

National Aeronautics and Space Administration

High-End Computing Capability

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NASA High-End Computing Highlighted at SC24

- Staff from the NASA Advanced Supercomputing (NAS) Division at Ames and the NASA Center for Climate Simulation (NCCS) at Goddard developed and coordinated the agency's booth on the Exhibit floor at the International Conference for High-Performance Computing, Networking, Storage, and Analysis (SC24) held in Atlanta, Georgia November 17-21, 2024.
- This marks the 36th year that NASA has exhibited at the annual conference, which welcomed over 18,000 attendees from the HPC community across academia, industry, and government organizations.
- The booth showcased 38 presentations by scientists and researchers from six NASA centers, as well as university and industry collaborators, whose computational analyses were enabled by supercomputing resources and services provided by HECC and NCCS.
- In addition to the two presentation theaters, small-group sessions provided attendees with overviews of NASA topics—from how to apply for internships to the ins and outs of supersonic flight, and an interactive area showcased new technology being used to disseminate Earth science.
- Working with presenters, the production team developed promotional material, including the NASA@SC24 website, popular handouts, and agency-level features highlighting research on display. The NASA booth remains one of the most popular destinations for attendees during the conference.

IMPACT: The annual Supercomputing Conference provides a highly visible public platform to showcase NASA science and engineering programs supported by the agency's high-end computing resources.

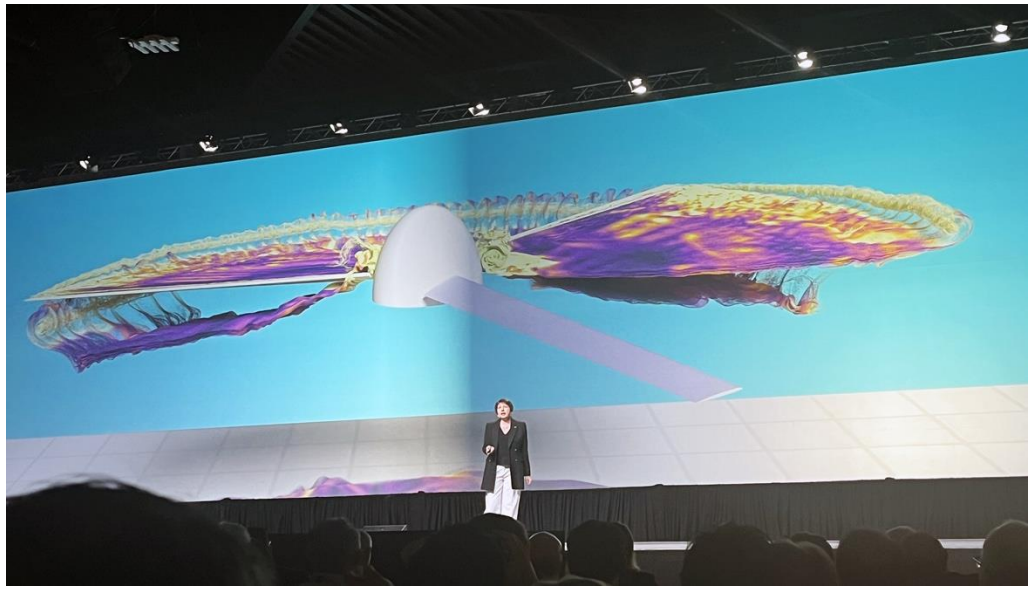


HECC Component Manager William Thigpen talks with NASA management, including Science Mission Directorate Associate Administrator Nicky Fox, in the new interactive area within the booth in the SC24 Exhibit Hall. Fox provided the keynote address at the conference, highlighting NASA's open science and exploration vision and how supercomputing enables it.
Mark Malanosky, NASA Goddard Space Flight Center

NASA High-End Computing Supports Nicky Fox SC24 Keynote

- The NASA High-End Computing Communications Strategy Team (with staff from HECC, NCCS, and NASA Headquarters) provided extensive support for development of the highly successful SC24 keynote presentation presented by Nicola “Nicky” Fox, Associate Administrator for the Science Mission Directorate on November 19.
- The team collaborated over several months with Fox's NASA presentation team and SC24 audio/video team members. Key efforts included compiling a variety of ideas across all areas of NASA Science, highlighting recommended examples from the longer provided list, locating additional high-resolution footage and photos, attending meetings to refine the presentation, and reviewing the draft script and providing edits and comments.
- Many of the spectacular images and videos were produced by visualization experts on the HECC team and at the Scientific Visualization Studio at NASA Goddard.
- Onsite at SC24, staff attended the keynote and gave glowing feedback to Fox (during her hour-long visit to the NASA exhibit) and her presentation team from SC24 attendees, who said it was the best keynote they have ever heard at the SC conference (including one attendee who has been coming since 1989!).

IMPACT: HECC supercomputing capabilities and comprehensive user support enable researchers to delve into the nature of observed phenomena with NASA missions, such as the Solar Dynamics Observatory, Solar Orbiter, and Hinode.



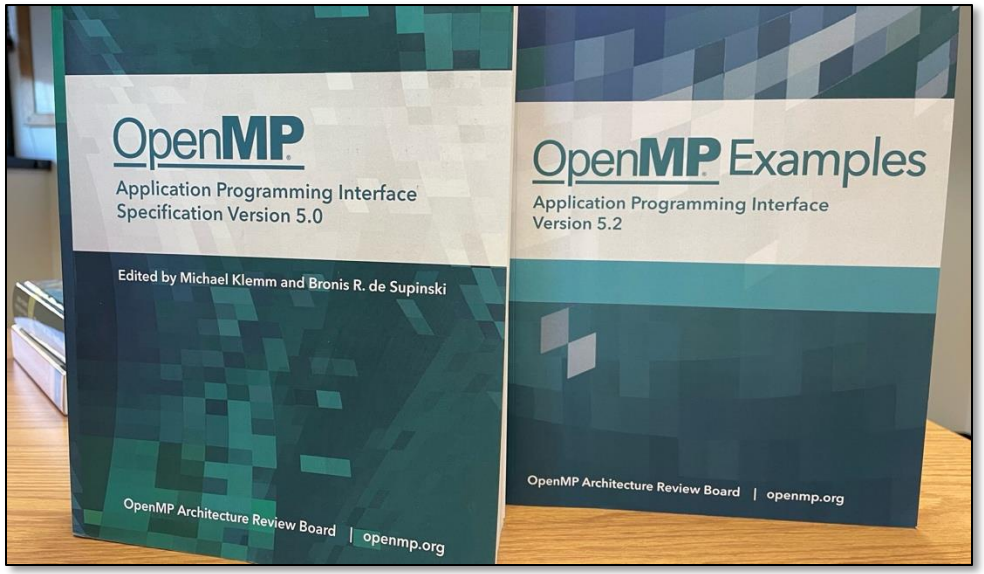
NASA’s Nicola “Nicky” Fox presented the keynote address, “NASA’s Vision for High Impact Science and Exploration,” at the SC24 conference. *Credit: Jarrett Cohen, NASA Goddard Space Flight Center.*

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

HECC Contributes to the Release of OpenMP 6.0

- The OpenMP 6.0 specification and its companion OpenMP 6.0 Examples document were released at SC24 (see slide 5). The specification was jointly developed by the OpenMP Architecture Review Board (OpenMP ARB), a group of major computer hardware and software vendors, and user community, in which HECC is an active member.
- OpenMP is a shared-memory parallel programming model for applications running on high-performance computing systems, including accelerated devices such as graphics processing units. Many of the NASA applications utilize OpenMP for speeding up execution on HECC systems such as Aitken and Cabeus.
- Some of the new features in the OpenMP 6.0 release include:
  - Simplification of task programming with task graph and free-agent threads.
  - Enhanced device support to ease the code development for GPUs.
  - New loop transformation capabilities.
  - Enhancement in expressing parallelism, such as parallel induction and reduction on private variables.
  - Greater user control of storage resources and memory spaces.
- HECC Deputy Component Manager Dr. Henry Jin serves as a co-chair of the OpenMP Examples subcommittee for the development and release of the OpenMP 6.0 Examples document.

