce Biojet Fuel using the ATJ Process**," B. Huerta-Rosas, et al., *Chemical Engineering and Processing – Process Intensification*, vol. 200, published online April 6, 2024. * https://www.sciencedirect.com/science/article/abs/pii/S0255270124001120
- "**An Improved BRDF Hotspot Model and Its Use in VLIDORT for Studying the Impact of Atmospheric Scattering on Hotspot Directional Signatures in the Atmosphere**," X. Xiong, et al., *Atmospheric Measurement Techniques*, vol. 17, issue 7, published online April 8, 2024. * https://amt.copernicus.org/articles/17/1965/2024/amt-17-1965-2024.html

** HECC provided supercomputing resources and services in support of this work.*

Papers (cont.)

- "**Planet Formation by Gas-Assisted Accretion of Small Solids**," G. D'Angelo, P. Bodenheimer, arXiv:2404.05906 [astro-ph.EP], April 8, 2024. *
  https://arxiv.org/abs/2404.05906
- "**Synthetic Spectra from Particle-in-Cell Simulations of Relativistic Jets Containing an Initial Toroidal Magnetic Field**," I. Dutan, et al., arXiv:2404.07392 [astro-ph.HE], April 10, 2024. *
  https://arxiv.org/abs/2404.07392
- "**The Solar Dynamo Begins Near the Surface**," G. Vasil, et al., arXiv:2404.07740 [astro-ph.SR], April 11, 2024. *
  https://arxiv.org/abs/2404.07740
- "**Numerical Investigation of the Effect of Trailing Edge Thickness of Simulated Ceramic Matrix Composite Blades on Loss Profiles**," K. Miki, A. Ameri, *Journal of Turbomachinery,* vol. 146, issue 9, published online April 16, 2024. *
  https://asmedigitalcollection.asme.org/turbomachinery/article-abstract/146/9/091009/1198898/Numerical-Investigation-of-the-Effect-of-Trailing
- "**TOI-4336 A b: A Temperate sub-Neptune Ripe for Atmospheric Characterization in a Nearby Triple M-Dwarf System**," M. Timmermans, et al., arXiv:2404.12722 [astro-ph.EP], April 19, 2024. *
  https://arxiv.org/abs/2404.12722
- "**Cross-Comparison of Observations with the Predictions of Global Hybrid Simulations for Multiple IMF Discontinuities Impacting the Bow Shock and Magnetosheath**," S. Lee, et al., *Journal of Geophysical Research: Space Physics*, vol. 129, issue 4, published online April 22, 2024. *
  https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2023JA032328

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Papers (cont.)

- "**Halo Asymmetry in the Modeling of Galaxy Clustering**," A. Durkalec, et al., *The Astrophysical Journal*, vol. 966, no. 1, published online April 26, 2024. *
  https://iopscience.iop.org/article/10.3847/1538-4357/ad36c6/meta
- "**Pre-Peak Emission in Tidal Disruption Events**," X. Huang, et al., arXiv:2401.18446 [astro-ph.HE], April 29, 2024. *
  https://arxiv.org/abs/2404.18446
- "**Planet Hunters TESS. V. A Planetary System Around a Binary Star, Including a Mini-Neptune in the Habitable Zone**," N. Eisner, et al., *The Astronomical Journal*, vol. 167, no. 5, published online April 30, 2024. *
  https://iopscience.iop.org/article/10.3847/1538-3881/ad1d5c/meta

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Presentations

- "**2023 TTX Impact Risk Assessment**," L. Wheeler, J. Dotson, G. Chomette, A. Coates, M. Aftosmis, E. Stern, D. Mathias, presented at the NASA/FEMA Planetary Defense Interagency Tabletop Exercise 5 in Laurel, MD, April 2-3, 204.
- **The Triennial Earth-Sun Summit 2024**, Dallas, TX, April 7-12, 2024.
  - "**Impacts of Solar Rotation on the Helioseismic Ring-Diagram Analysis and Observed Properties of the Photosphere**," I. Kitiashvili.
  - "**Surrogate Modeling of Subgrid Turbulent Transport in Application to Stellar Box Simulations**," I. Kitiashvili.
  - "**Space Radiation in Earth Environment with Radiation Data Portal**," I. Kitiashvili.

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News and Events

- **Scientists Use NASA Data to Predict Solar Corona Before Eclipse,** NASA, April 2, 2024—In anticipation of the solar eclipse on April 8, 2024, scientists at Predictive Science are using data from NASA's Solar Dynamics Observatory (SDO) to predict what our Sun's crown may look like on that day. Pleiades is specifically cited in the second paragraph, "What's more, their model uses the computational efforts of NASA's Pleiades supercomputer to update its predictions in near real-time. This means that the model continuously updates its predictions as it ingests data beamed down from SDO, providing information as close to real-time as possible".
  https://science.nasa.gov/solar-system/skywatching/scientists-use-nasa-data-to-predict-solar-corona-before-eclipse/
- **'Vast and Rich:' Studying the Ocean with NASA Computer Simulations**, NASA Ames, April 22, 2024—The NAS Division's Visualization and Data Analysis team develops stunning images and videos to help scientists explore their ocean data using in-house developed analysis tools. Visualization researcher Nina McCurdy is thrilled to "to collaborate with devoted, world-class scientists doing such important, cutting-edge research." The team offers both traditional and customized services to help users process, view, explore, and analyze complex scientific datasets.
  https://www.nasa.gov/image-article/vast-and-rich-studying-the-ocean-with-nasa-computer-simulations/

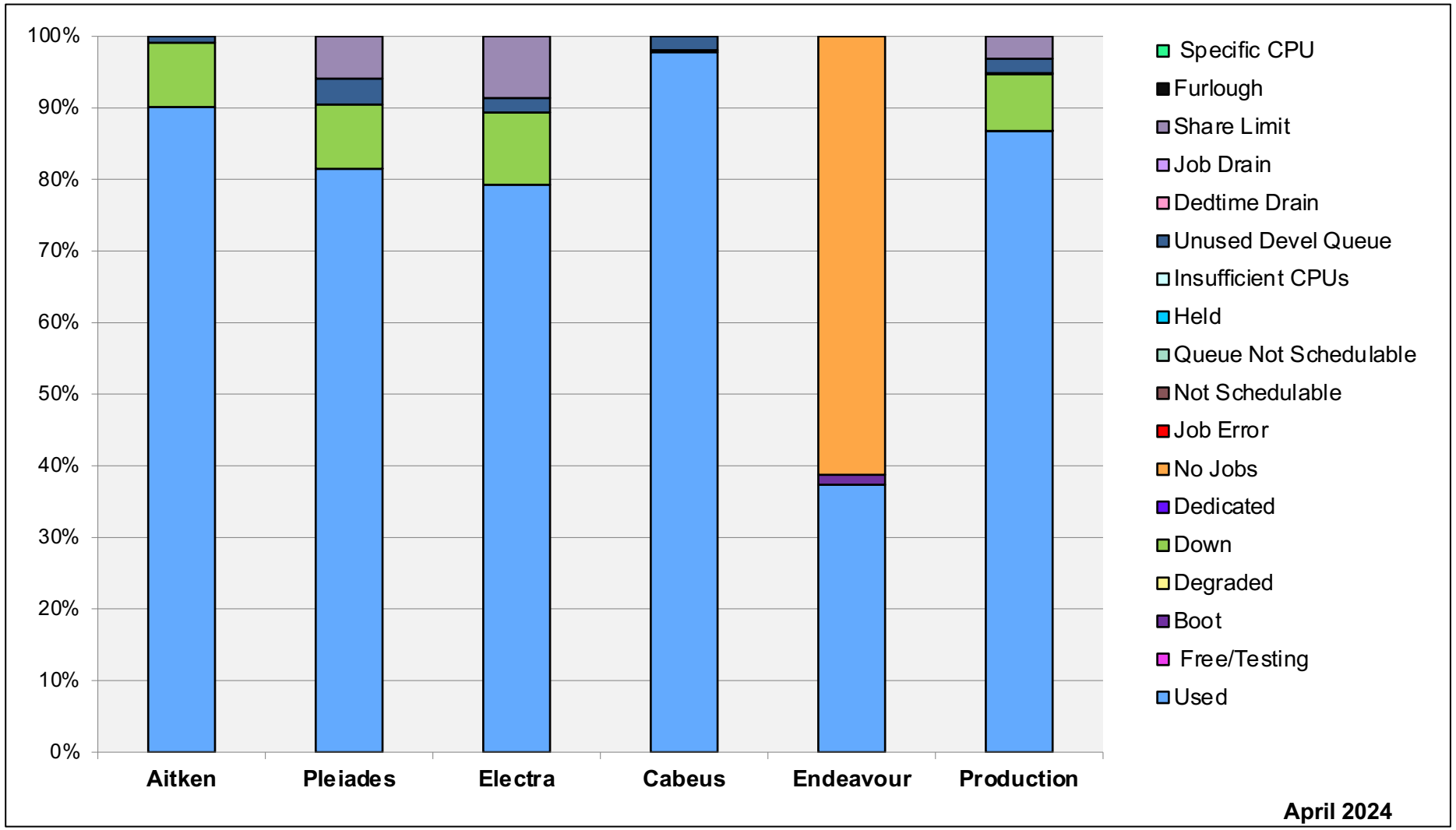
** HECC provided supercomputing resources and services in support of this work.*

News: Social Media

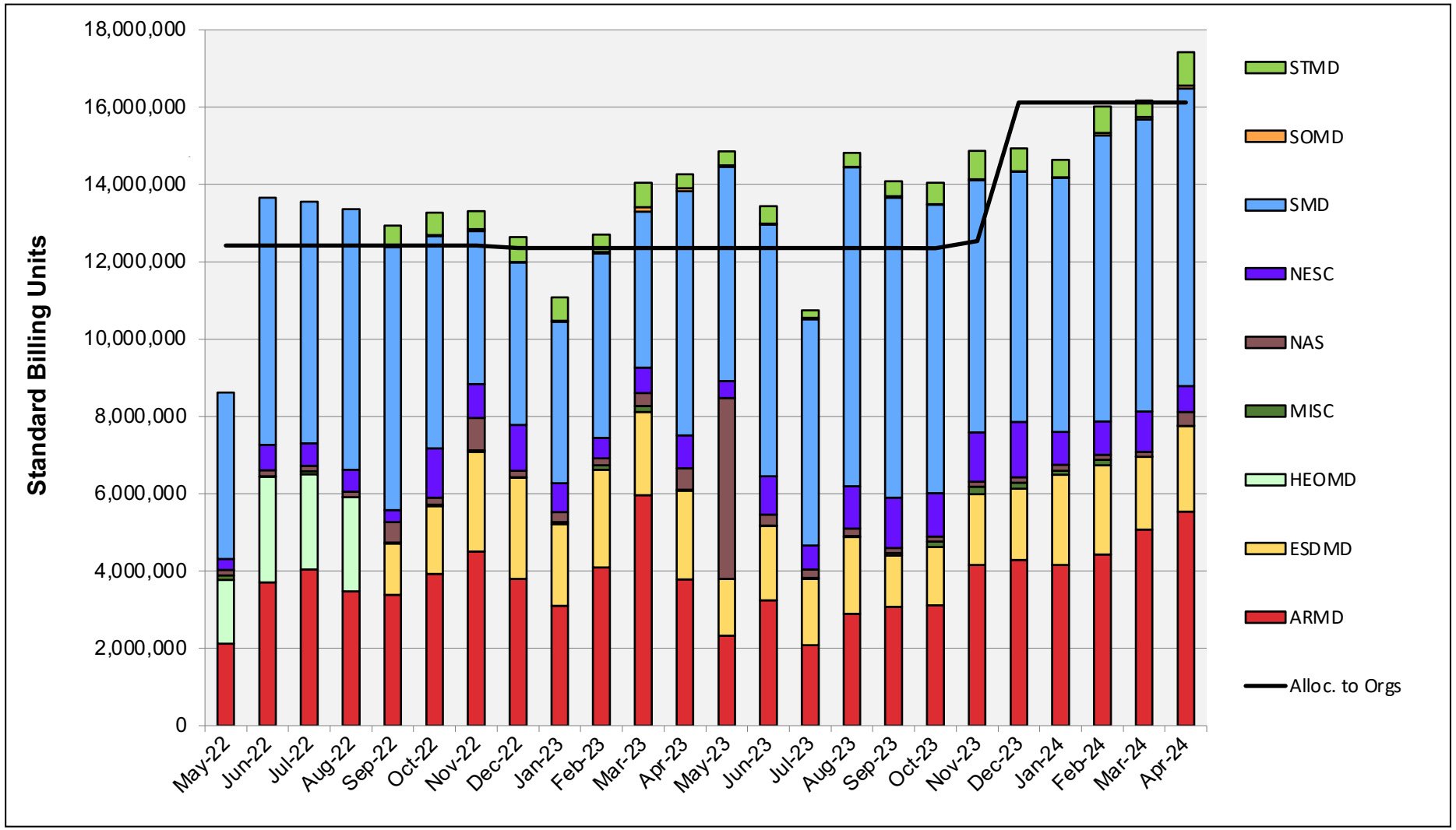
- **North American Solar Eclipse (April 8)**
  - NASA Advanced Supercomputing: X 10 reposts, 24 likes.
  - NASA Supercomputing: Facebook 14 likes, 6 shares.
- **Earth Day (April 22)**
  - NASA Advanced Supercomputing: X 2 reposts, 4 likes.
  - NASA Supercomputing: X 3 reposts, 10 likes; Facebook 17 likes.

** HECC provided supercomputing resources and services in support of this work.*

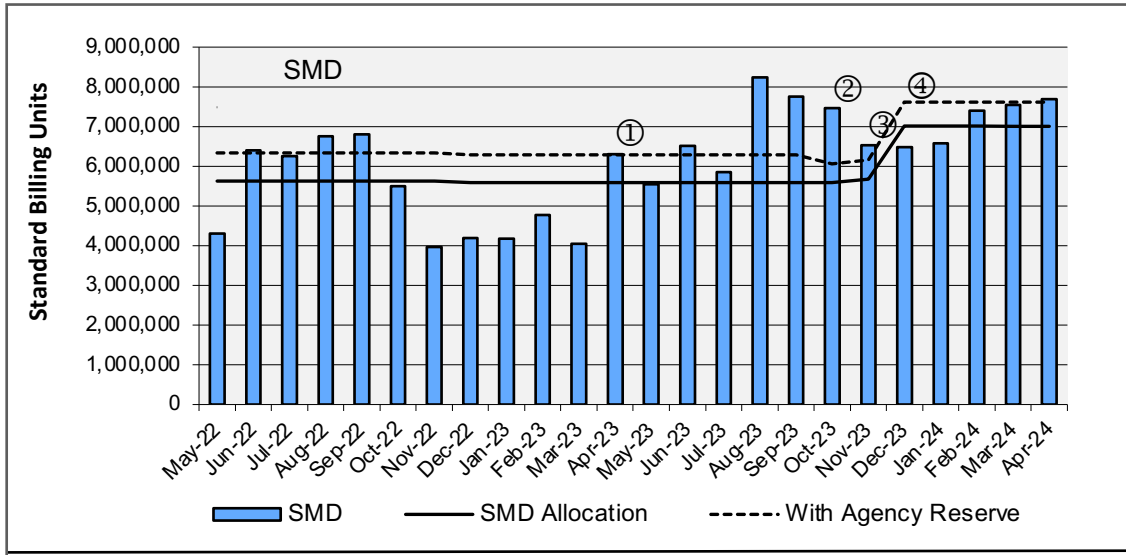
HECC Utilization

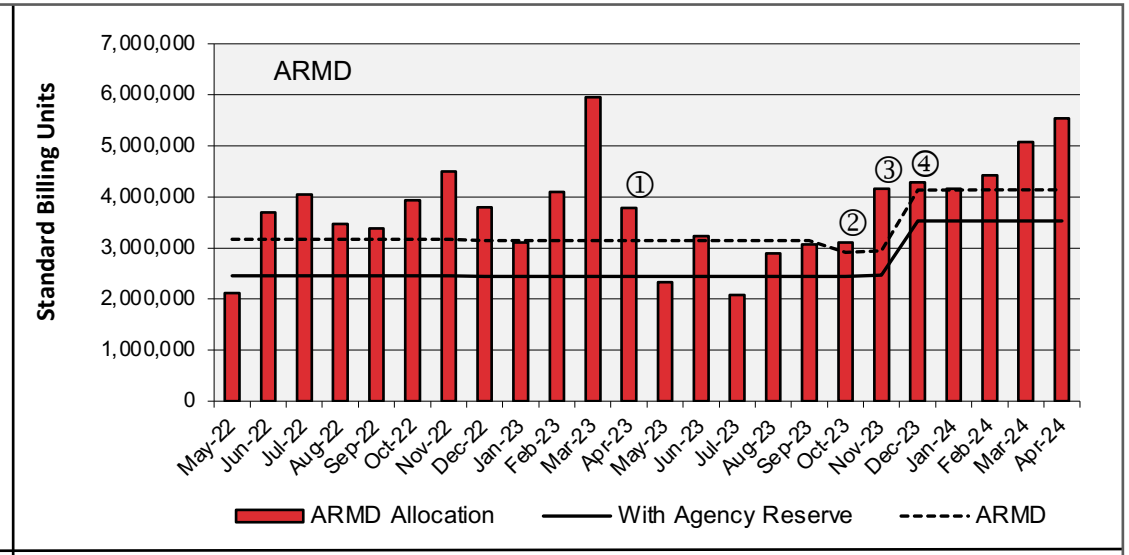


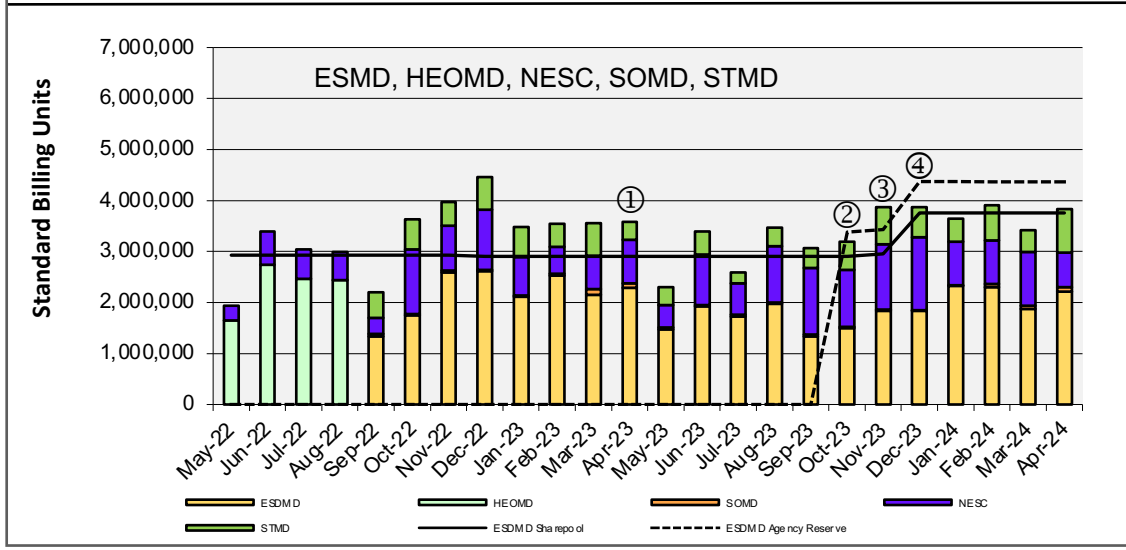
HECC Utilization Normalized to 30-Day Month