IMPACT: The OpenMP programming language has been used by many NASA applications to run on parallel systems. HECC's contributions to the new OpenMP 6.0 features will help ease the development of new parallel applications.

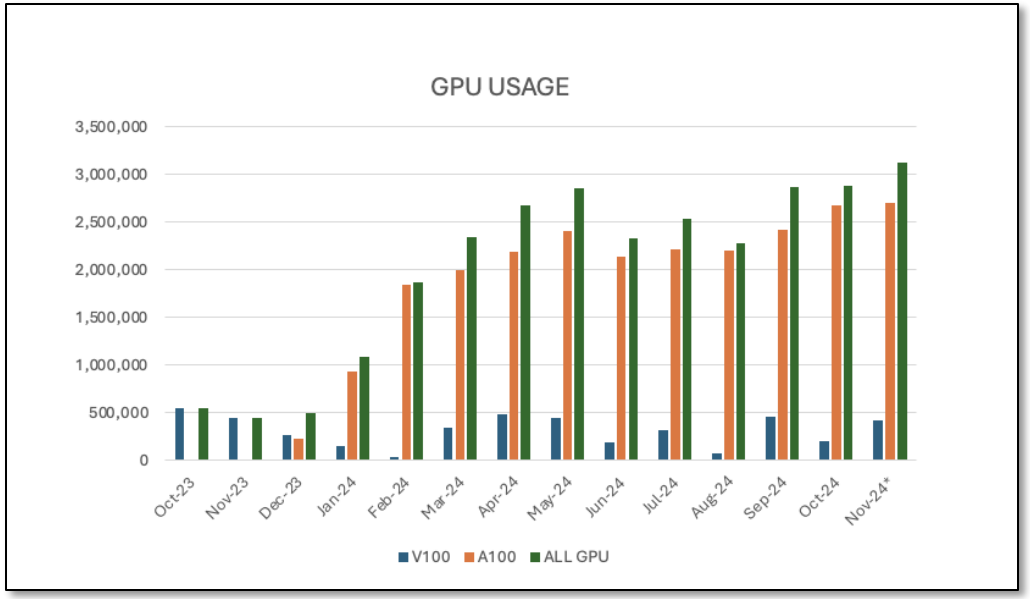


The OpenMP Specification and Examples Documents, released by the OpenMP Architecture Review Board. See http://www.openmp.org/ for more information.

Improving Utilization of Cabeus Milan A100 Nodes

- The demand for Cabeus Milan A100 GPU nodes has consistently surpassed available resources, driving the need for better job scheduling and packing to minimize the number of "holes"— idle nodes that aren't used by any jobs.
  - Specifically, wide jobs (those needing 32 or more nodes) consistently created holes because enough idle nodes need to be accumulated to run wide jobs.
  - A new queue structure with prime-time and non-prime-time was created to isolate the running of wide jobs to only two days a week during non-primetime (Thursday 7:00 a.m. – Saturday 7:00 a.m. Pacific Time). But this required draining the system twice a week and created larger holes since prime-time jobs cannot cross into non-prime-time and vice versa.
- To decrease the scheduling holes and improve node utilization, the HECC Application Performance and Productivity (APP) team continues to help users utilize idle nodes during periods of system draining and overrode the scheduling policy when appropriate.
  - The team developed and implemented scripts to automate manual operations that start wide jobs ahead of schedule if enough nodes free up and run small jobs during non-prime-time.
  - The team helped users to become more adept at using "shrink-to-fit;" that is, specifying a minimum and maximum wall-time and letting the scheduler adjust the actual wall-time to fit the duration of the hole.

IMPACT: The Cabeus Milan A100 nodes have been oversubscribed for many months. HECC applications experts increased utilization by manual steering of job scheduling and working with users to reduce the number, size, and duration of scheduling holes.

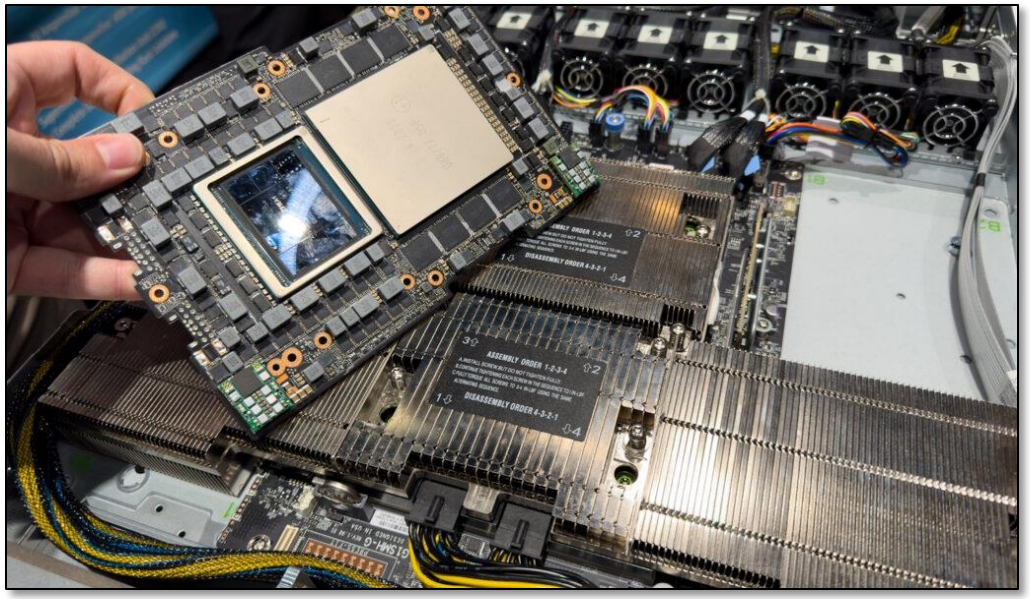


Total SBU usage on the GPU nodes exceeded 3 million for the first time in November 2024. This increase is made possible through careful optimization of job scheduling and packing to minimize time spent by scheduling holes and working with users to use shrink-to-fit methods.

Grace Hopper Pre-Engineering Effort Complete

- The HECC Systems team completed the Grace-Hopper pre-engineering development effort, which was performed in advance of the deployment of a new 350-node Grace Hopper graphics processing unit (GPU) cluster.
- The team initially received prototype hardware for use as a technology testbed. Once initial benchmark tests were complete, this testbed was converted into a pre-engineering development cluster, used to test both the Grace Hopper system hardware in the HECC enclave environment and NVIDIA's Base Command Manager cluster management software.
- The Grace Hopper pre-engineering development cluster was comprised of the following components:
  - Two Supermicro Grace Hopper compute nodes with NVIDIA GH200 Grace CPU, ARM Neoverse V2 CPU cores:
    - Single NVIDIA H100 GPU per GPU node, with 96 gigabytes (GB) high-memory (M3) GPU memory.
    - Single-port NVIDIA NDR200 InfiniBand.
  - Service Nodes
    - One front-end development server.
    - One PBS scheduling server.
    - Two Grace Hopper base management controller admin servers.
  - Storage: DDN/Lustre test filesystem

IMPACT: The Grace Hopper pre-engineering development cluster provided a valuable opportunity to discover and and solve compatibility and performance issues much earlier than in previous system deployments.

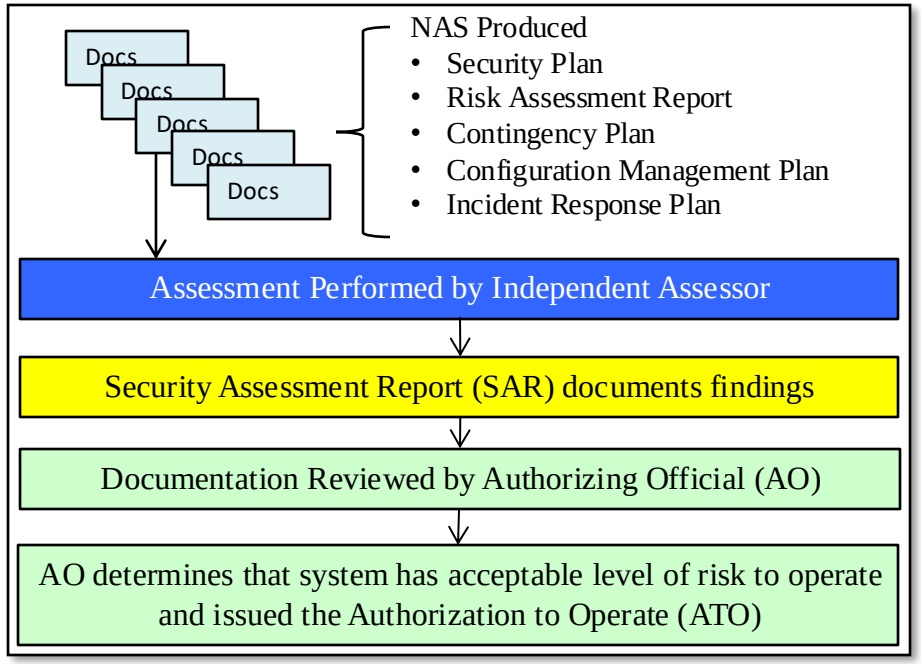


The NVIDIA Grace Hopper Superchip installed at the NASA Advanced Supercomputing facility. *Don Story, NASA Ames*

Security Team Obtains Authorization to Operate

- The NAS/HECC Security team completed updating the NAS Systems Environment (NSE) System Security Plan (SSP) with input from other HECC support groups. A completed package was submitted for a year-two Security Controls Assessment (SCA) based on the ongoing Authorization to Operate (ATO) granted last year.
  - The SCA was performed by the NSE Security team as a self-assessment in alignment with agency requirements.
  - The SCA team evaluated the information assurance posture of NSE facilities, systems, and operations, including HECC systems, with agency requirements.
- All findings were addressed and briefed to Dr. David Korsmeyer, deputy center director of NASA's Ames Research Center, who is the Authorizing Official (AO) for NSE.
- Based on analysis of the Security Assessment Report, the AO issued a renewal of the ongoing ATO. The ATO allows NSE and HECC operations for another year, in compliance with agency security requirements.

IMPACT: Reauthorization of the NAS Systems Environment System Security Plan allows HECC systems to continue operating for another year, providing critical supercomputing resources to NASA missions, programs, and projects.

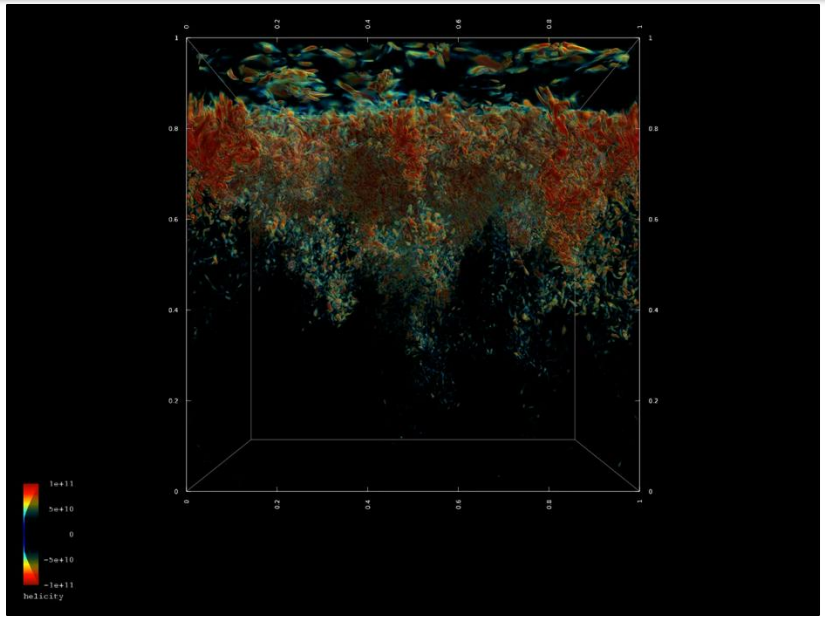


Flow chart outlining the evaluation and approval process leading to receiving an Authorization to Operate.

Realistic Modeling of the Sun: From Tiny to Large Scales*

- Scientists at NASA Ames performed 3D realistic radiative hydrodynamic and magnetohyrodynamic modeling of the Sun from the deep interior regions to the atmosphere
- These realistic models allowed the scientists to study the physics of solar plasma from tiny to large scales—on scales significantly smaller than any telescope can resolve scales larger than the American continent.
- The 3D realistic hydrodynamics modeling enabled the discovery of a 6,200-mile-thick near-surface layer of the Sun (the leptocline) that is crucial for understanding how subsurface magnetic fields reorganize just before their emergence on the solar surface.
- The model results are used to generate synthetic observables for calibration and interpretation of observations from the Helioseismic and Magnetic Imager onboard the Solar Dynamics Observatory and test existing and new techniques to reconstruct subsurface dynamics and structure of the Sun.
- The simulations utilize state-of-the-art advances in modeling radiating plasma in the presence of the Sun's magnetic fields and rotation in the highly stratified medium.

IMPACT: HECC supercomputing capabilities and comprehensive user support enable researchers to delve into the nature of observed phenomena with NASA missions such as the Solar Dynamics Observatory, Solar Orbiter, and Hinode.



3D radiative hydrodynamic simulation showing the evolution and coupling of the helical flows in the upper layers of the Sun's convection zone and low atmosphere.
Irina Kitiashvili and Timothy A. Sandstrom, NASA/Ames

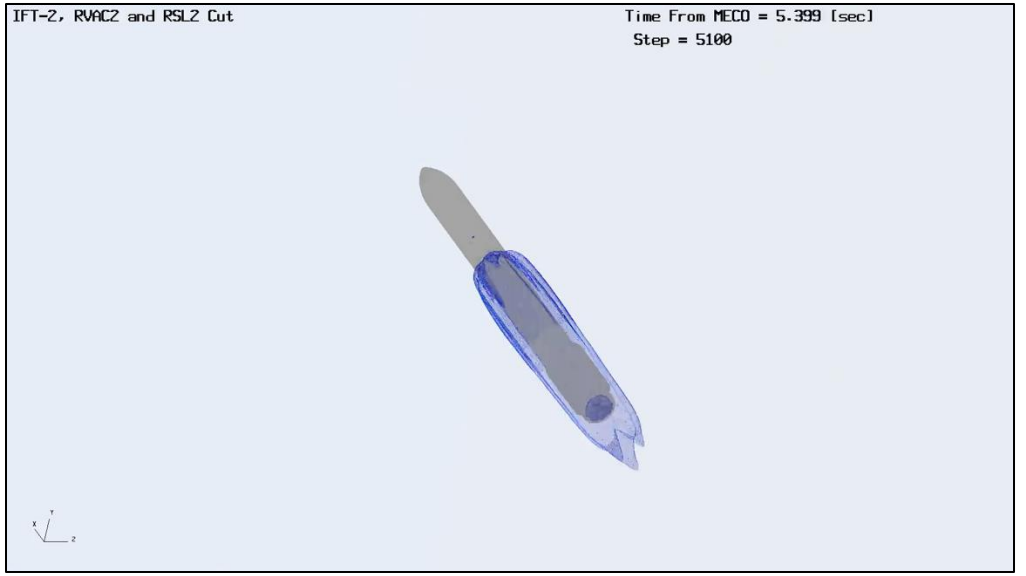
** HECC provided supercomputing resources and services in support of this work.*