HECC Utilization Normalized to 30-Day Month







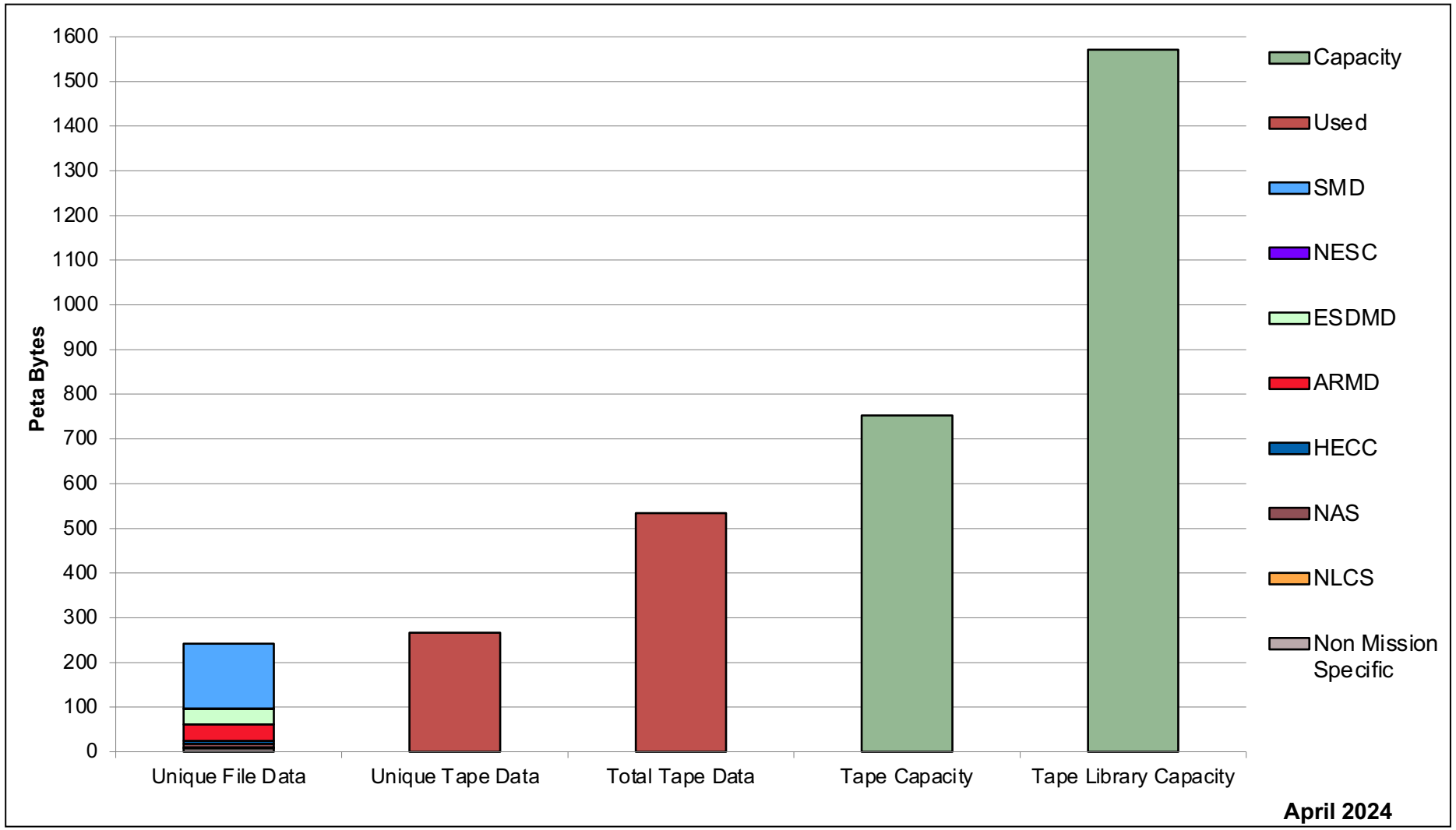
① 4 Rome Apollo Racks added to Aitken

② 4 Rome Apollo Racks added to Aitken

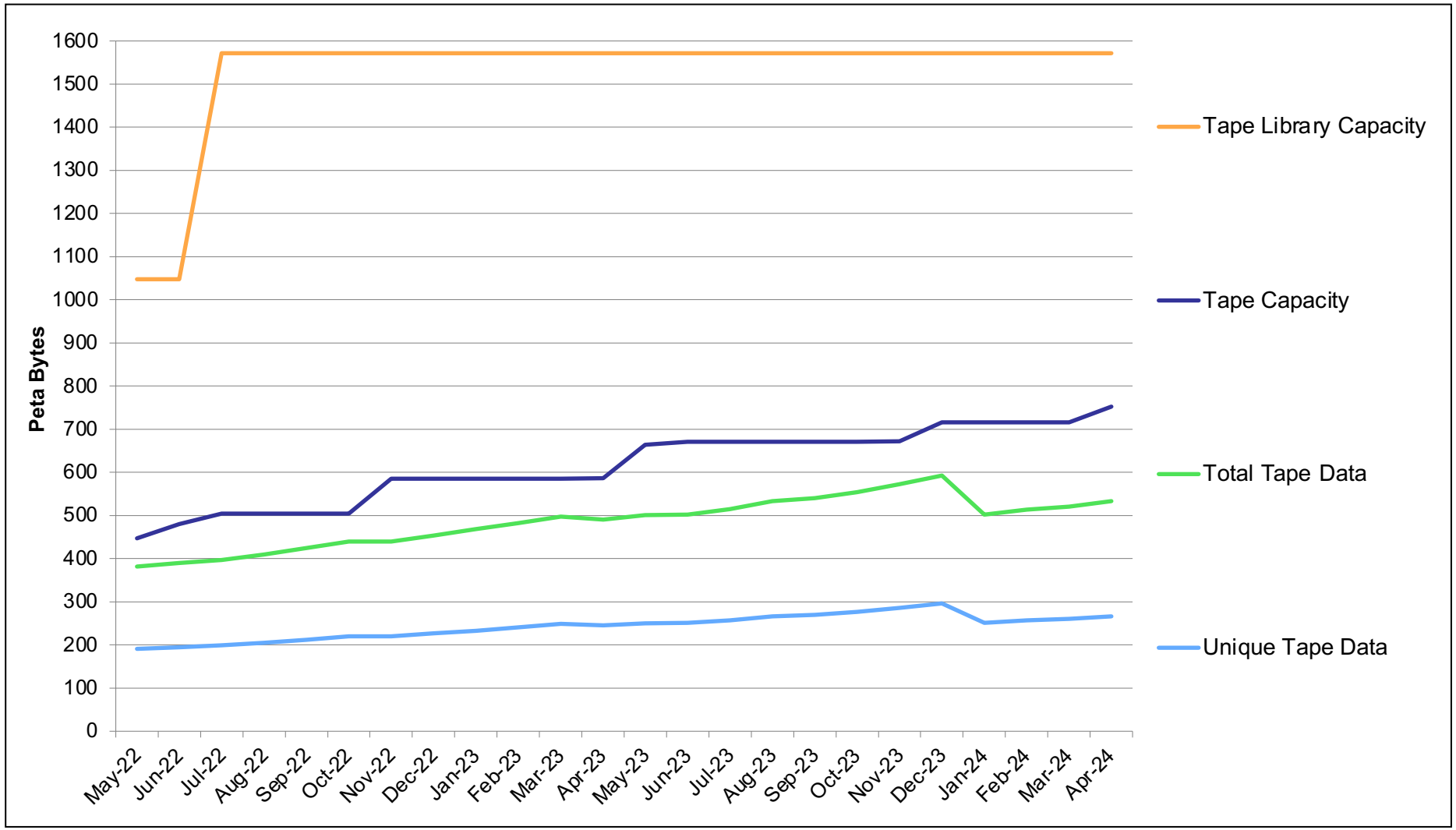
③ Cabeus v100 nodes added

④ Cabeus Milan a100 nodes added

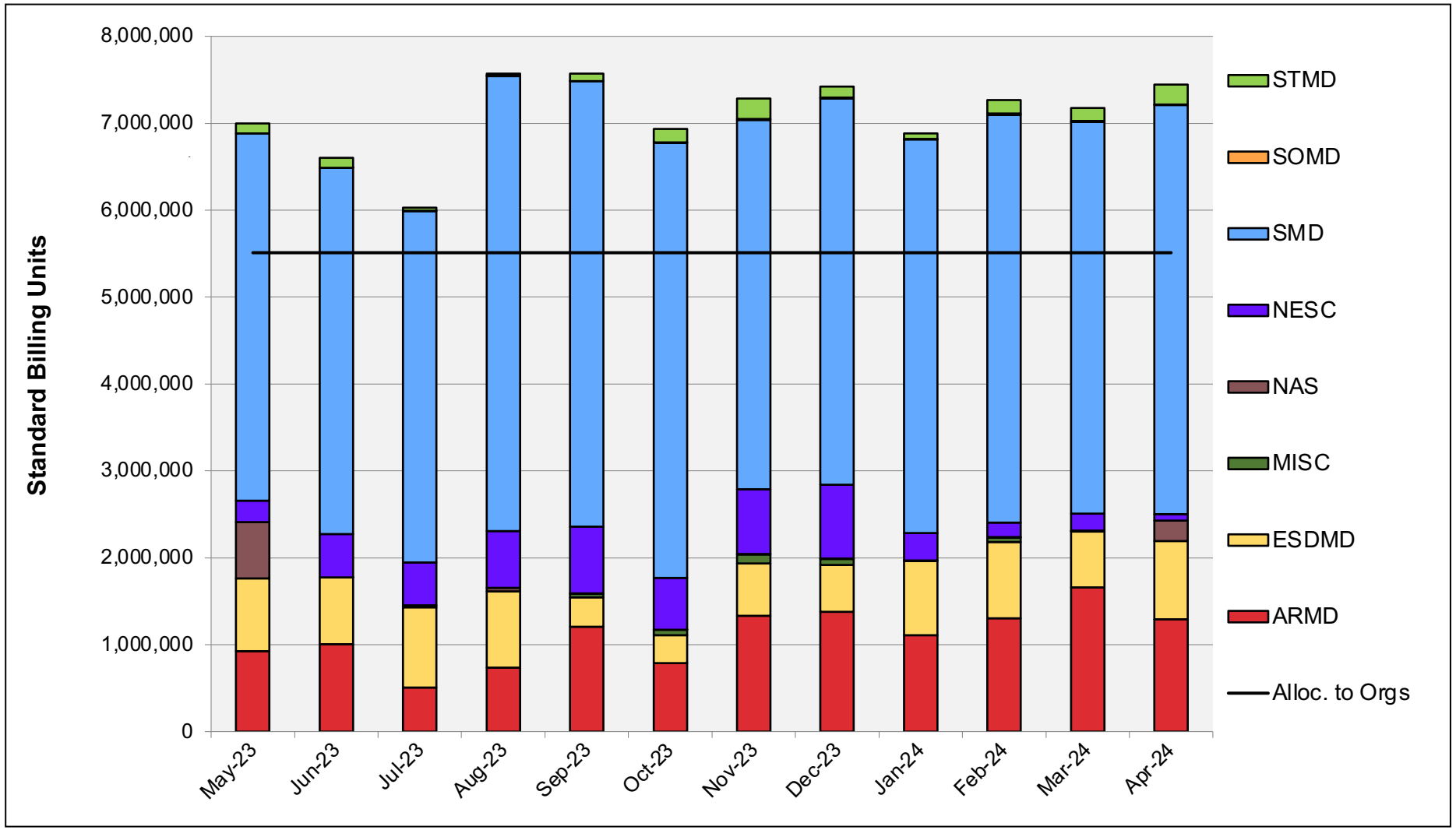
Tape Archive Status



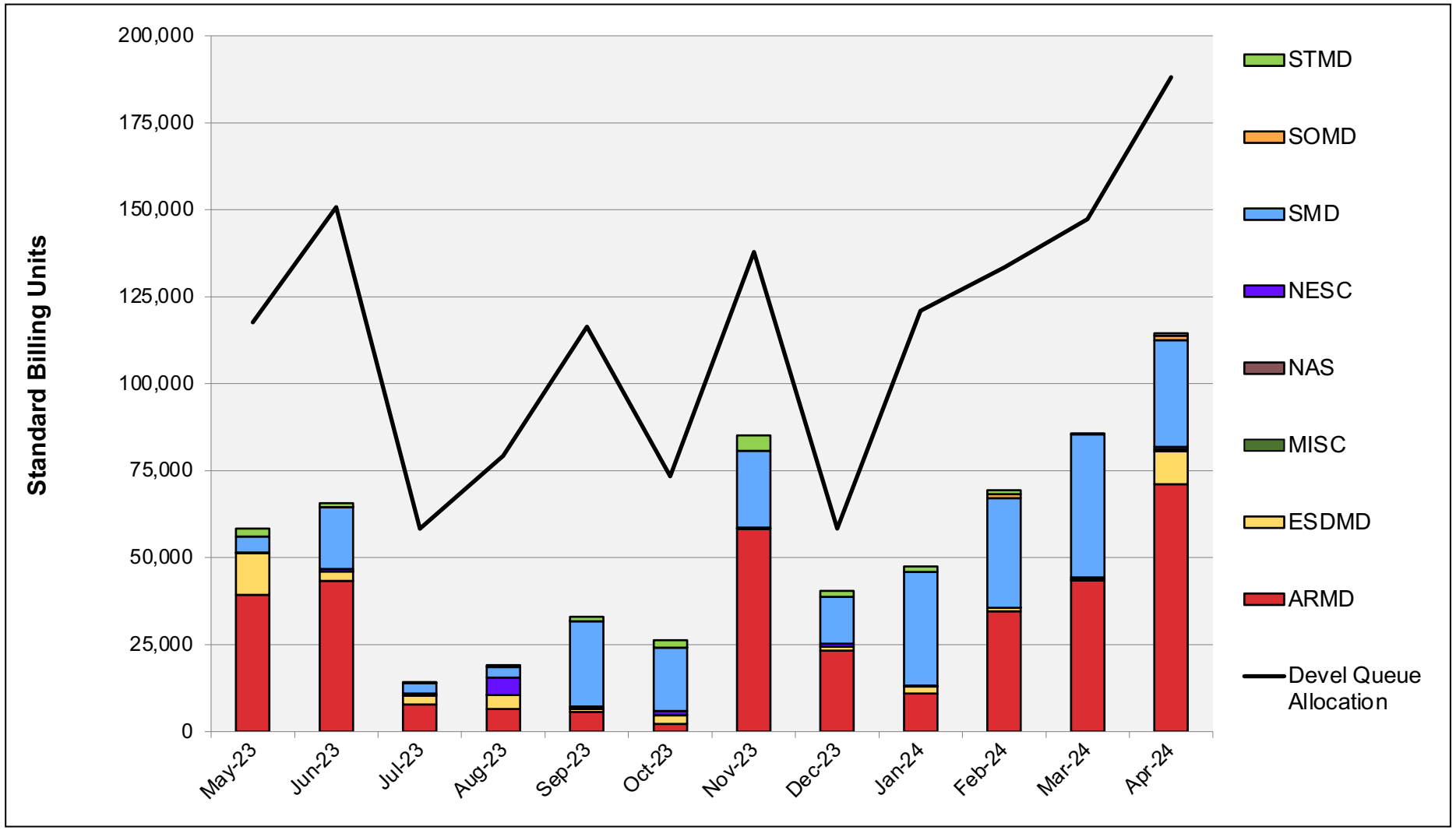
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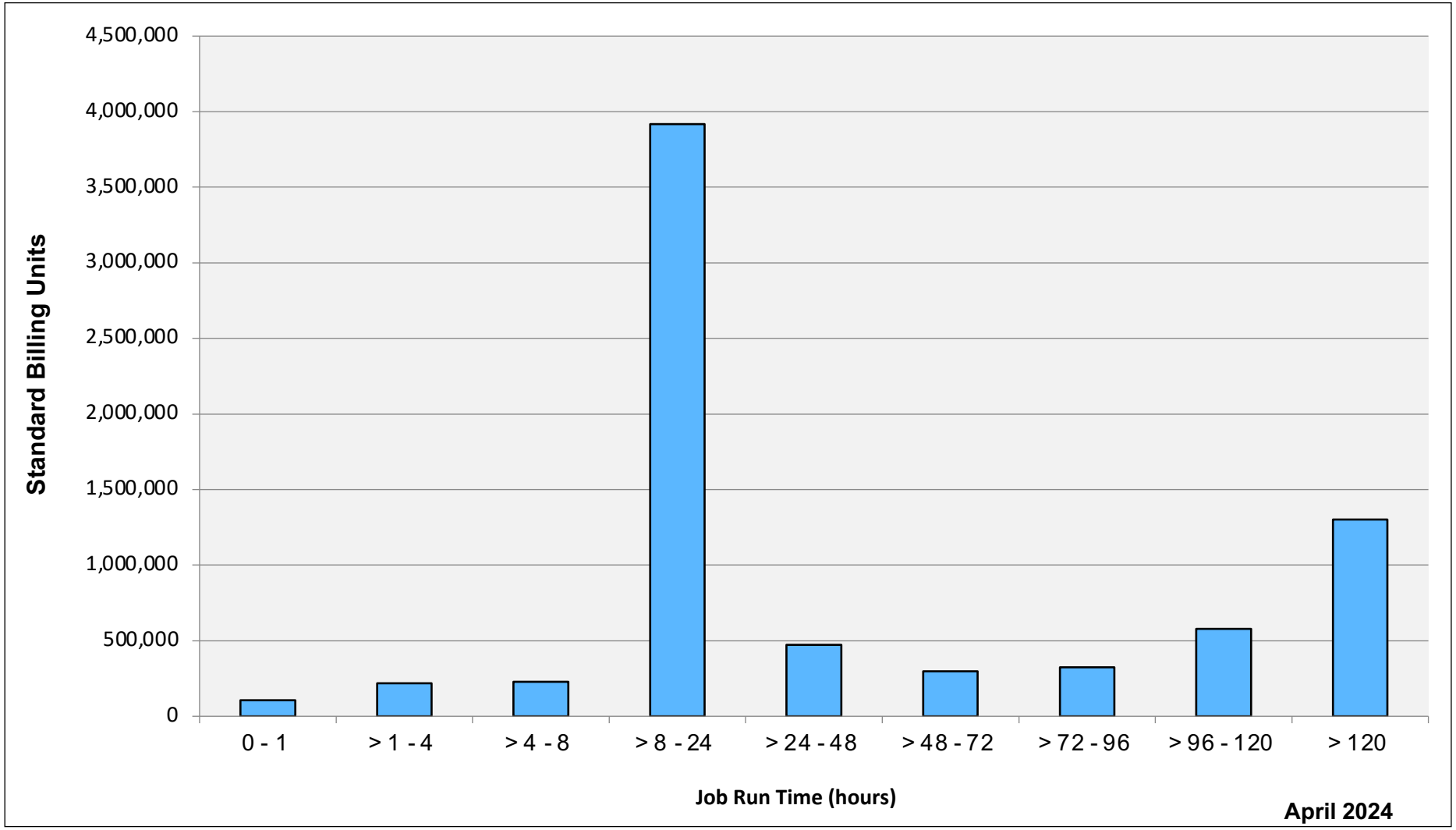
Aitken: SBUs Reported, Normalized to 30-Day Month