SpaceX Starship Hot Staging from Concept to Flight*

- To analyze the hot staging maneuver used by SpaceX's Starship for its stage separation, researchers in the Fluid Dynamics Branch at NASA's Marshall Space Flight Center performed computational fluid dynamics (CFD) simulations using the Loci/CHEM flow solver.
  - With hot staging, the spacecraft's upper-stage engines are ignited before the booster engines are completely cut off. Prior to Starship, the maneuver had never been done on a vehicle of this size (at nearly 400 feet, the largest rocket ever built).
  - Hot staging is more efficient than traditional stage separation because the rocket never stops accelerating during separation; however, plume impingement occurs in the confined interstage space between the booster and the upper stage, creating an environment that is complex and not well understood.
- The Marshall team simulated various engine startup sequences and analyzed the resulting aerodynamic loads. These simulations included steady-state simulations as well as sophisticated time-accurate moving body simulations on a variety of iterations of the Starship geometry.
- The separation and motion of the booster as it drifted away from Starship were also studied.
- Flight data from Starship's second Integrated Flight Test (IFT2) compared favorably to the CFD results. The simulations supported SpaceX in designing a successful hot-staging separation.

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

IMPACT: This work supported SpaceX in designing a successful hot-staging separation. Further optimization of the flow solver will help NASA make better use of the more computationally intensive, higher fidelity tools for lunar mission planning.



As the upper stage Starship engines start up, their exhaust flows out of the vents in the interstage between Starship and the lower stage booster. In this animation, the exhaust is represented by colored isosurfaces. The isosurfaces change from blue to red as the Mach number increases. *Jason Howison, NASA/Marshall*

Papers

- "**Origins of Super Jupiters: TOI-2145b Has a Moderately Eccentric and Nearly Aligned Orbit**," J. Dong, et al., arXiv:2411.01356 [astro-ph.EP], November 2, 2024. *
  https://arxiv.org/abs/2411.01356
- "**Characterisation of TOI-406 as Showcase of the THIRSTEE Program. A Two-Planet System Straddling the M-Dwarf Density Gap**," G. Lacedelli, et al., *Astronomy & Astrophysics*, published online November 2, 2024. *
  https://www.aanda.org/component/article?access=doi&doi=10.1051/0004-6361/202452244
- "**A Data-Driven Magnetohydrodynamic Simulation of the 2011 February 15 Coronal Mass Ejection from Active Region NOAA 11158**," Y. Fan, et al., *The Astrophysical Journal*, vol. 975, no. 2, published online November 5, 2024. *
  https://iopscience.iop.org/article/10.3847/1538-4357/ad7f53/meta
- "**Dual Active Galactic Nuclei: Precursors of Binary Supermassive Black Hole Formation and Mergers**," V. Saeedzadeh, et al., *The Astrophysical Journal*, vol. 975, no. 2, published online November 7, 2024. *
  https://iopscience.iop.org/article/10.3847/1538-4357/ad7a6f/meta
- "**Development of Super Plasma Bubbles During the 7 September 2017 Geomagnetic Storm Revealed by Coupled GITM-SAMI3 Simulations**," Z. Wang, et al., *Geophysical Research Letters*, vol. 51, issue 22, published online November 14, 2024. *
  https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2024GL112211
- "**Flux Ropes Induced by O+ Outflow in the Near-Earth Magnetotail: Three-Dimensional Hybrid Simulations**," Y. Omelchenko, et al., *Geophysical Research Letters*, vol. 51, issue 22, published online November 14, 2024. *
  https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2024GL112609?af=R

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

Papers (cont.)

- "**Battle of the CH Motions: Aliphatic vs. Aromatic Contributions to Astronomical PAH Emission and Exploration of the Aliphatic, Aromatic, and Ethynyl Stretches**," V. Esposito, et al., *Monthly Notices of the Royal Astronomical Society*, published online November 15, 2024. * https://academic.oup.com/mnras/advance-article/doi/10.1093/mnras/stae2588/7901356
- "**Self–Organization of Collisionless Shocks: From a Laminar Profile to a Rippled Time-Dependent Structure**," M. Gedalin, V. Roytershteyn, *Journal of Plasma Physics*, vol. 90, issue 6, published online November 15, 2024. * https://doi.org/10.1017/S0022377824001429
- "**Intermediate Mass Ratio Inspirals in Milky Way Galaxies**," J. Bellovary, et al., arXiv:2411.12117 [astro-ph.GA], November 18, 2024. * https://arxiv.org/abs/2411.12117
- "**The GAPS Programme at TNG. LXV. Precise Density Measurement of TOI-1430 b, a Young Planet with an Evaporating Atmosphere**," D. Nardiello, et al., arXiv:2411.12795 [astro-ph.EP], November 19, 2024. * https://arxiv.org/abs/2411.12795
- "**Particle Fragmentation Inside Planet-Induced Spiral Waves**," L. Eriksson, et al., *Monthly Notices of the Royal Astronomical Society: Letters*, published online November 20, 2024. * https://academic.oup.com/mnrasl/advance-article/doi/10.1093/mnrasl/slae110/7905883
- "**A Giant Planet Transiting a 3-Myr Protostar with a Misaligned Disk**," M. Barber, et al., *Nature*, vol. 635, published online November 20, 2024.* https://www.nature.com/articles/s41586-024-08123-3
- "**Planets Around Solar Twins/Analogs (PASTA) I.: High Precision Stellar Chemical Abundance for 17 Planet-Hosting Stars and the Condensation Temperature Trend**," Q. Sun, et al., arXiv:2411.13825 [astro-ph.SR], November 21, 2024. * https://arxiv.org/abs/2411.13825

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

Presentations

- **2024 Supercomputing Conference**, Atlanta, Georgia, November 17-21, 2024.
  - "**Scale-Resolving Simulations for Jet Noise Prediction**," O. Martin. https://www.nas.nasa.gov/SC24/research/project01.php
  - "**Supercomputing in Supersonics: Analyzing Noise Predictions from High-Speed Aircraft**," M. Nemec. https://www.nas.nasa.gov/SC24/research/project02.php
  - "**Optimizing Aircraft Performance for Enhanced Efficiency and Reduced Environmental Impact**," B. Lowe. https://www.nas.nasa.gov/SC24/research/project03.php
  - "**Scale-Resolving Methods for Accurately Predicting Aerodynamics of In-Flight Icing**," D. Craig Penner. https://www.nas.nasa.gov/SC24/research/project04.php
  - "**Enabling Sky-High Commutes: Simulating NASA's Tilt-Wing Air Taxi Concept**," D. Garcia Perez. https://www.nas.nasa.gov/SC24/research/project05.php
  - "**Decoding Martian Dust: Brownout Simulations of the Ingenuity Mars Helicopter**," P. Ventura Diaz. https://www.nas.nasa.gov/SC24/research/project06.php
  - "**Parallel Geometry-Based Mesh Adaptation for Supersonic Jet Acoustic Analysis**," C. Ashby. https://www.nas.nasa.gov/SC24/research/project07.php
  - "**Analyzing the Artemis I Launch Environment with Multiphase CFD**," C. DeGrendele. https://www.nas.nasa.gov/SC24/research/project08.php
  - "**NASA-GPT: Searching the Entire NASA Technical Reports Server Using AI**," D. Dalle. https://www.nas.nasa.gov/SC24/research/project09.php
  - "**HEC: Meeting Today's Most Challenging Problems and Preparing for the Future**," W. Thigpen. https://www.nas.nasa.gov/SC24/research/project10.php

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Presentations (cont.)