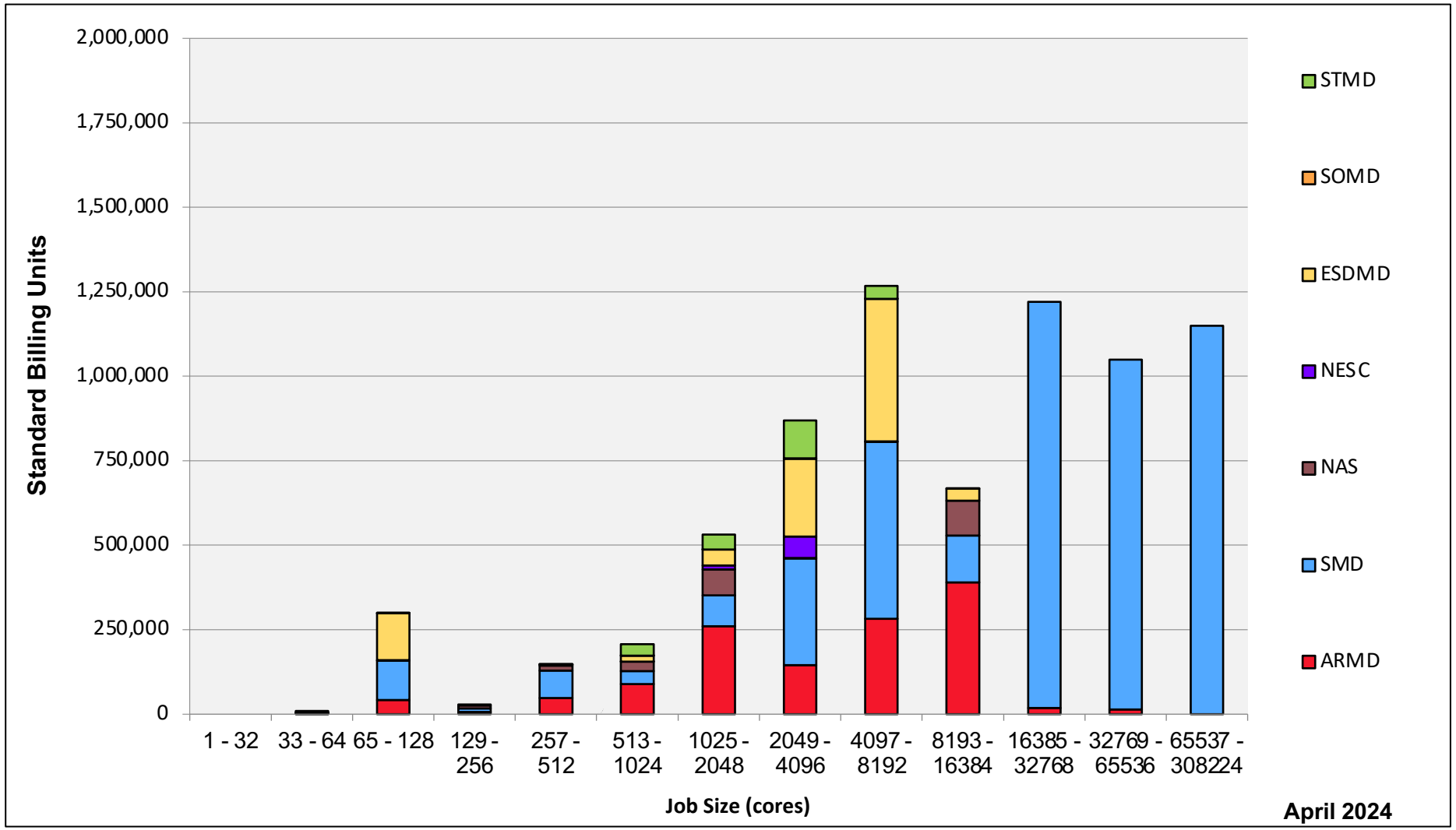
Aitken: Devel Queue Utilization



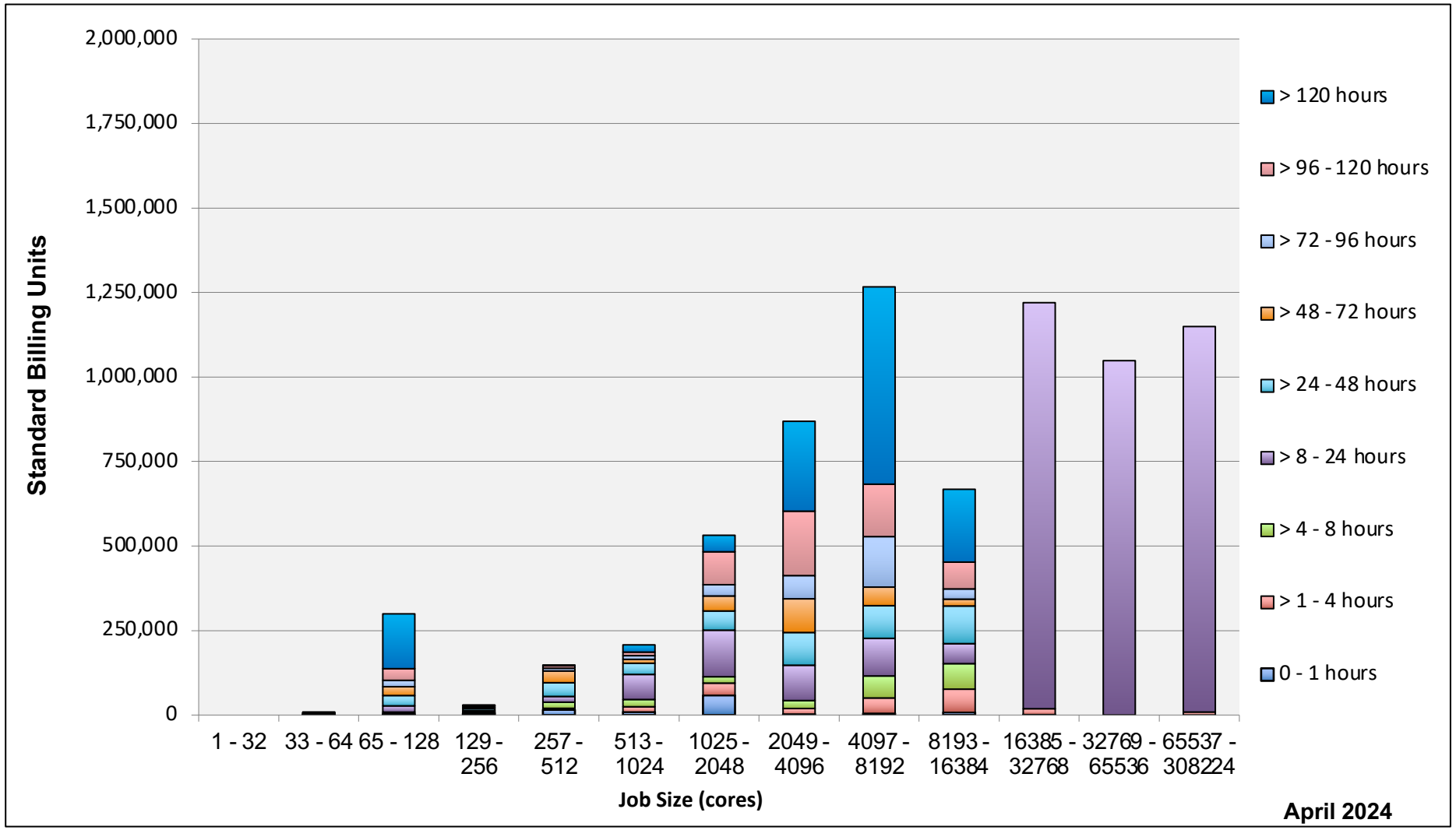
Aitken: Monthly Utilization by Job Length



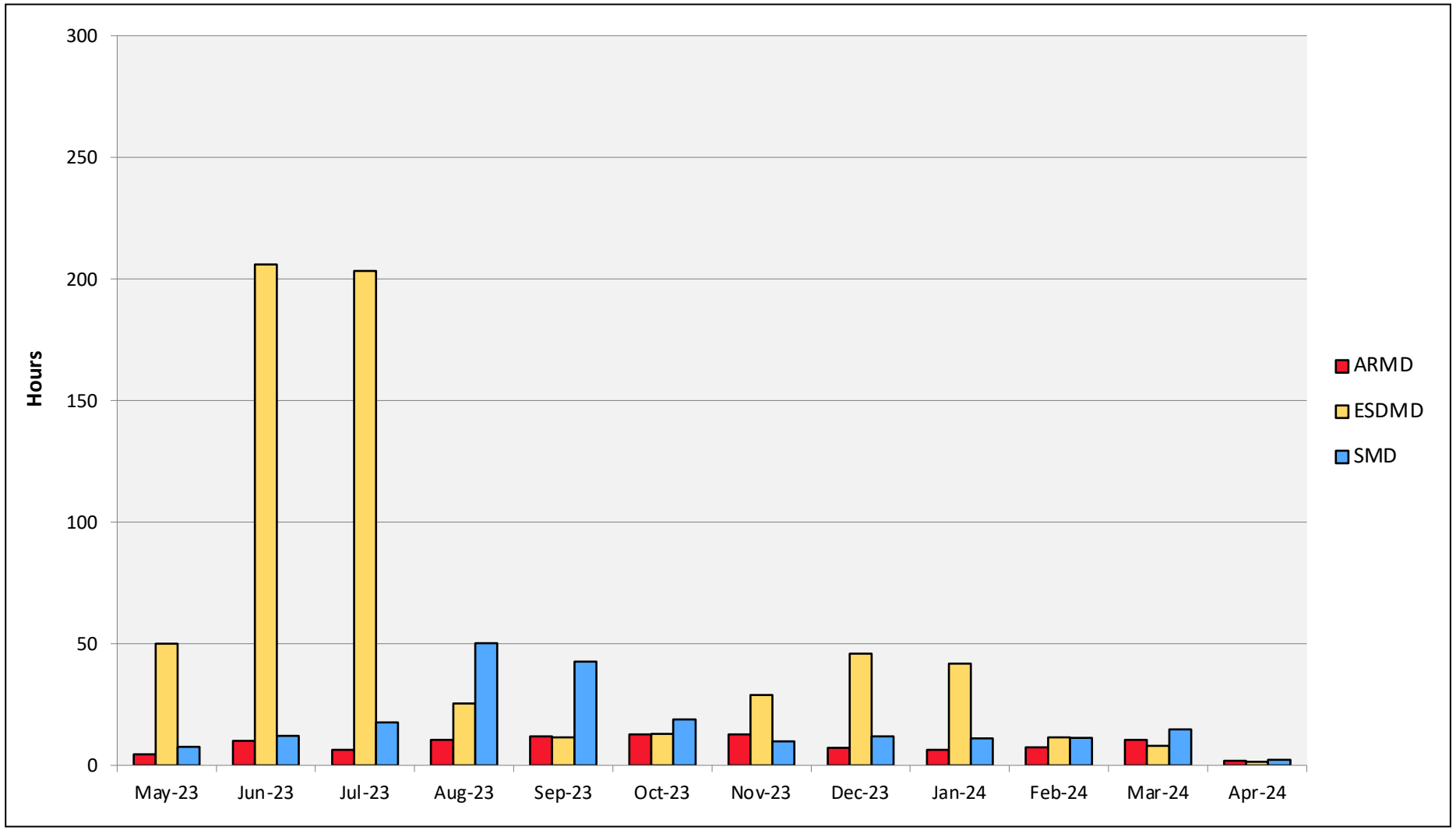
Aitken: Monthly Utilization by Job Size



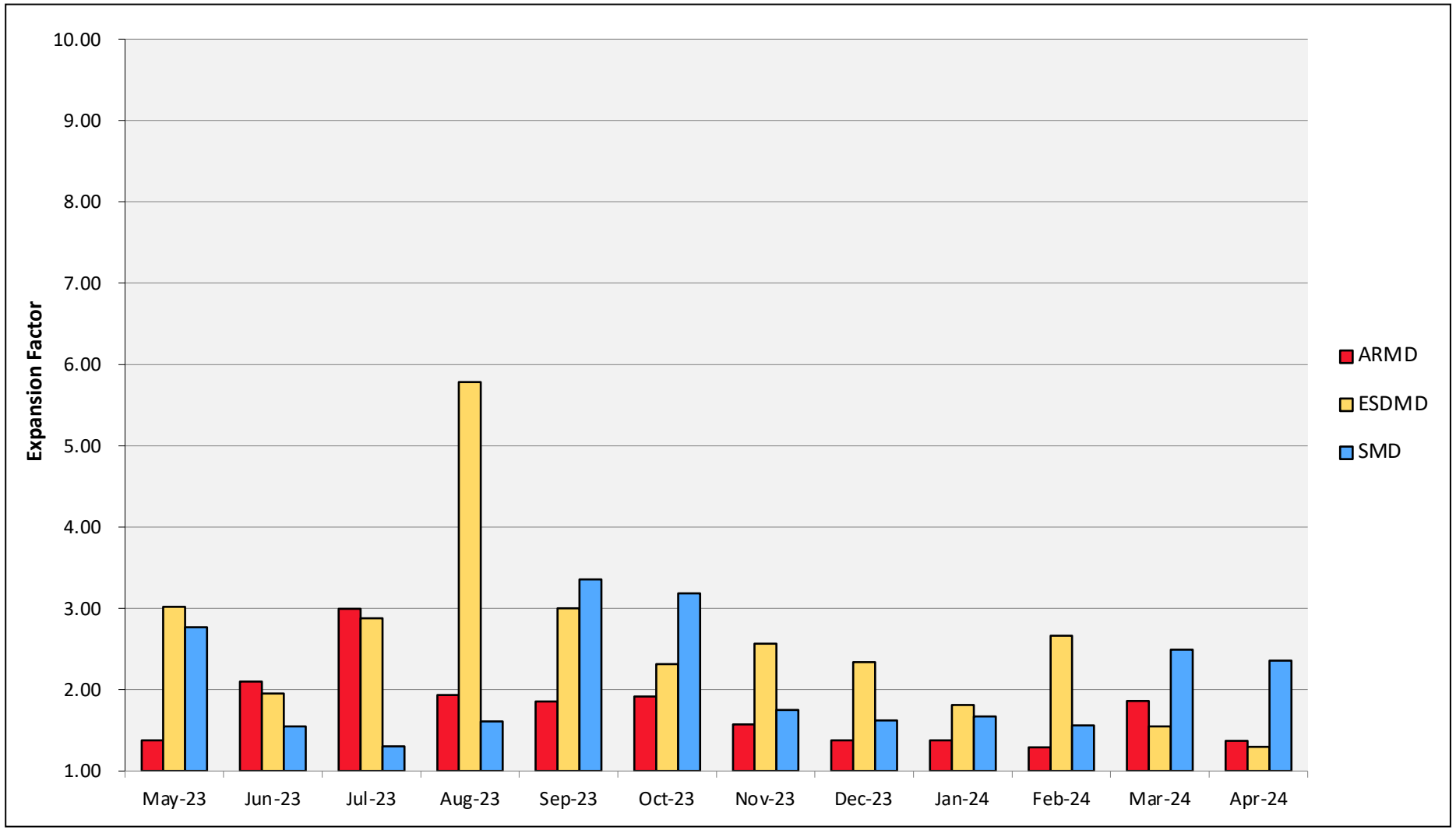
Aitken: Monthly Utilization by Size and Length