- **2024 Supercomputing Conference** (cont.)
  - "**The Sun in Action! 3D Realistic Modeling from Tiny to Large Scales**," I. Kitiashvili. https://www.nas.nasa.gov/SC24/research/project11.php
  - "**Forecasting Space Weather Using Machine Learning**," S. Kasapis. https://www.nas.nasa.gov/SC24/research/project12.php
  - "**Solar Corona Live! Predicting the 2024 Eclipse in Real Time**," R. Caplan. * https://www.nas.nasa.gov/SC24/research/project17.php
  - "**Unveiling Neutron Stars: Simulations and AI Insights into Cosmic Emissions**," C. Kalapotharakos, G. Olmschenk. * https://www.nas.nasa.gov/SC24/research/project20.php
  - "**Reliable Thermal Protection Systems for Planetary Missions**," S. Poovathingal. * https://www.nas.nasa.gov/SC24/research/project21.php
  - "**SpaceX Starship Hot Staging – From Concept to Flight**," J. Liu. * https://www.nas.nasa.gov/SC24/research/project24.php
  - "**Coupled Simulations of Propellant and Vehicle Dynamics Over Extreme Duration Time Scales**," M. Sansone. * https://www.nas.nasa.gov/SC24/research/project25.php
  - "**Computational Methods for Evaluating Transonic Aircraft Buffet**," D. Maldonado.
  - "**Supercomputing in Supersonics: Quiet Supersonic Flight**," M. Nemec.
  - "**Becoming a NASA Intern and Exploring the World of CFD Simulations**," P. Ventura Diaz.
  - "**How NASA Manages User Access Using Arbiter2**," D. Chau.
  - "**Managing and Patching Multiple Architectures at NASA**," D. Story.
  - "**Designing Ansible for Large Scale Environments**," A. Pelkey.
  - "**The Infrastructure Enabling Edge Computing**," W. Thigpen.

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News and Events

- **Inside NASA's High-Tech World: How Supercomputing Is Unlocking the Universe**, *SciTechDaily*, November 24, 2024—NASA harnesses the power of supercomputing to advance our understanding of the universe, from redesigning launch pads for Artemis II to developi ng AI for climate modeling.
  https://scitechdaily.com/inside-nasas-high-tech-world-how-supercomputing-is-unlocking-the-universe/
- **NASA's Innovations in Space Science Computing**, *Observer Voice*, November 23, 2024—At the Supercomputing Conference 2024 (SC2024), NASA's Associate Administrator for the Science Mission Directorate, Nicola Fox, unveiled groundbreaking computational tools a imed at enhancing space science.
  https://observervoice.com/nasas-innovations-in-space-science-computing-78373/
- **Ready, Set, Action! Our Sun is the Star in Dazzling Simulation**, *NASA Ames*, November 21, 2024—NASA supercomputers are shedding light on what causes some of the Sun's most complex behaviors. Using data from the suite of active Sun-watching spacecraft currently observing the star at the heart of our solar system, researchers can explore solar dynamics like never before.
  https://www.nasa.gov/general/ready-set-action-our-sun-is-the-star-in-dazzling-simulation/
  - **Ready Set Action Our Sun Takes Center Stage in Simulation Advances**, *Space Daily*, November 22, 2024
    https://www.spacedaily.com/reports/Ready_set_action_our_sun_takes_center_stage_in_simulation_advances_999.html
  - **Ready, Set, Action! Our Sun is the Star in Dazzling Simulation**, *Space Week*, November 21, 2024
    http://spaceweekly.com/?p=791372
- **NASA Brings AI to Space Science, These Areas to Get Biggest Boost**, *Financial Express,* November 21, 2024—During the Supercomputing conference or SC2024, NASA's Associate Administrator for the Science Mission Directorate, Nicola Fox, explained about the new computational tools powered by artificial intelligence (AI). These tools are made to upgrade space science.
  https://www.financialexpress.com/life/science-nasa-brings-ai-to-space-science-these-areas-to-get-biggest-boost-3671269/#:~:text=By%20bringing%20an%20AI%20tool,be%20explored%20or%20understood%20earlier

News and Events (cont.)

- **Exploring New Frontiers: HPC Infrastructure with NASA and Solidigm**, *Tech Arena*, November 20, 2024—Solidigm's Jeniece Wnorowski speaks with Bill Thigpen about NASA high end computing, delving into the data demands of modern satellites, and the impressive infrastructure required on the ground to support the uninterrupted flow of information about our planet—and everything beyond.
https://www.techarena.ai/content/exploring-new-frontiers-hpc-infrastructure-with-nasa-and-solidigm
- **NASA Showcases AI-Powered Computational Tools to Advance Scientific Research at SC24 Event**, *Gadgets360*, November 20, 2024
At the Supercomputing Conference or SC2024, NASA's Associate Administrator for the Science Mission Directorate, Nicola Fox, detailed new computational tools intended to advance space science.
https://www.gadgets360.com/science/news/nasa-ai-tools-scientific-research-advancement-supercomputing-conference-2024-sc24-nicky-fox-7064194
- **SC2024 Keynote: NASA's Nicky Fox Takes Us for a Ride**, *HPCwire*, November 19, 2024—Nicky (Nicola) Fox's visually-stunning SC2024 keynote was partly a whirlwind flyby of NASA missions, providing just enough to whet the appetite, with pit-stops along the way to emphasize the foundational role of computation in NASA's past work, including the emergence of AI stepping into the fray.
https://www.hpcwire.com/2024/11/19/sc2024-keynote-nasas-nicky-fox-takes-us-for-a-ride/
- **Six Ways Supercomputing Advances Our Understanding of the Universe**, *NASA Feature*, November 15, 2024**—**From understanding our own planet to exploring the farthest reaches of the cosmos, supercomputers are essential to NASA science and engineering — including space weather research, AI-based models for weather and climate science, fuel-efficient aircraft design, optimizing the launch environment for the Artemis Program, and revealing the mysteries of neutron stars. These projects are just a sample of the many that were on display in NASA's exhibit during SC24.
https://www.nasa.gov/general/six-ways-supercomputing-advances-our-understanding-of-the-universe/

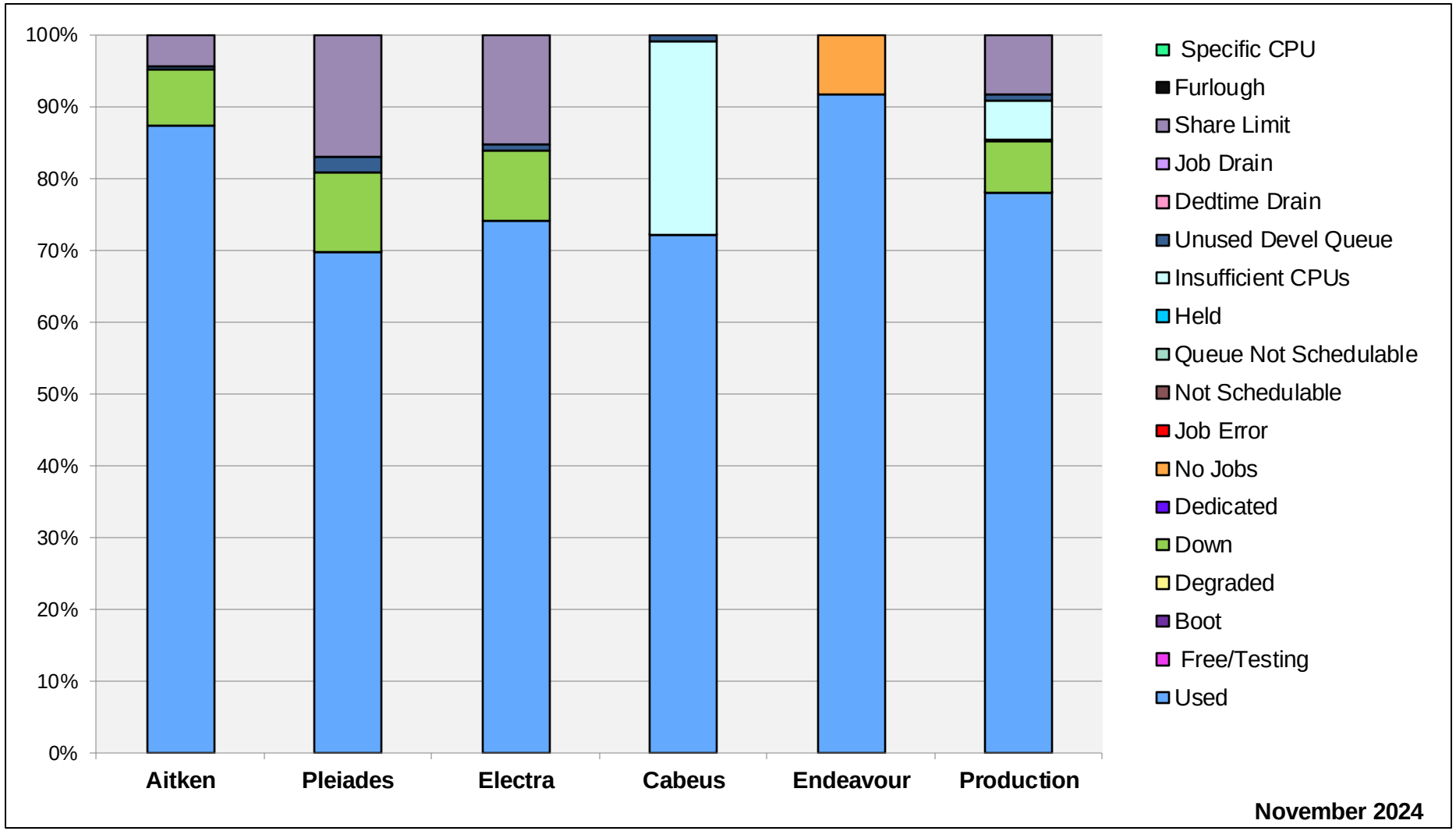
News and Events (cont.)

- **A Window into the Universe: NASA 'hyperwall' Advances Data Visualization at a Massive Scale**, *Mountain View Voice*, November 11, 2024—A massive visualization system that spans a large stretch of a wall at NASA's Ames Research Center is having a big impact on scientists who are traveling from all over the world to pore over the display for research. The new hyperwall is a 300 square-foot display that gives scientists the opportunity to see and analyze high-dimensional data at an unprecedented scale and in great detail. https://www.mv-voice.com/technology/2024/11/11/a-window-into-the-universe-nasas-hyperwall-advances-data-visualization-at-a-massive-scale/
- **Top500 Wild Cards Could Add Thrills to Supercomputing 2024 Show**, *HPCwire*, November 11, 2024—This year's keynote speaker is Nicky Fox, the associate administrator for NASA's Science Mission Directorate. She will talk about missions conducted by NASA and the science behind them. She will discuss how supercomputing helped the space agency achieve its goals. The keynote will also touch on AI's role in NASA's supercomputing infrastructure. Artificial intelligence is a top priority for scientific computing, reflected in the numerous sessions at this year's SC 2024.
https://www.hpcwire.com/2024/11/11/top500-wild-cards-could-add-thrills-to-supercomputing-2024-show/