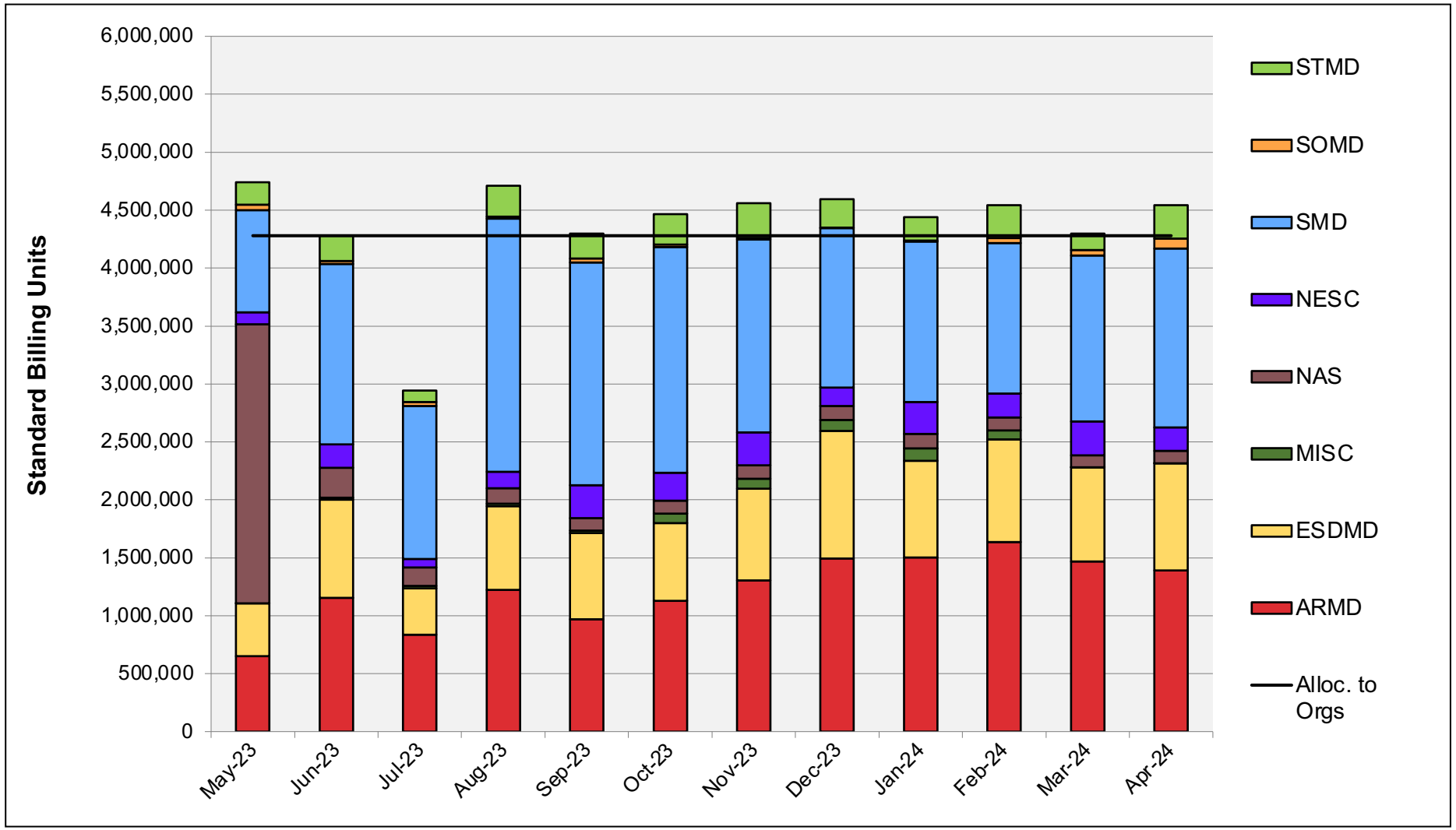
Aitken: Average Time to Clear All Jobs



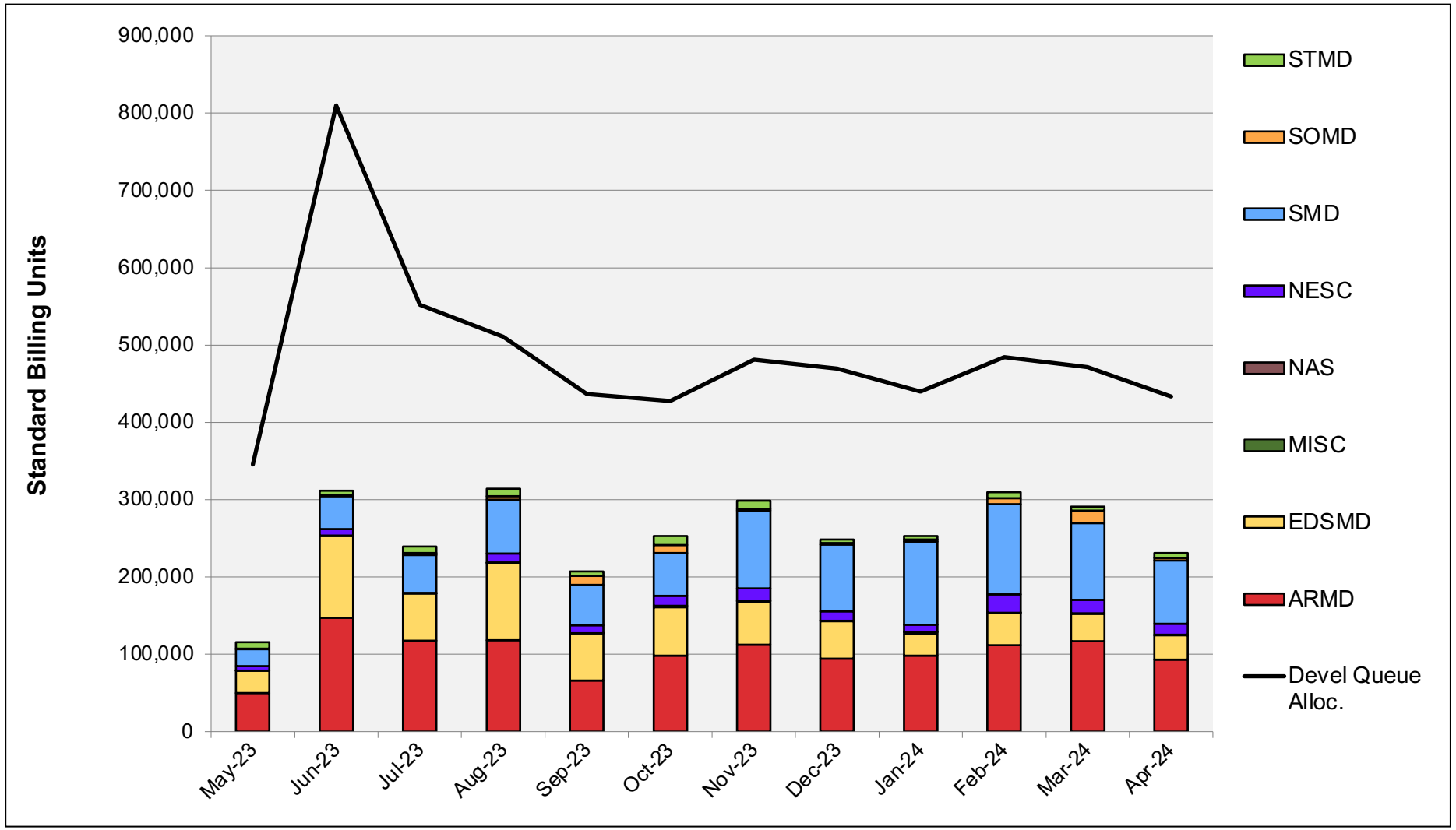
Aitken: Average Expansion Factor



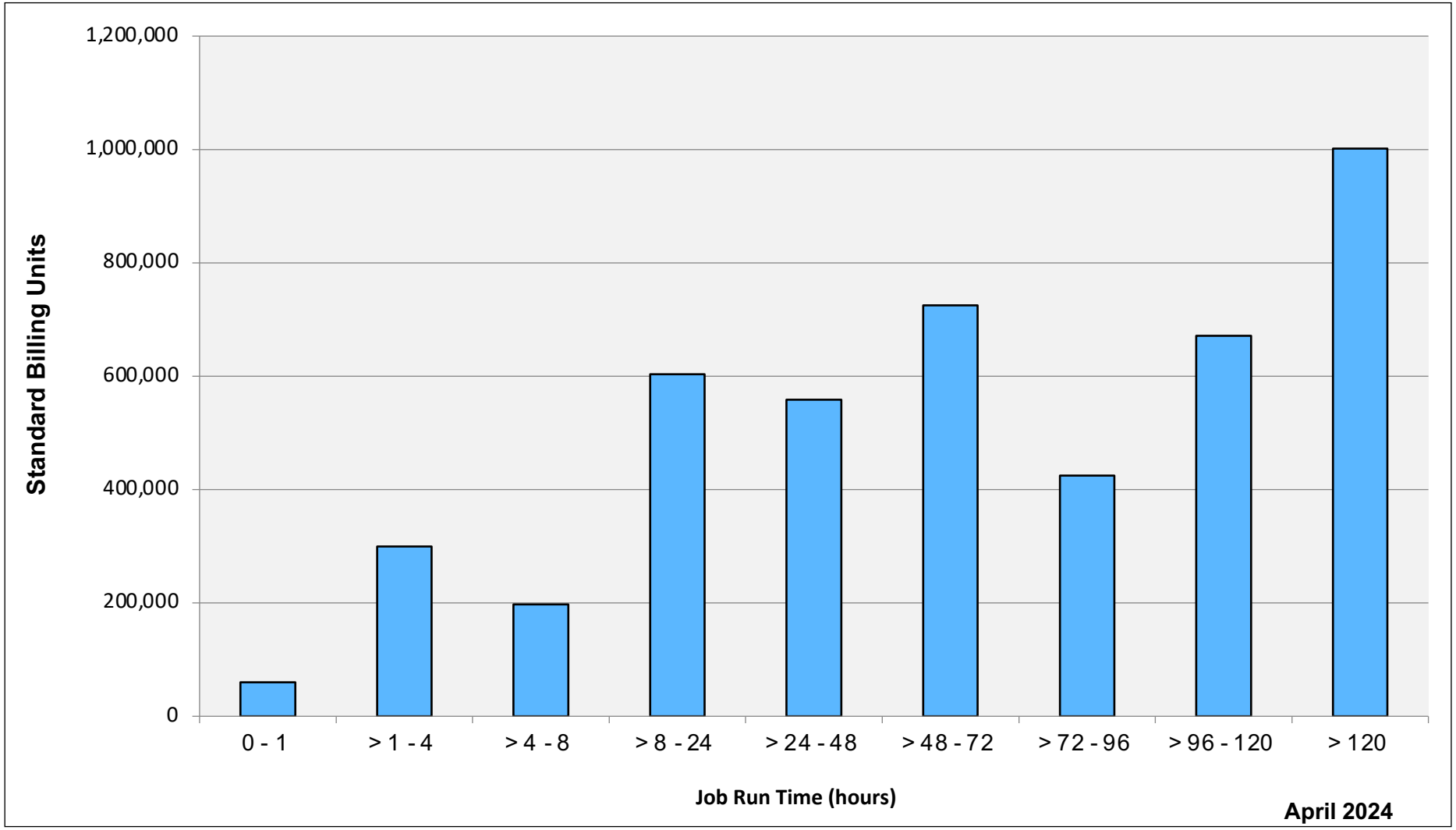
Pleiades: SBUs Reported, Normalized to 30-Day Month



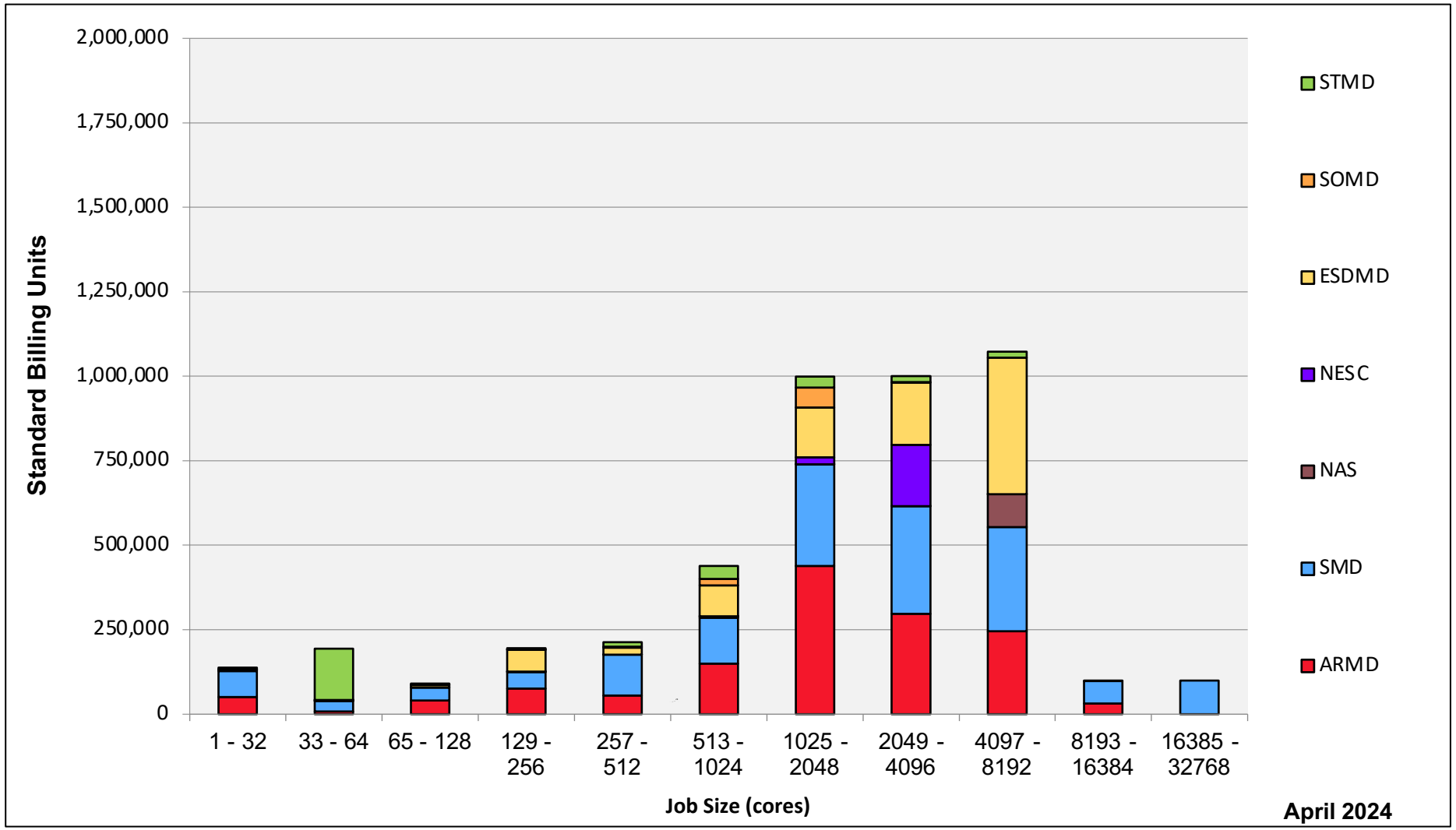
Pleiades: Devel Queue Utilization



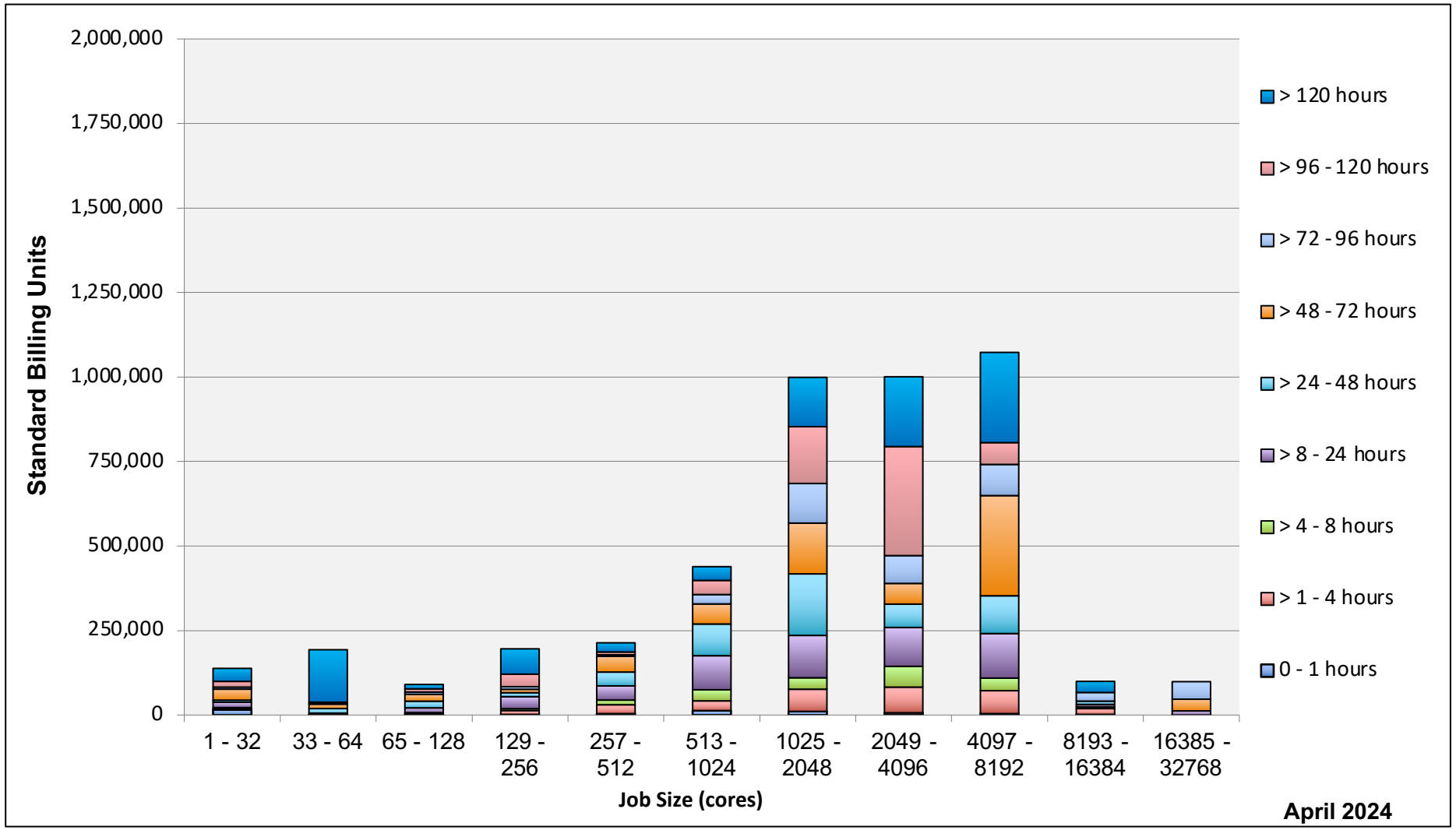
Pleiades: Monthly Utilization by Job Length