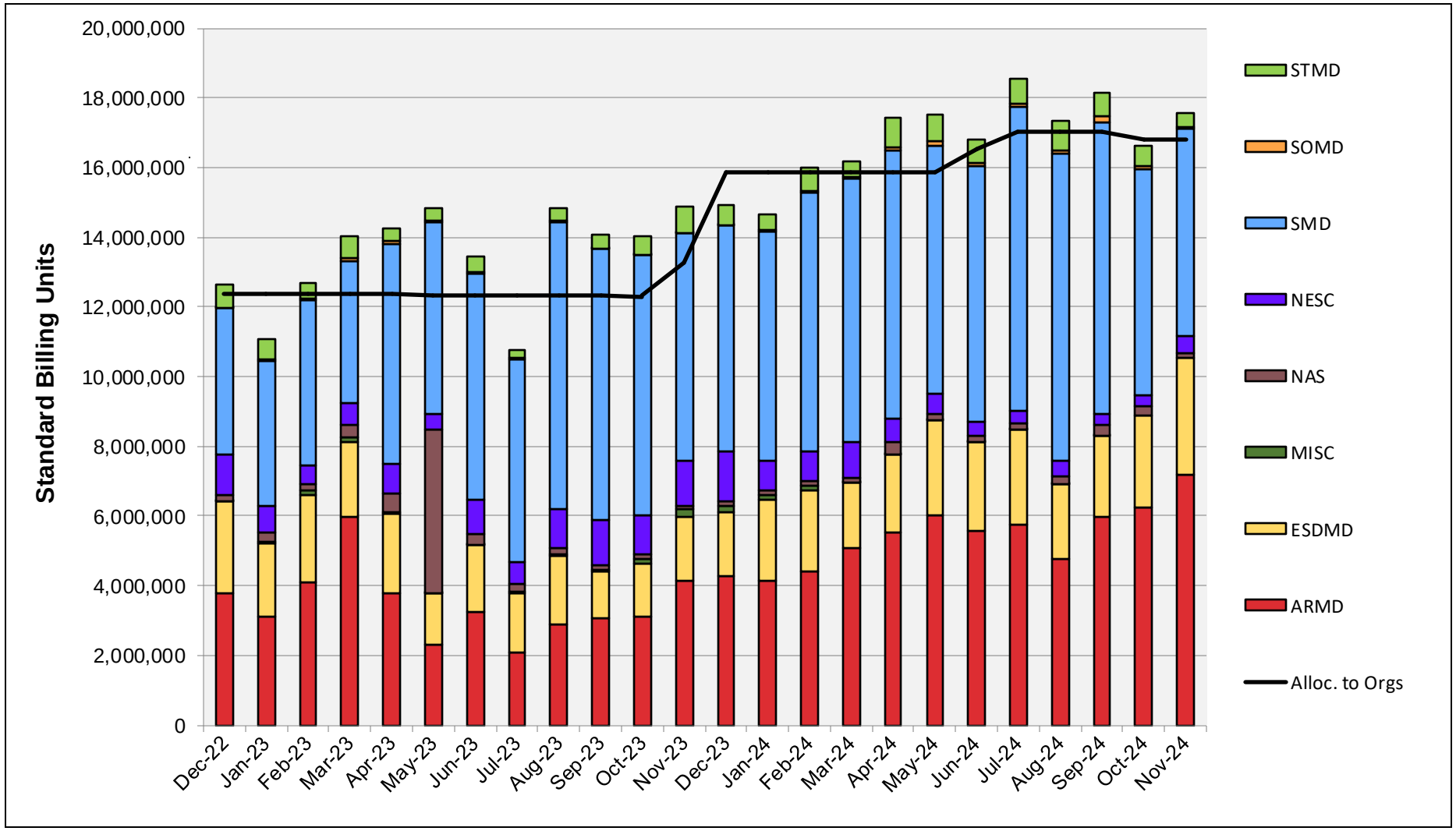
Social Media

- **SC24 Promotional Posts**:
  - **Announcement**
    - **NASA Supercomputing:** Facebook 7 likes; X 3 shares, 8 likes.
  - **"Six Ways…" Feature**
    - **NASA Ames:** Facebook 796 likes, 44 comments; X 111 comments, 314 shares, 2.2k likes.
    - **NASA Supercomputing:** Facebook 7 likes, 2 shares; X 2 shares, 7 likes..
    - **NASA Advanced Supercomputing Division (NAS):** X 1 shares, 7 likes.
  - **Global Emissions Feature**
    - **NASA Ames:** Facebook 2.6k likes, 944 comments; X 50 comments, 219 shares, 695 likes.
  - **Solar Simulation Feature**
    - **NASA Ames:** Facebook 157 likes, 13 comments; X 2 comments, 15 shares, 80 likes.
  - **SC24 Wrap-Up**
    - **NASA Supercomputing:** Facebook 8 likes, 1 share.
  - **Presentation Related Posts**
    - **Dr. Nicky Fox (Keynote):** X 1 comment, 7 shares, 27 likes.
    - **NASA Supercomputing:** X – 38 posts announcing times and locations.

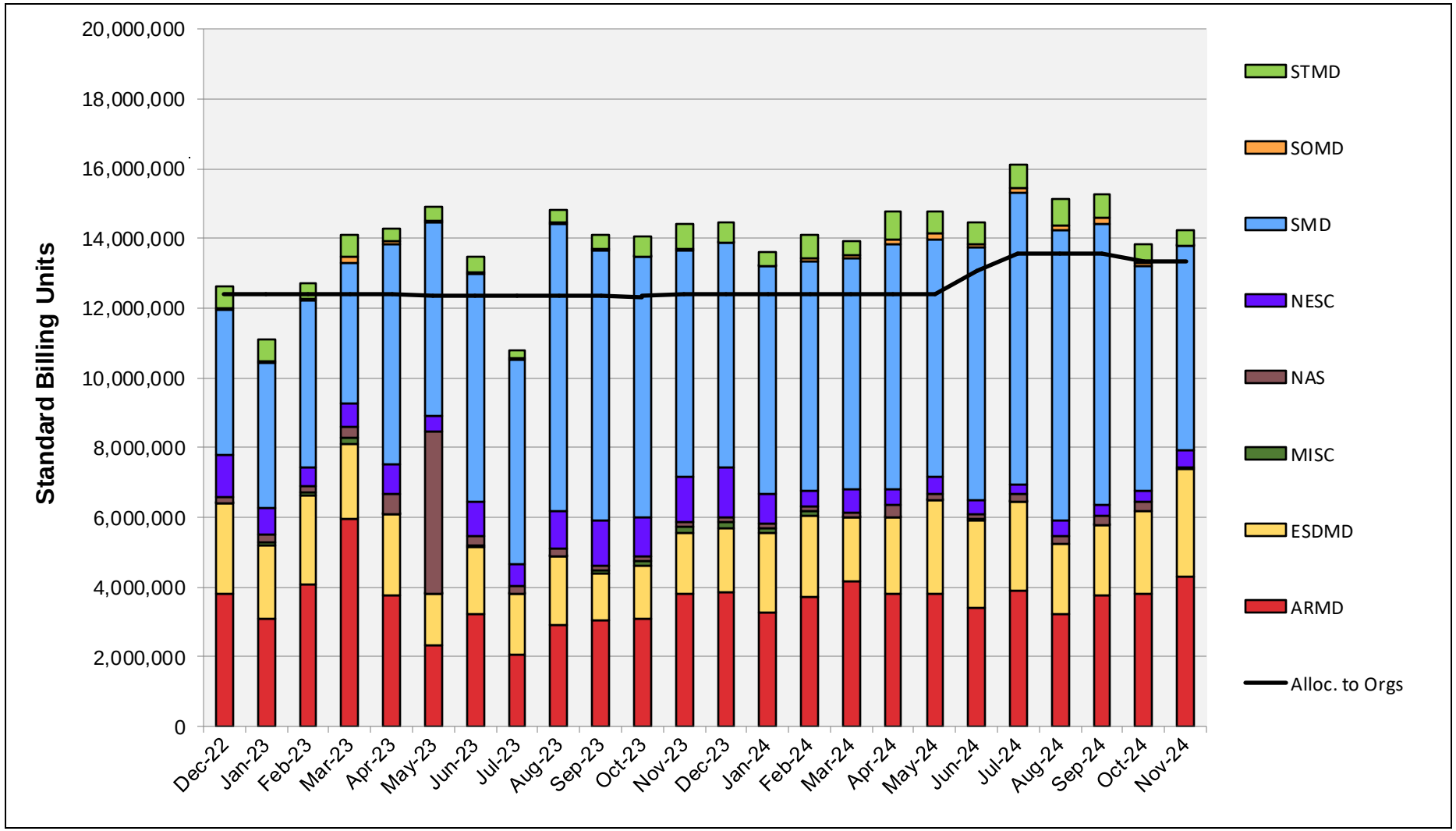
HECC Utilization



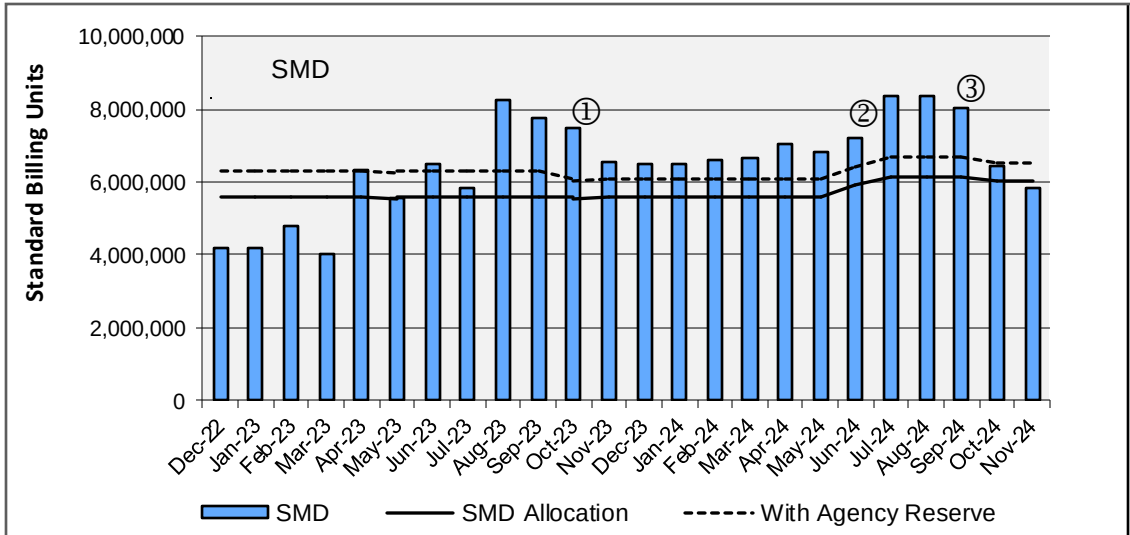
HECC Utilization Normalized to 30-Day Months