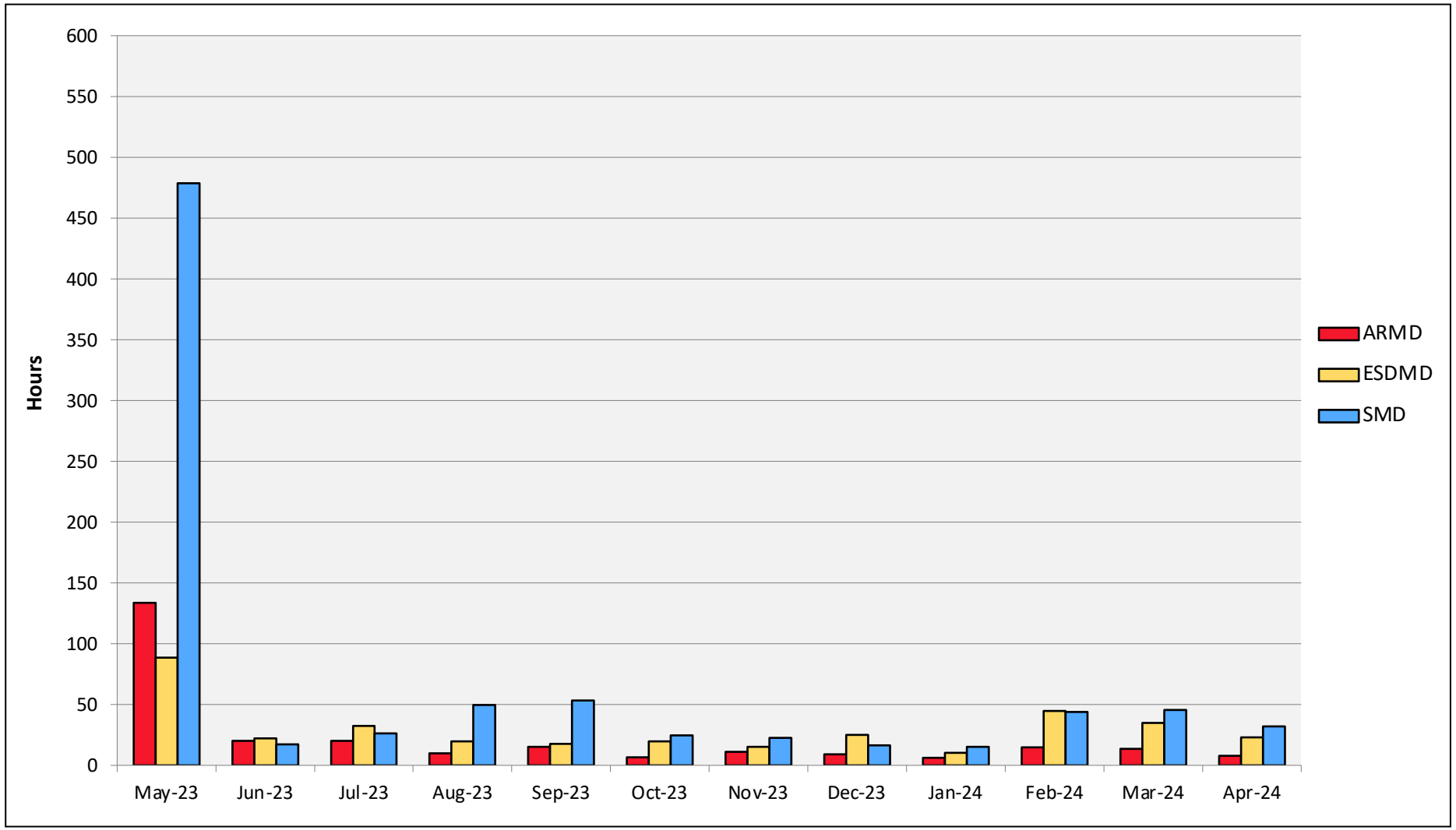
Pleiades: Monthly Utilization by Job Size



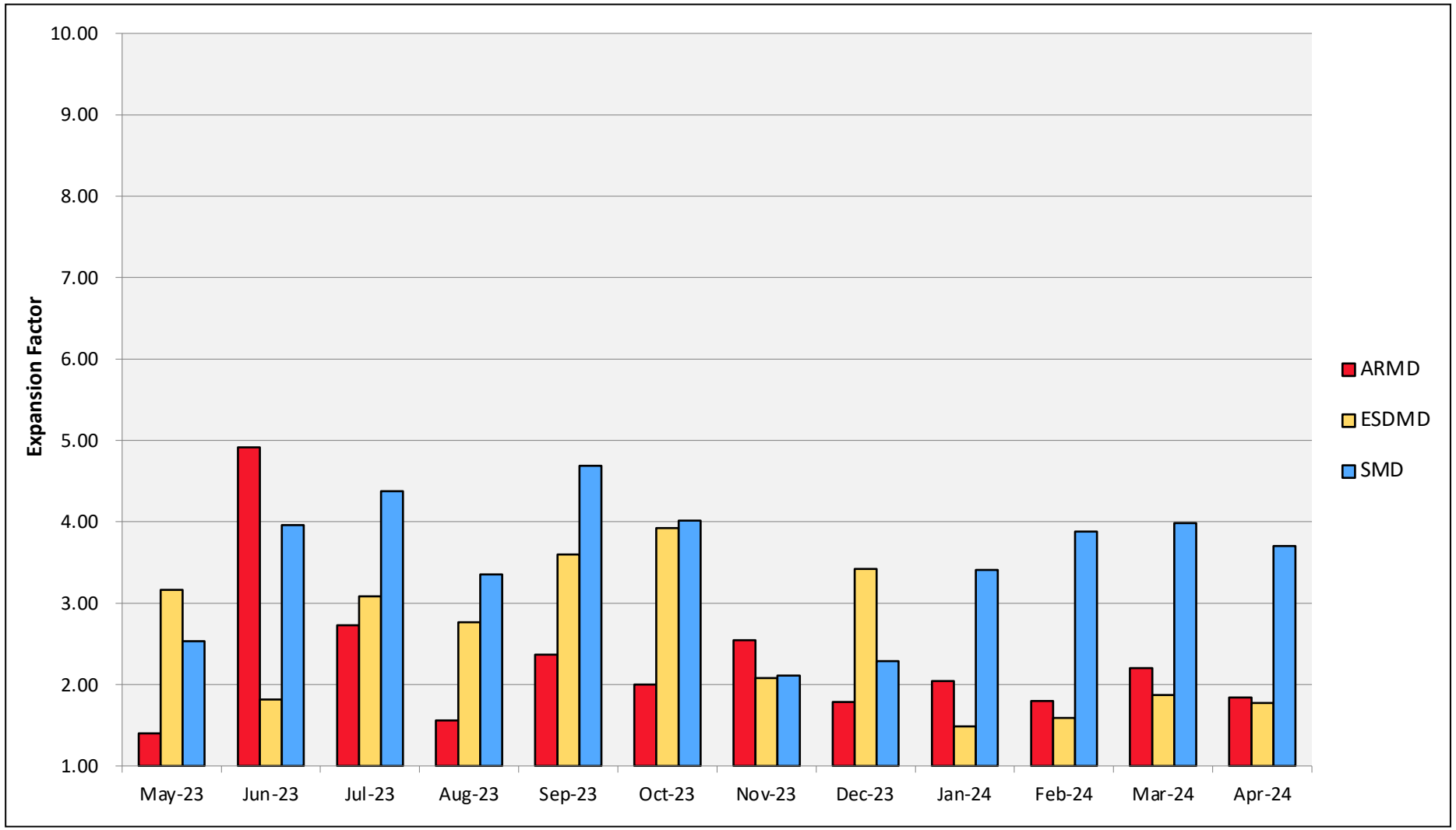
Pleiades: Monthly Utilization by Size and Length



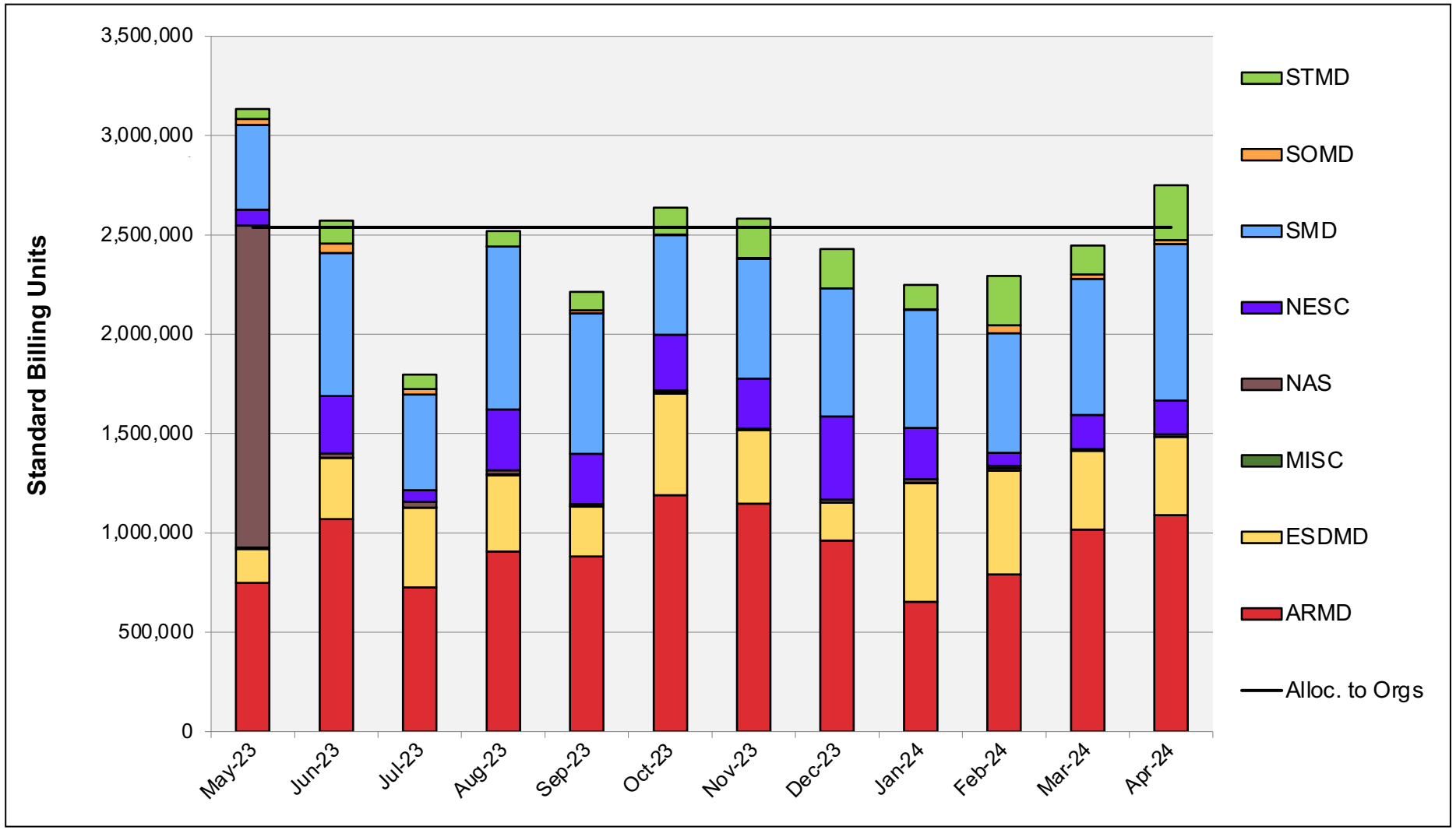
Pleiades: Average Time to Clear All Jobs



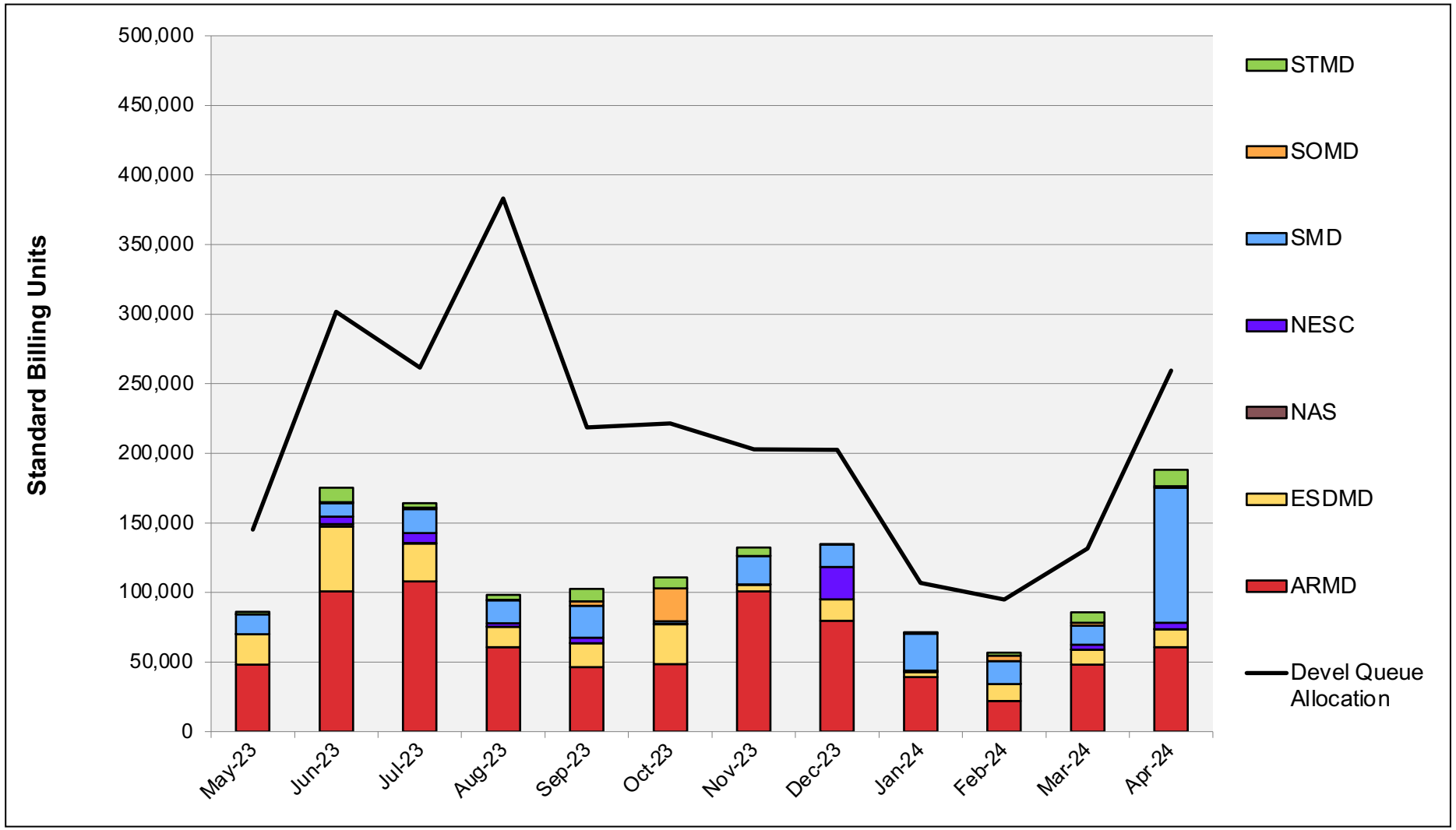
Pleiades: Average Expansion Factor



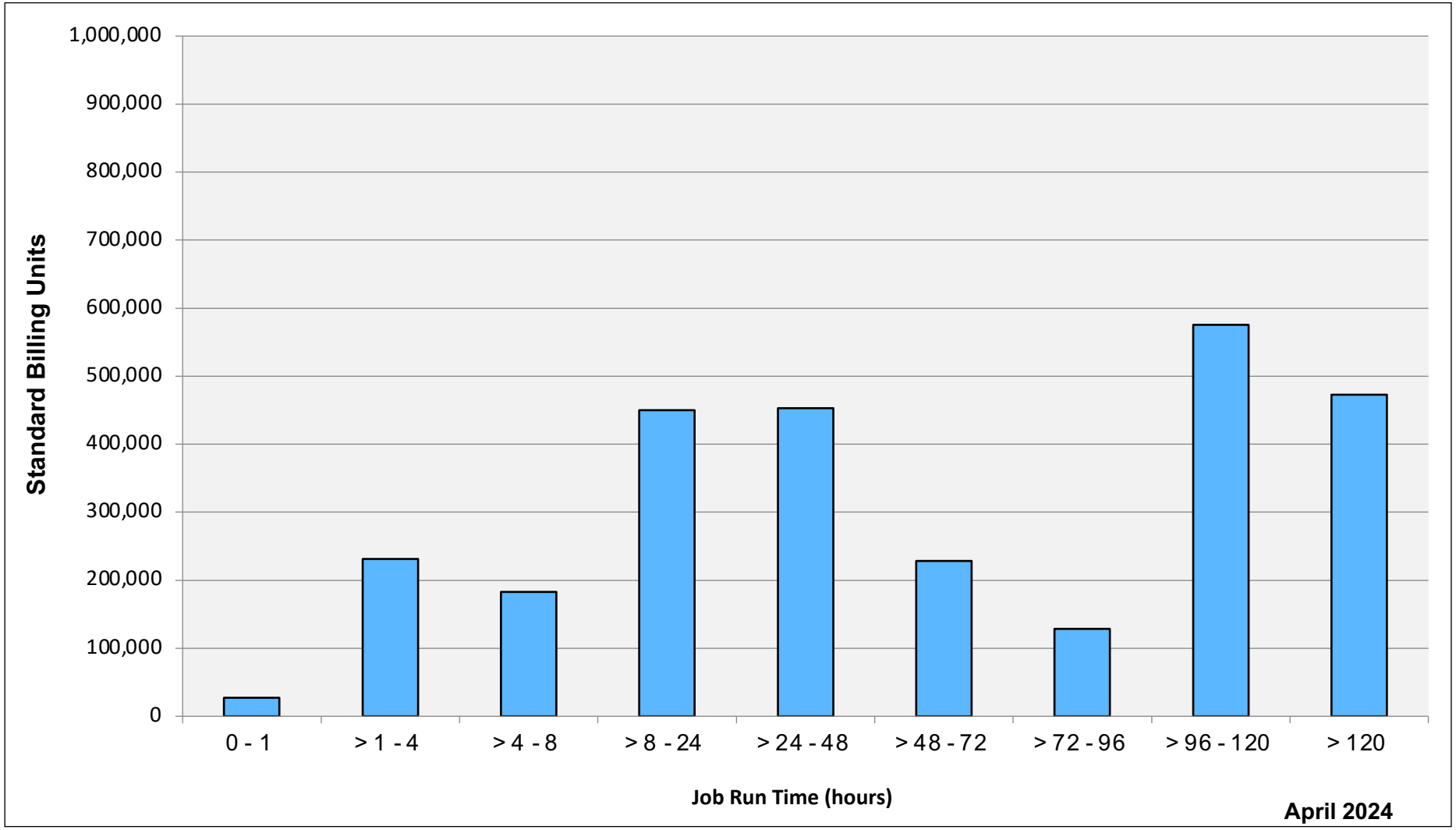
Electra: SBUs Reported, Normalized to 30-Day Month



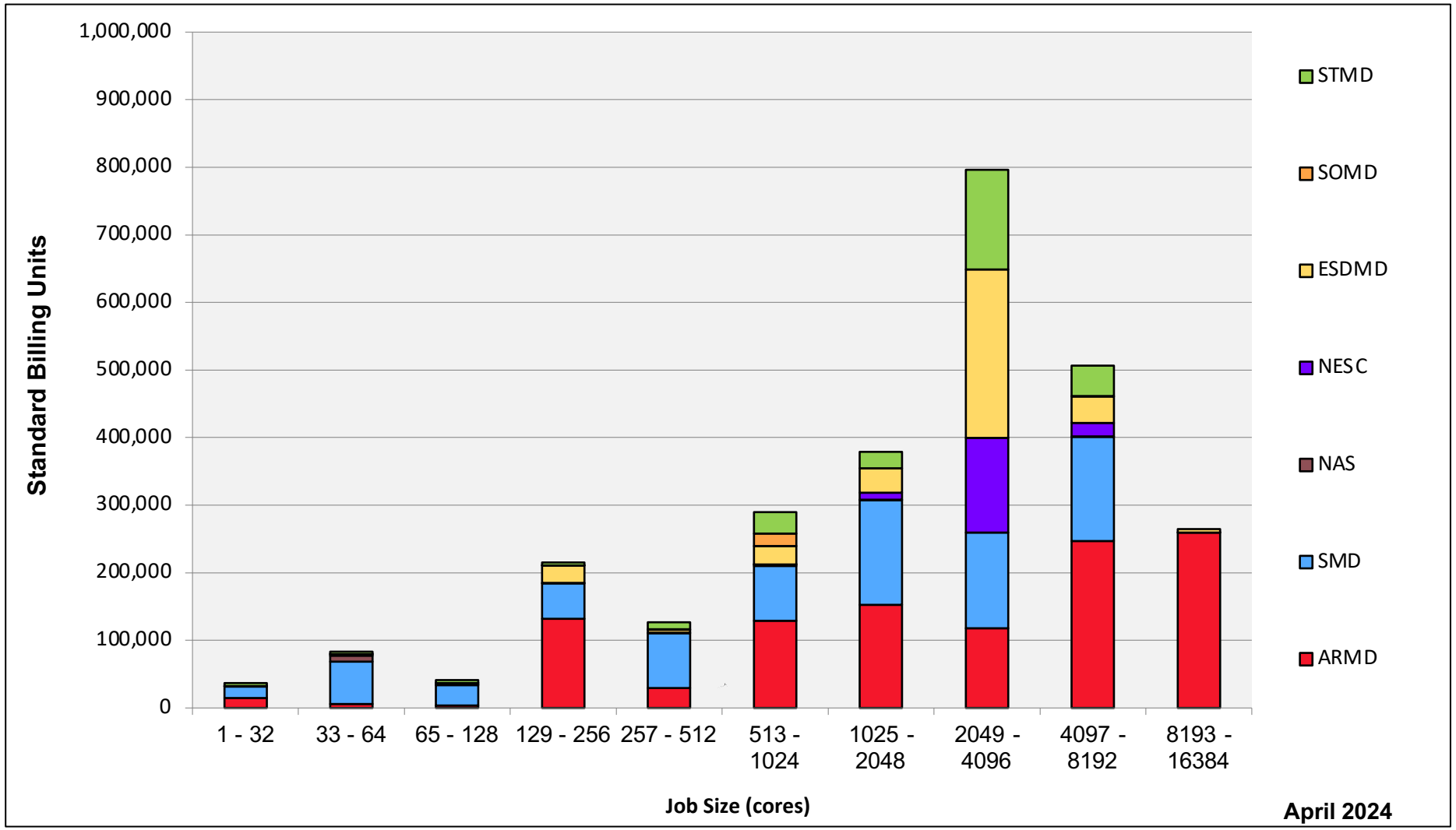
Electra: Devel Queue Utilization



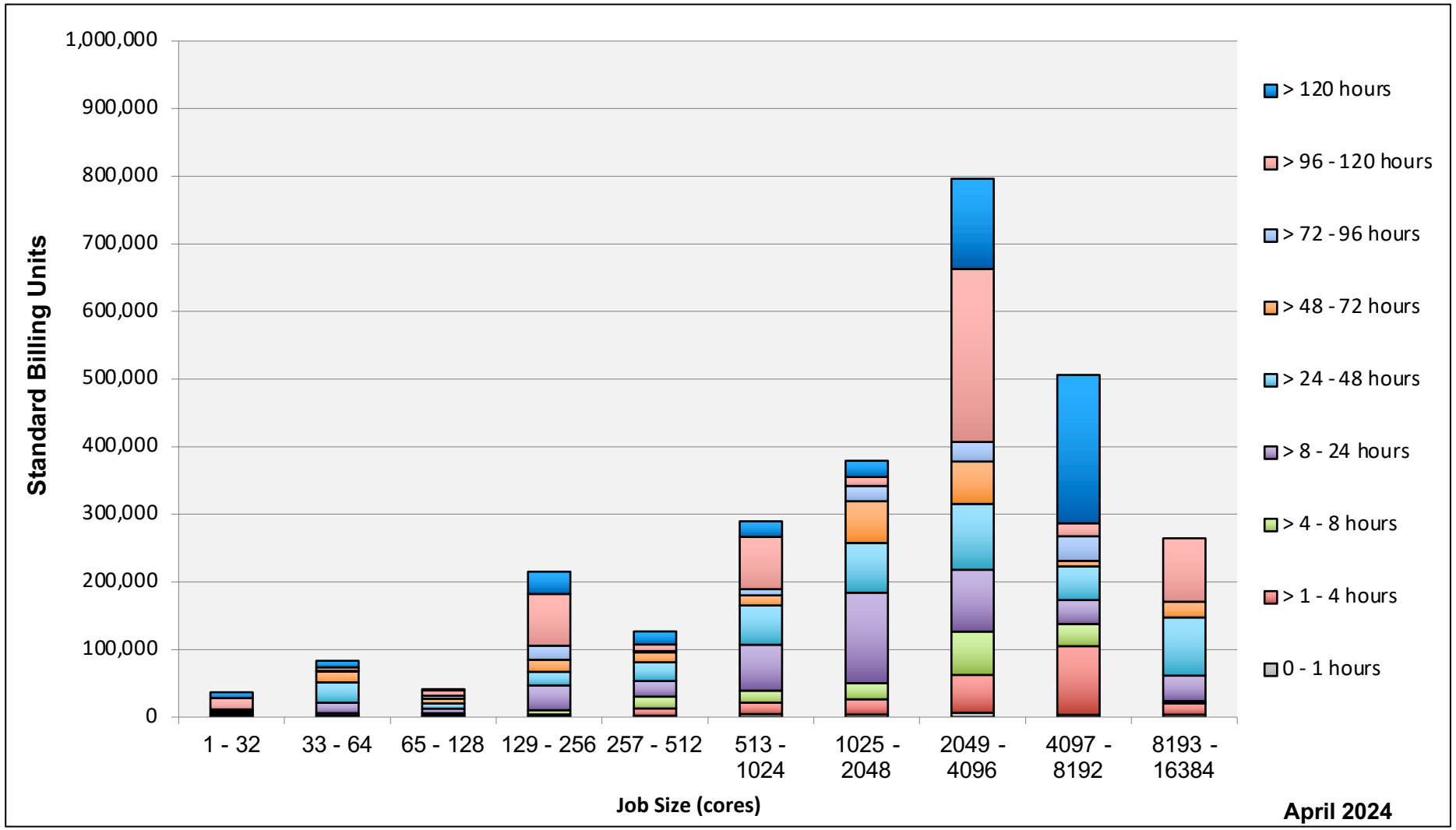
Electra: Monthly Utilization by Job Length



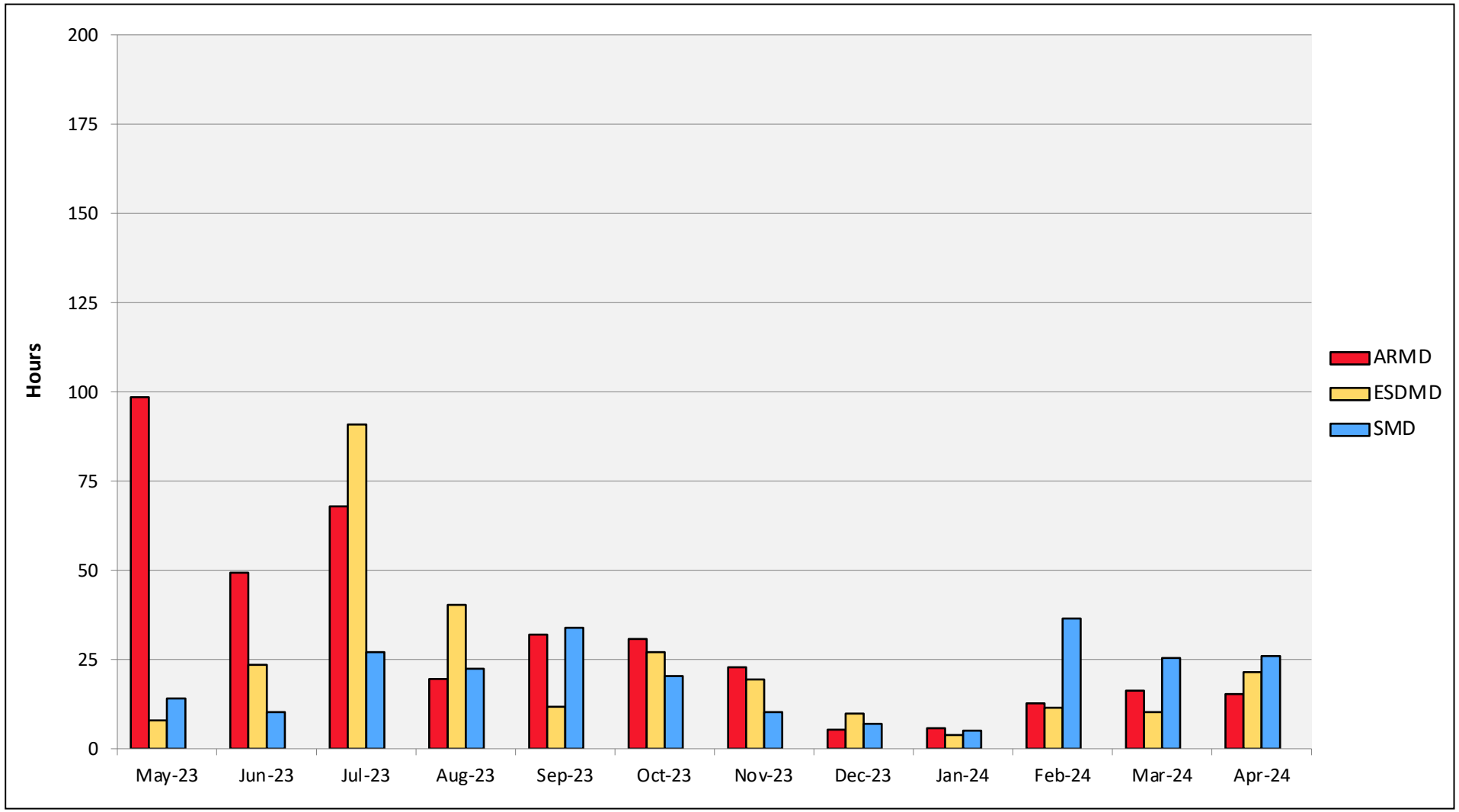
Electra: Monthly Utilization by Job Size



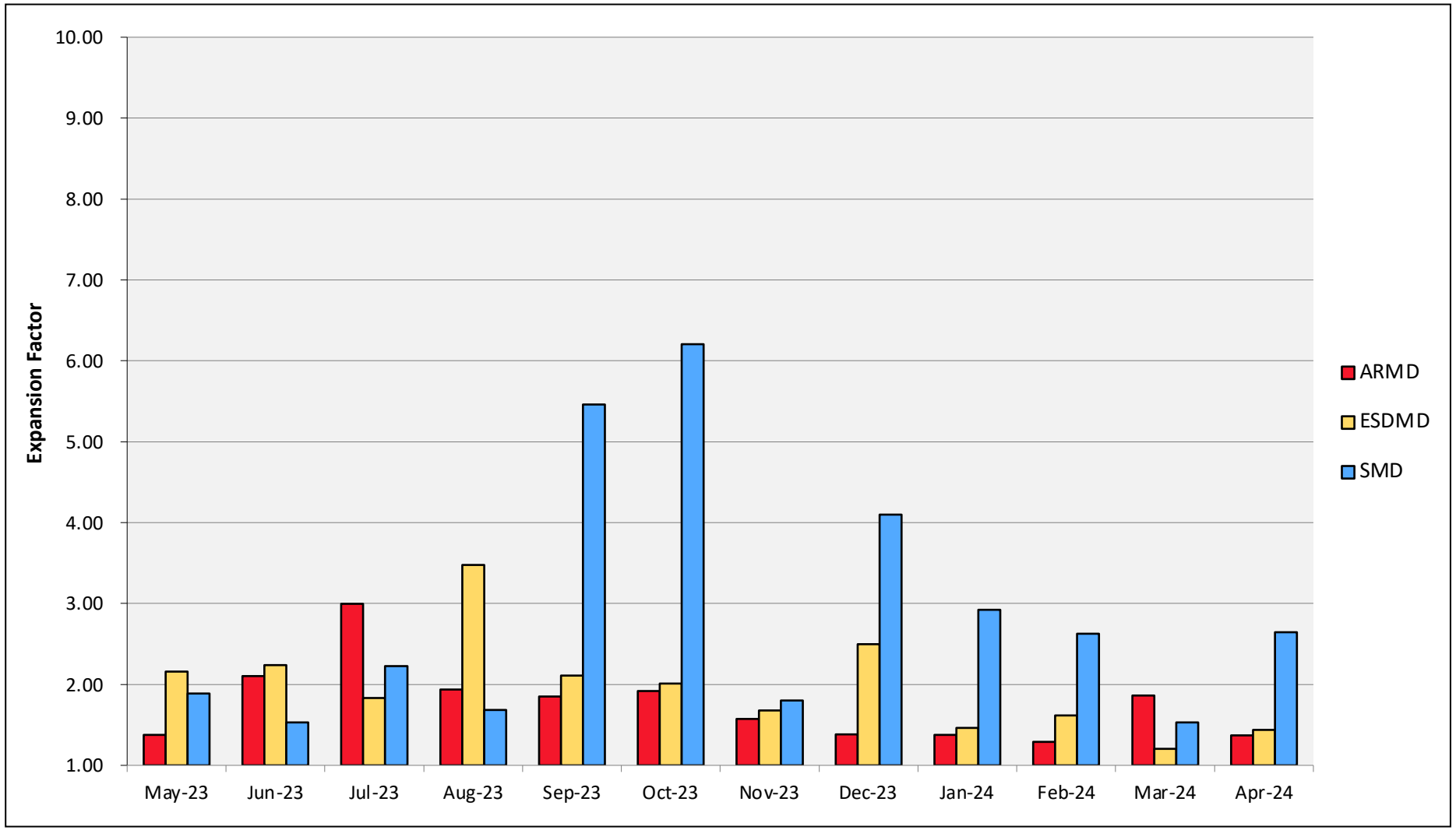
Electra: Monthly Utilization by Size and Length



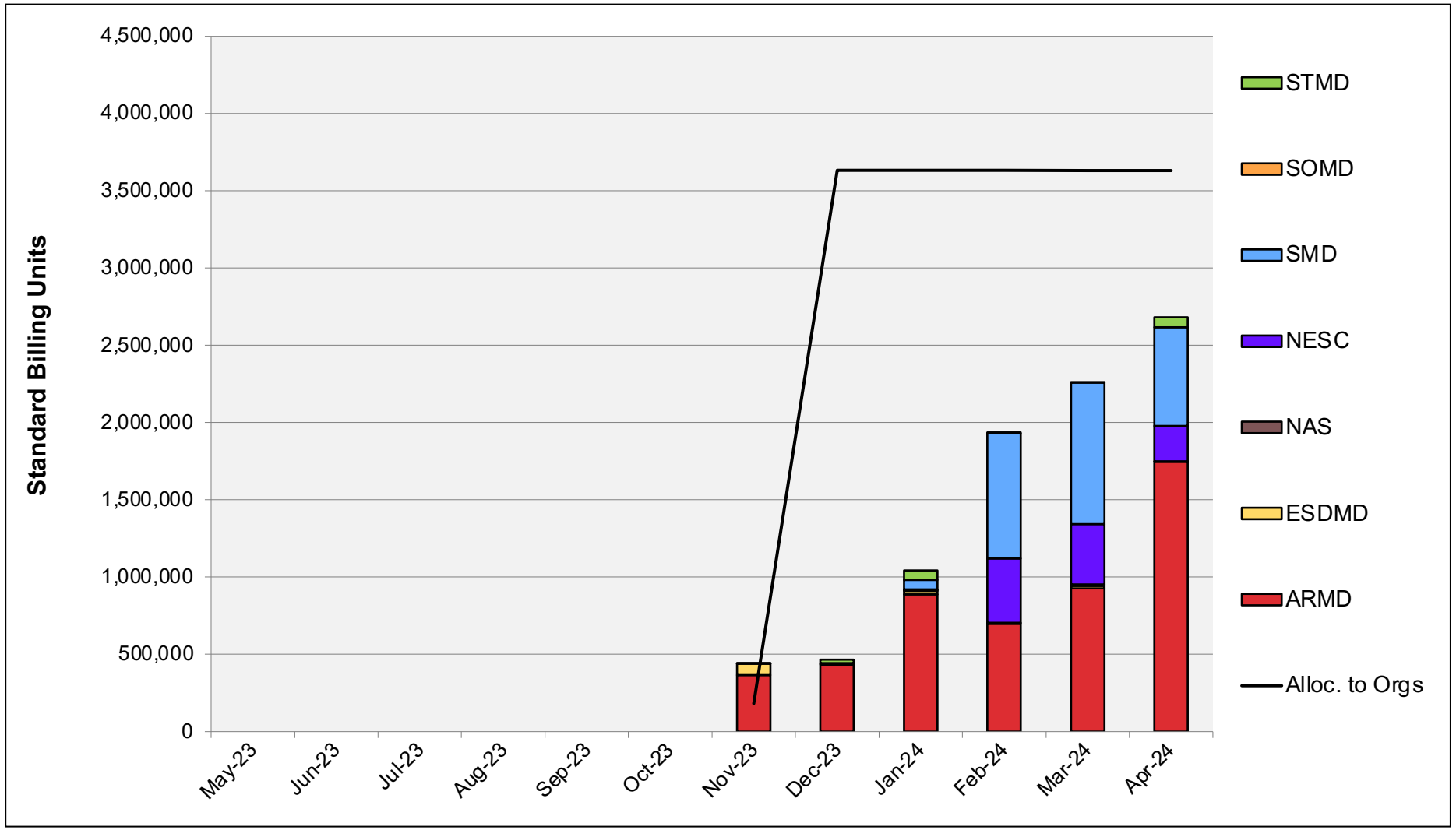
Electra: Average Time to Clear All Jobs



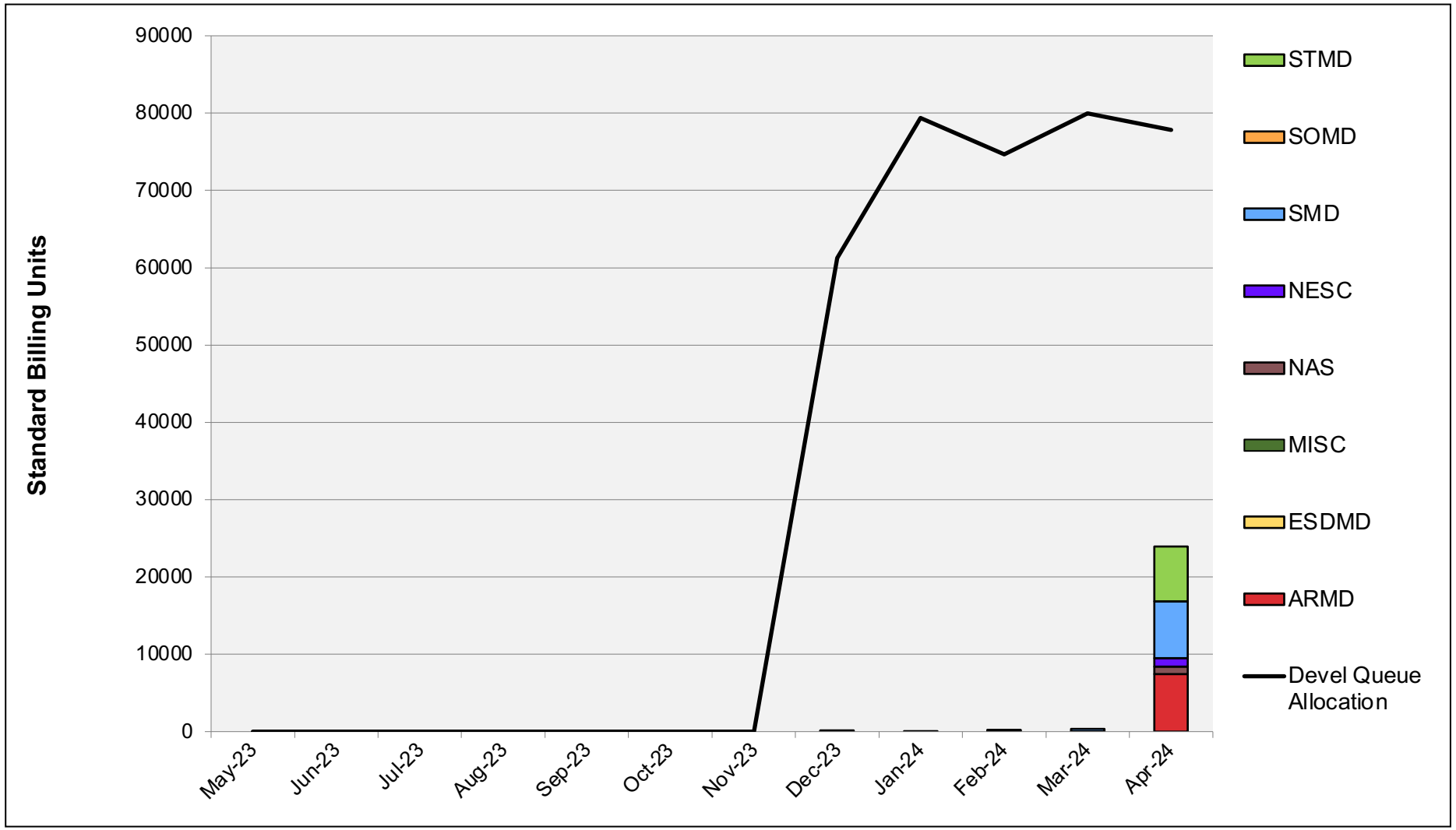
Electra: Average Expansion Factor



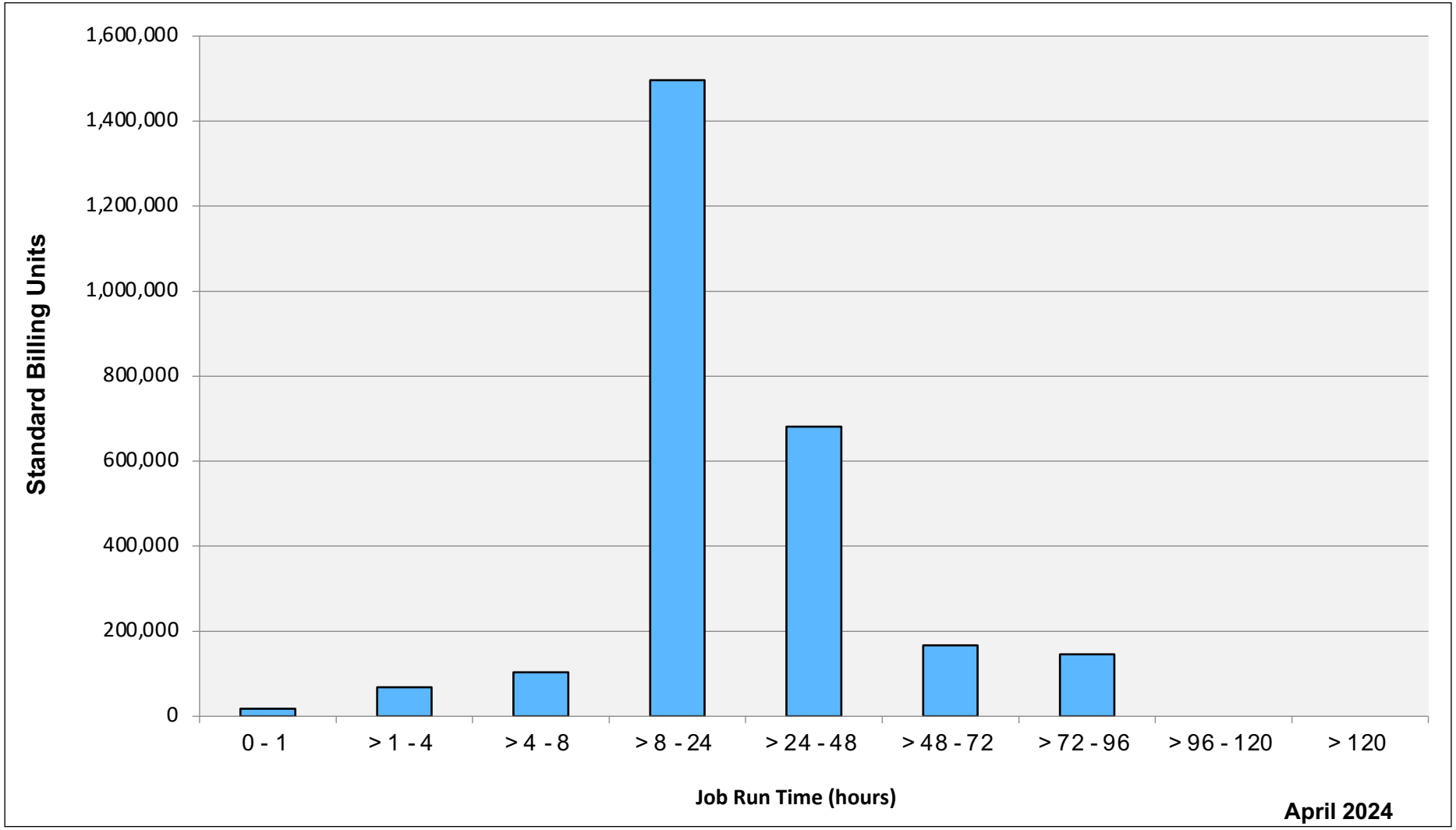
Cabeus: SBUs Reported, Normalized to 30-Day Month



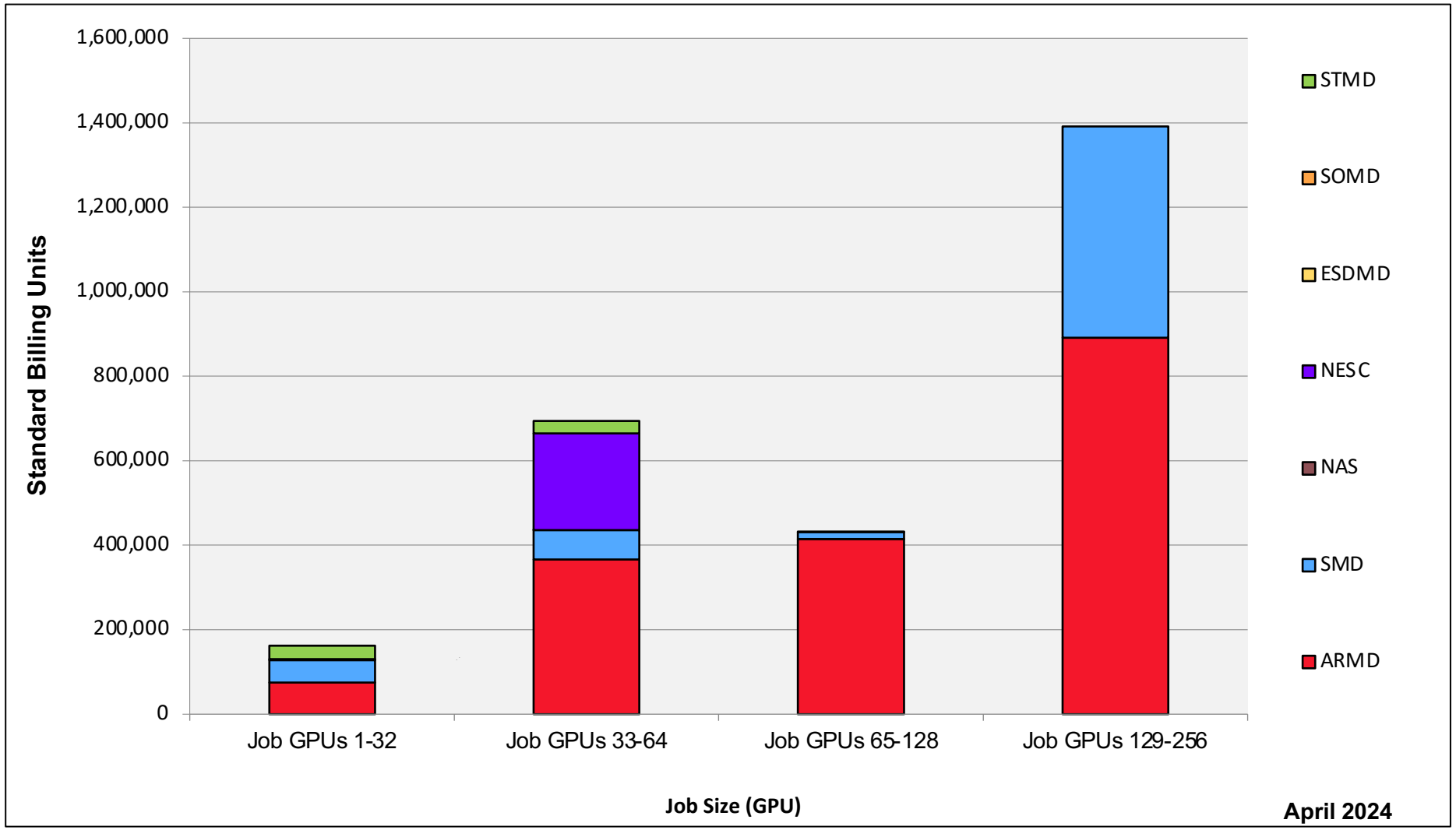
Cabeus: Devel Queue Utilization



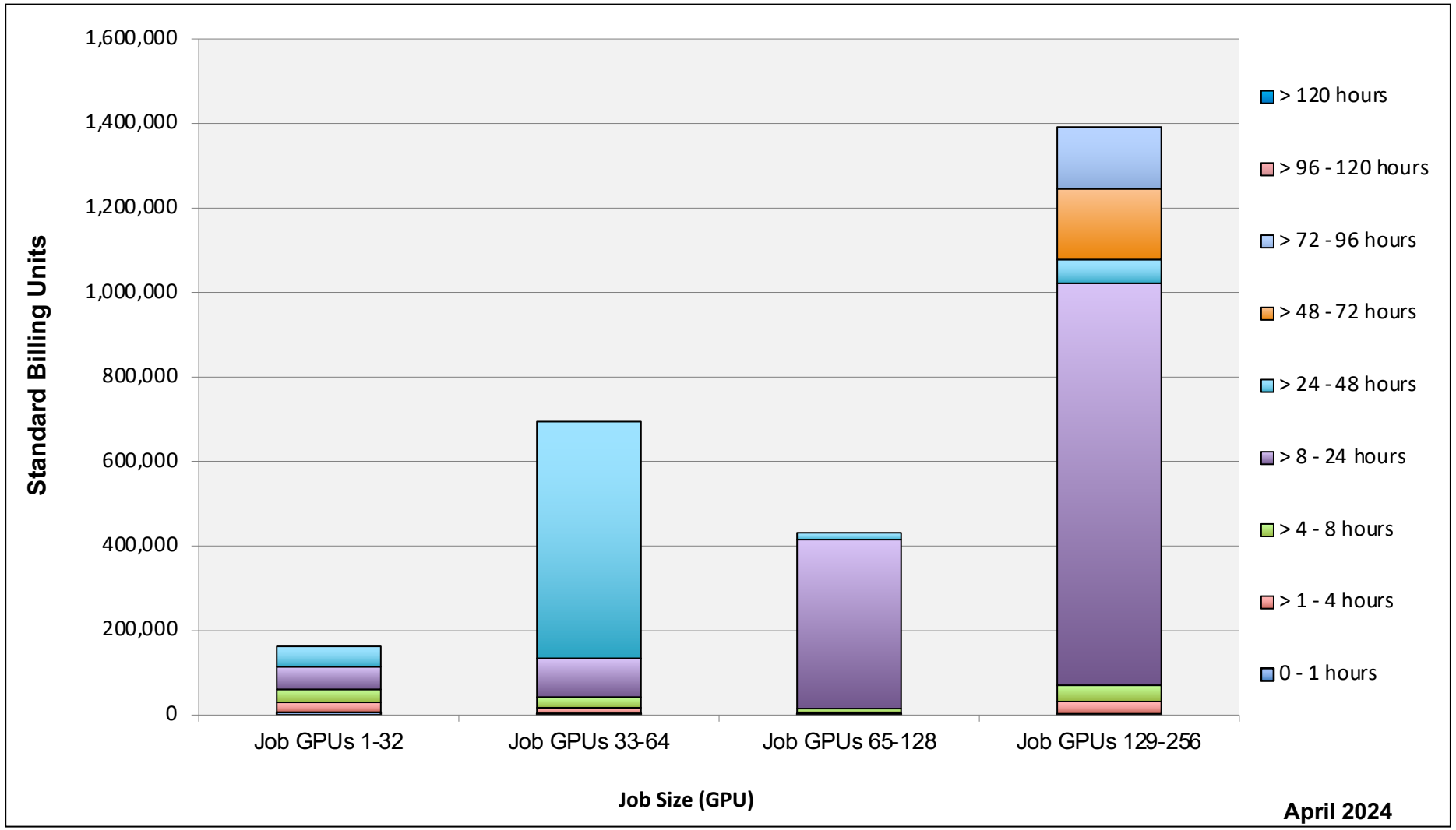
Cabeus: Monthly Utilization by Job Length



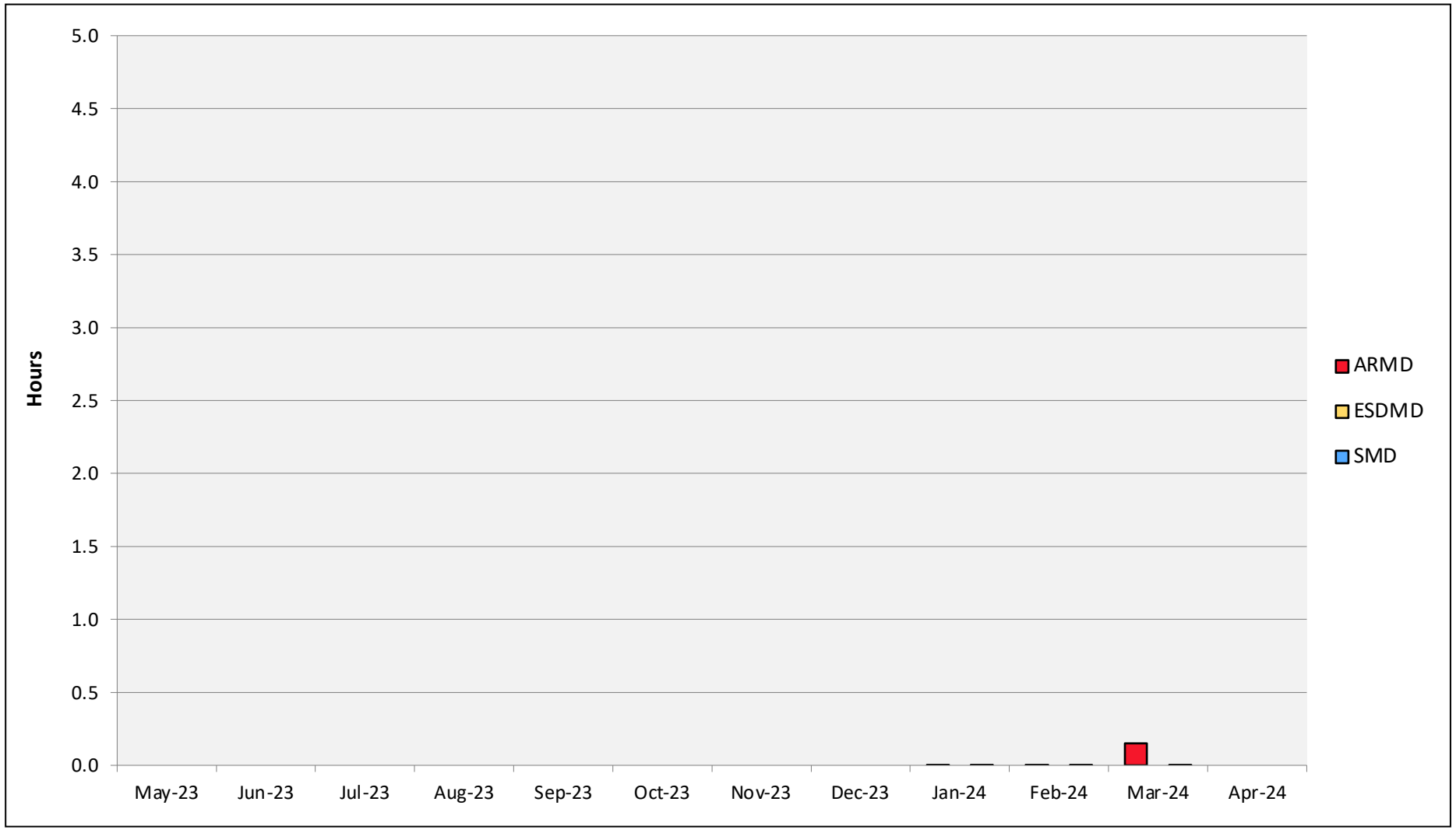
Cabeus: Monthly Utilization by Job Size



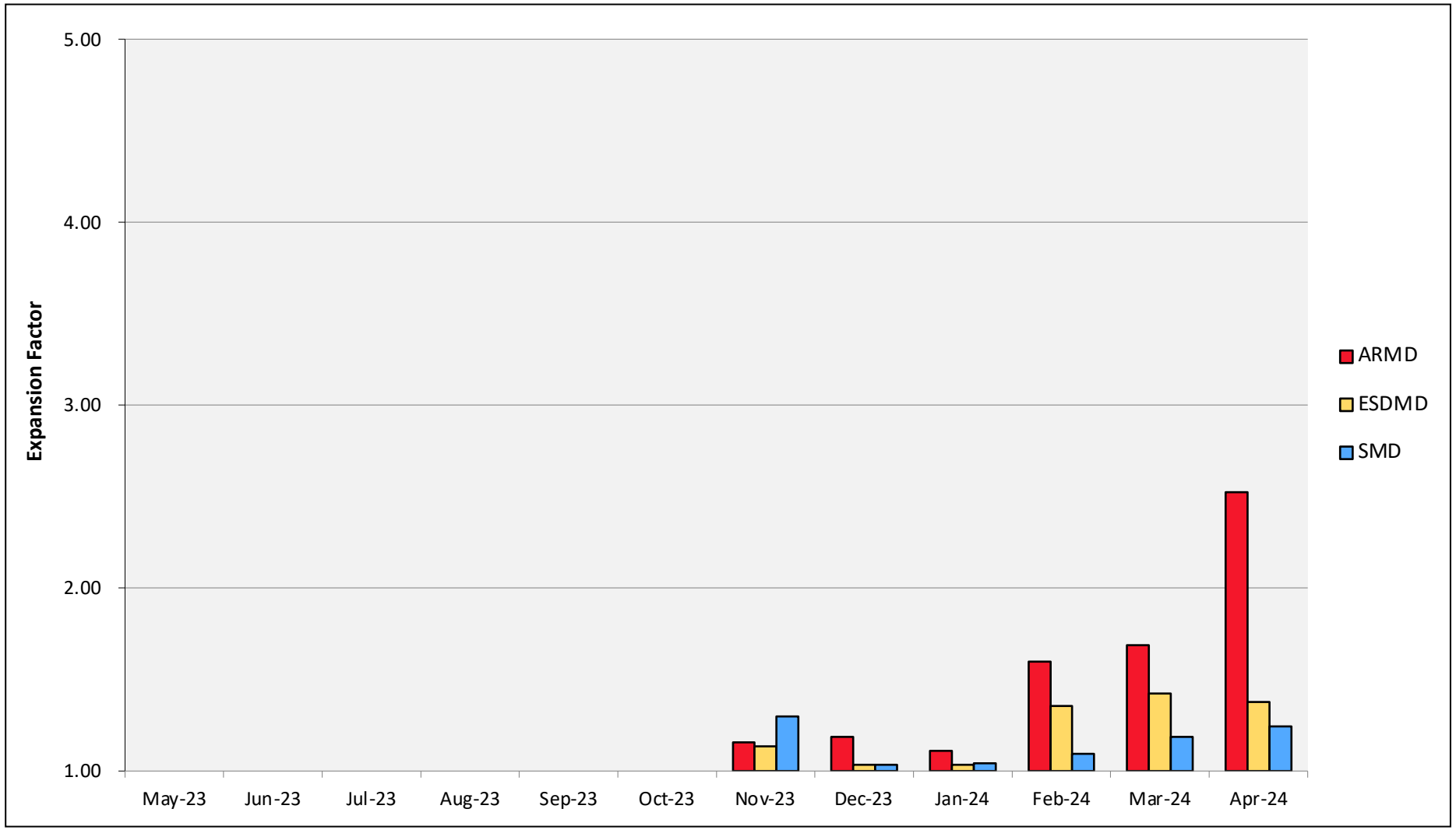
Cabeus: Monthly Utilization by Size and Length



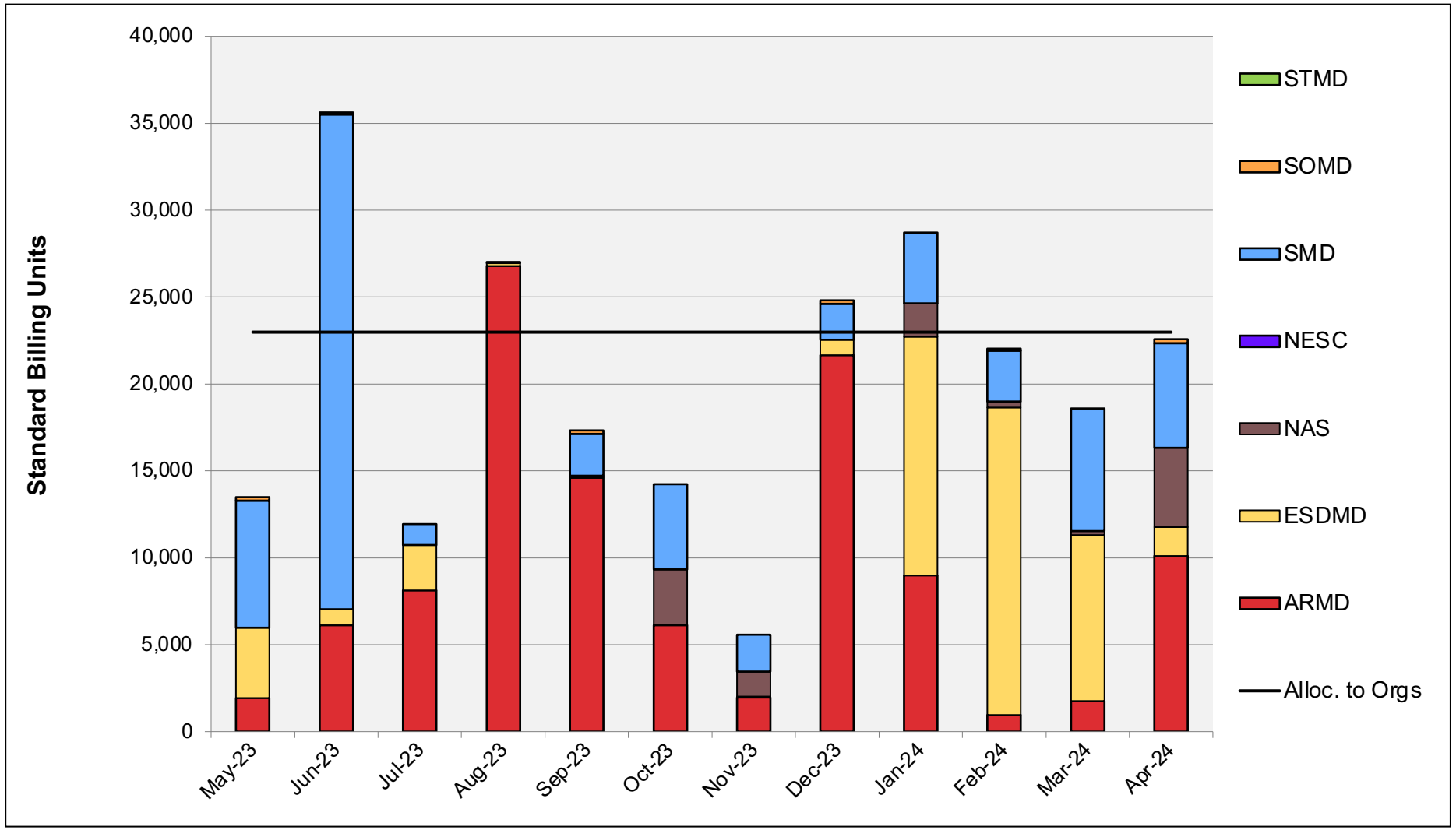
Cabeus: Average Time to Clear All Jobs



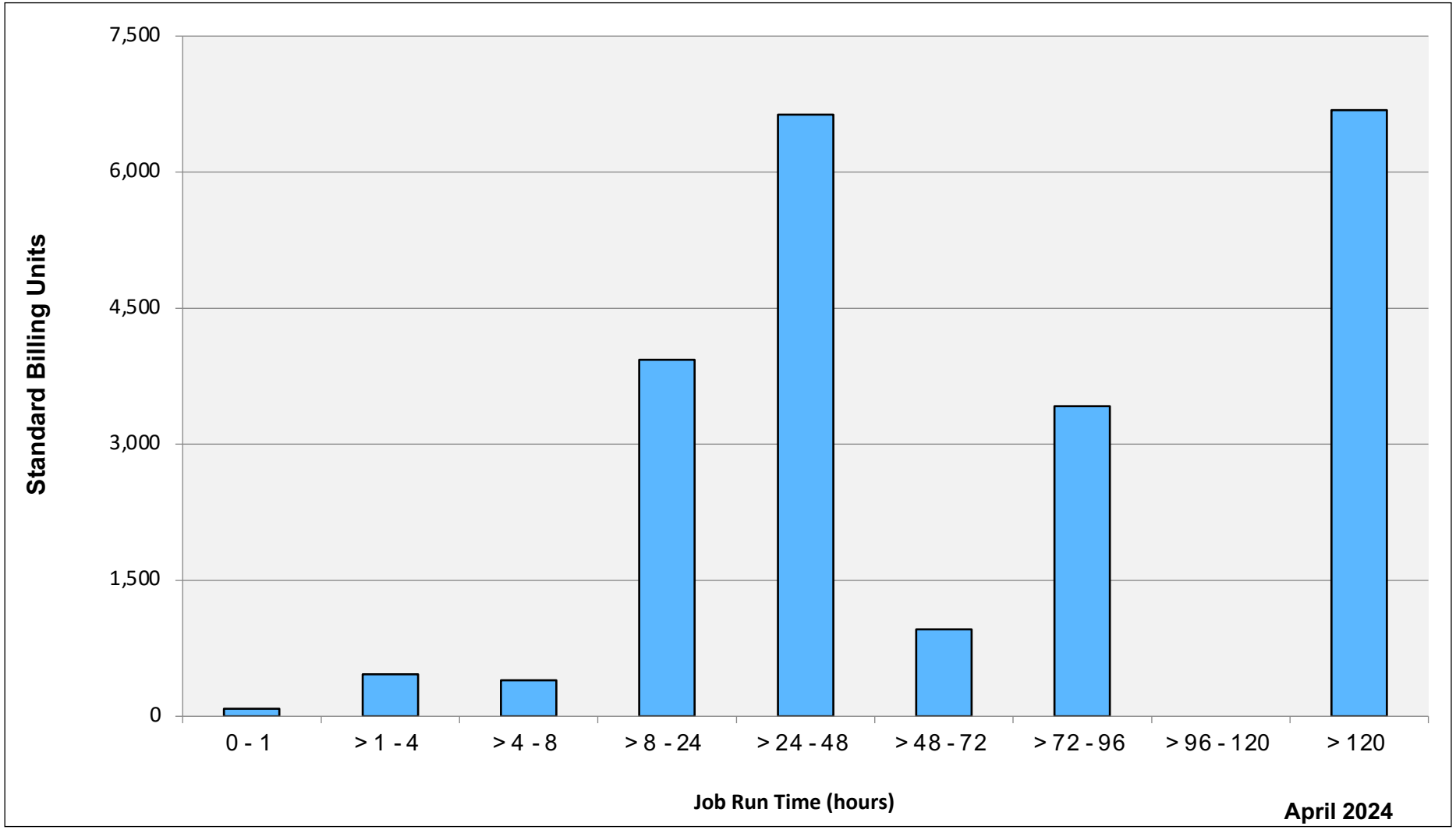
Cabeus: Average Expansion Factor



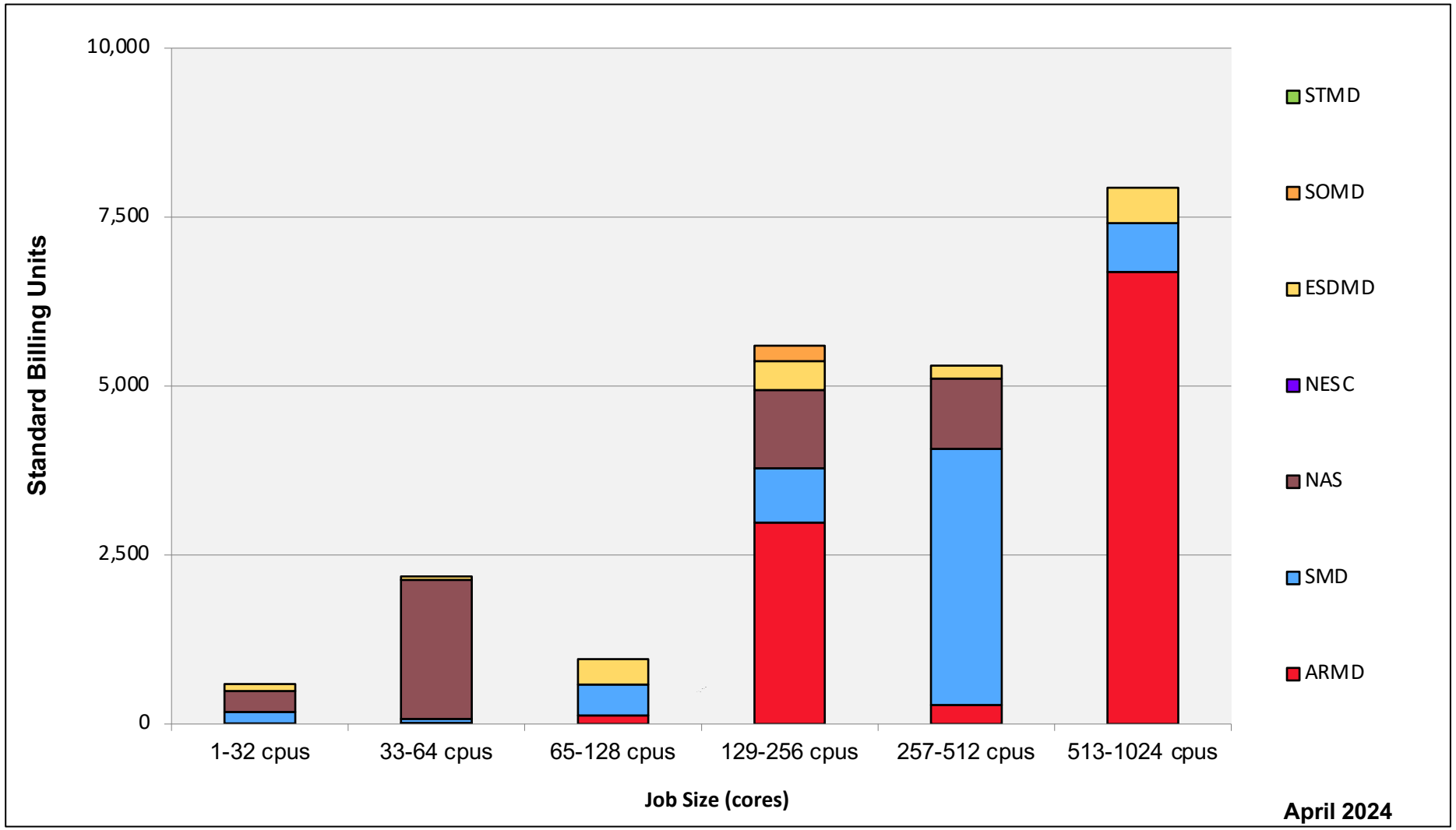
Endeavour: SBUs Reported, Normalized to 30-Day Month



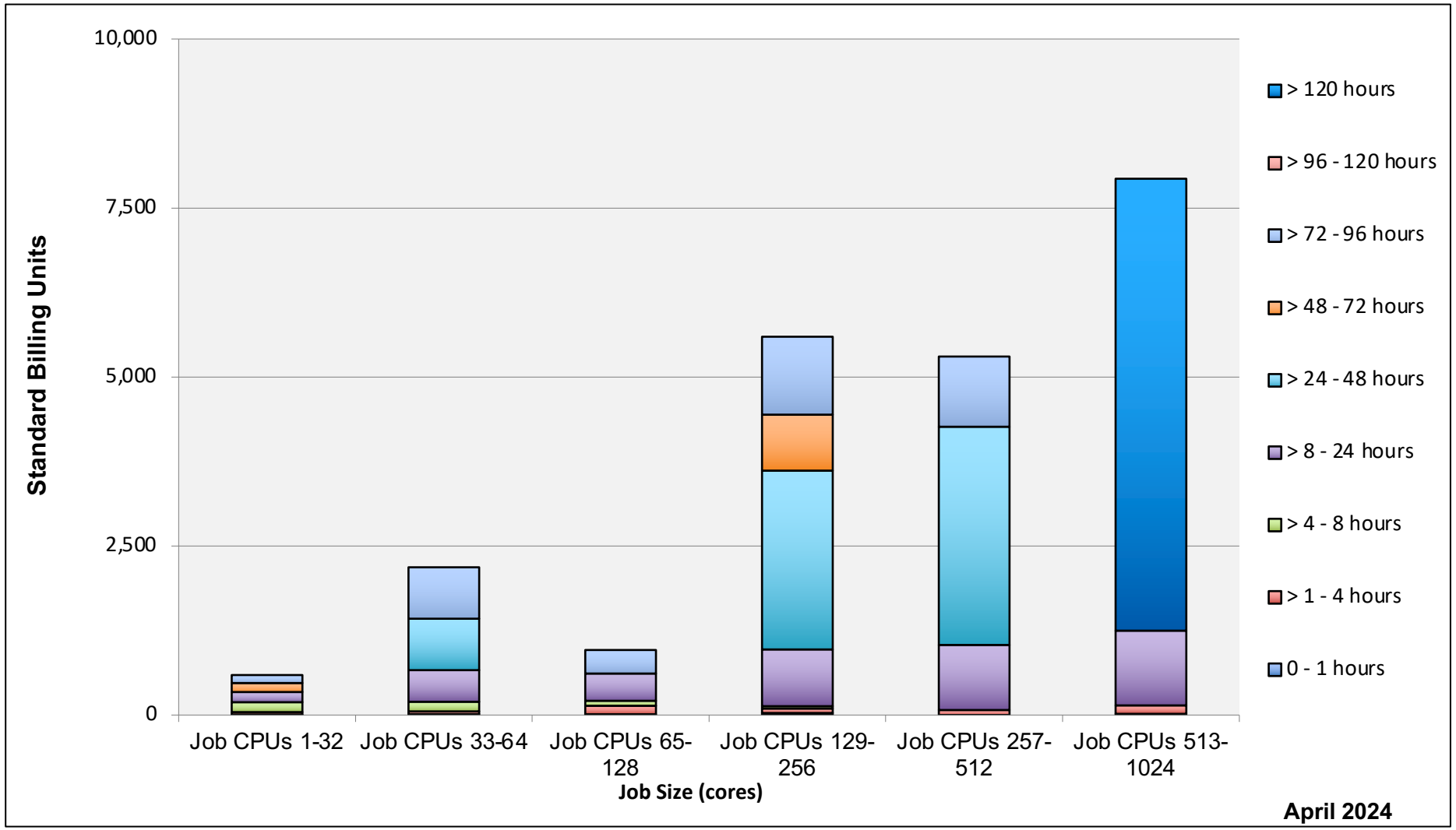
Endeavour: Monthly Utilization by Job Length



Endeavour: Monthly Utilization by Job Size



Endeavour: Monthly Utilization by Size and Length



Endeavour: Average Expansion Factor