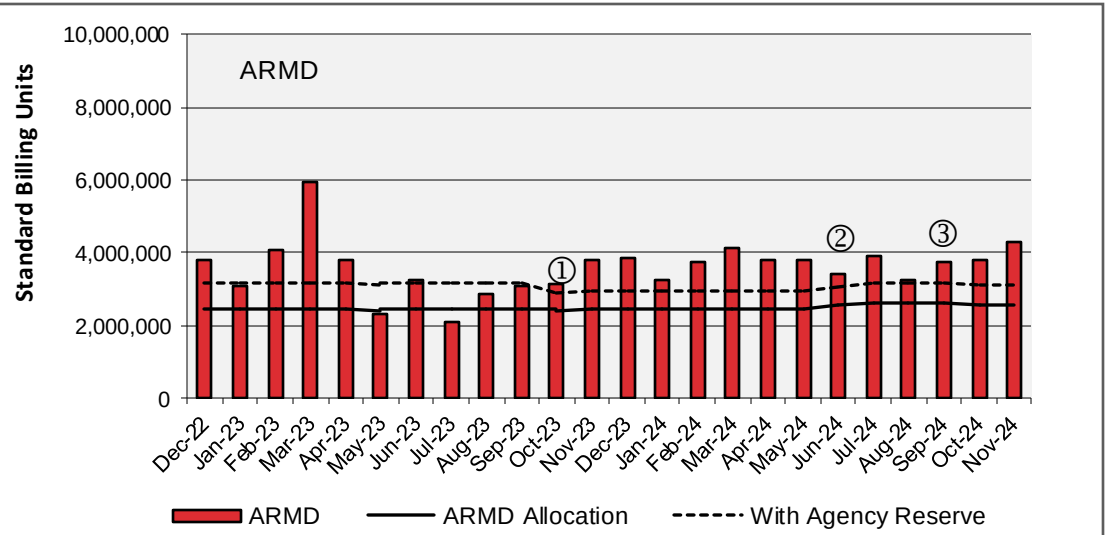


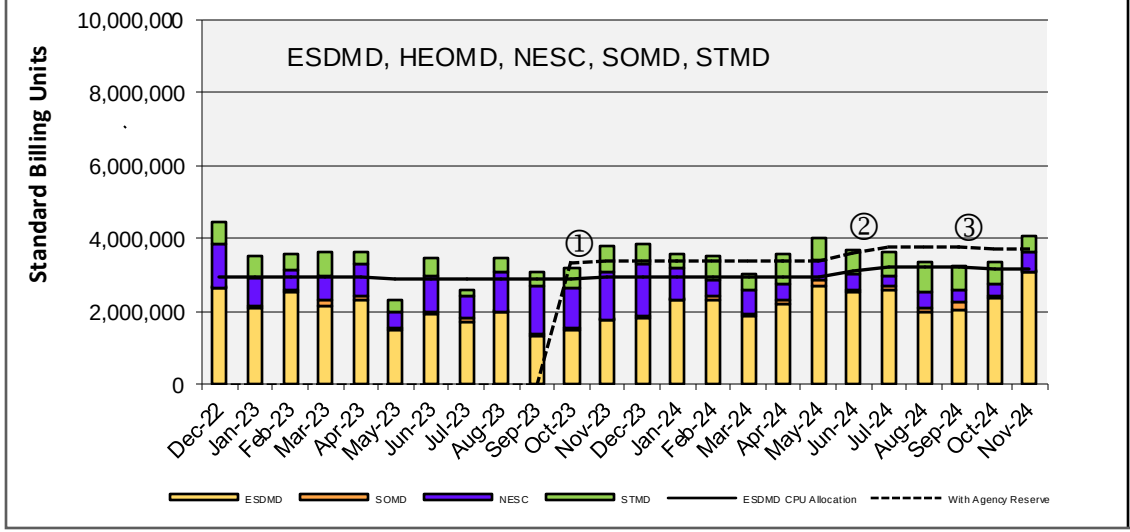
CPU Only Normalized Data



CPU Only by Mission Directorate





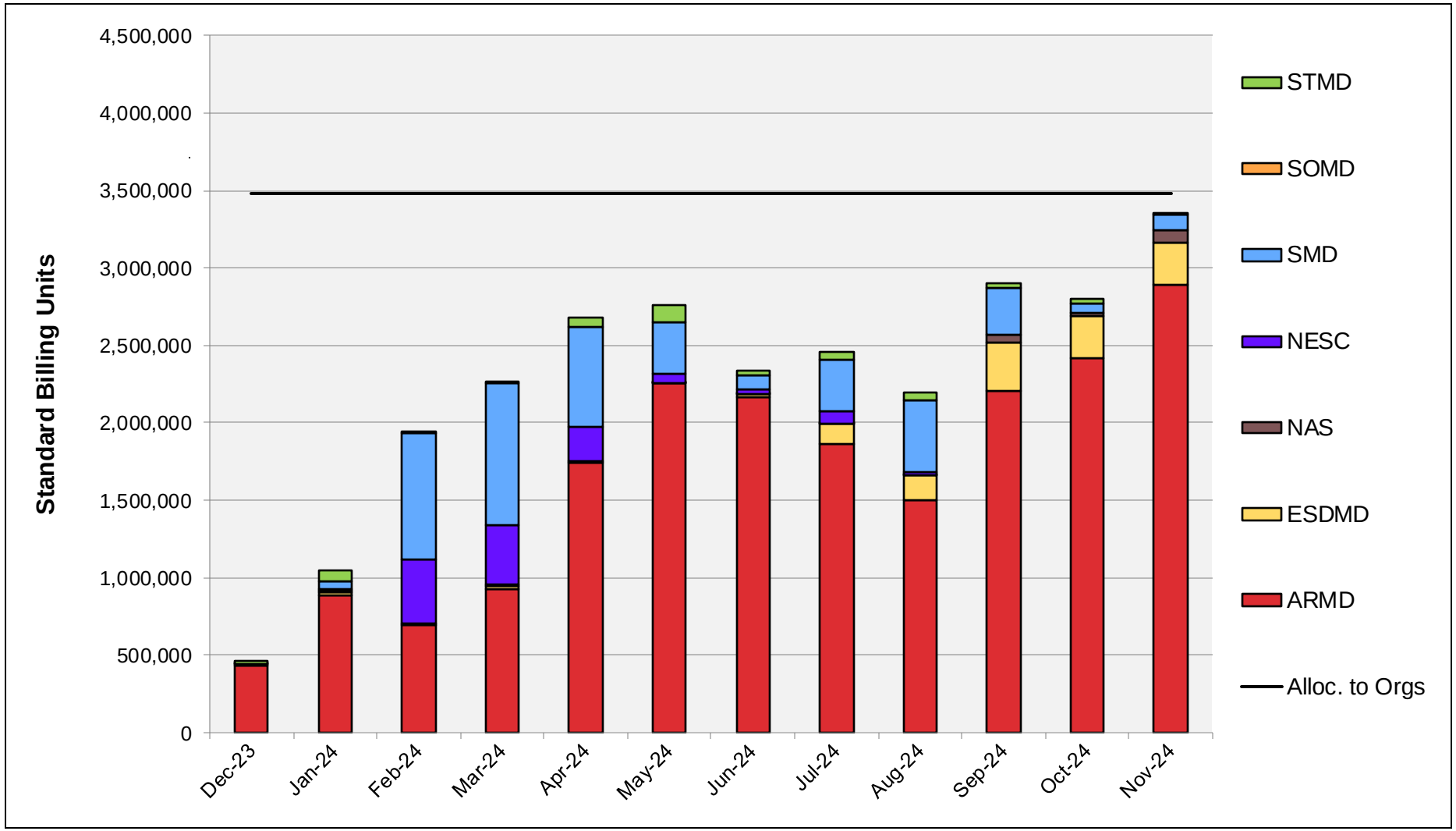


① 4 Rome Apollo Racks added to Aitken

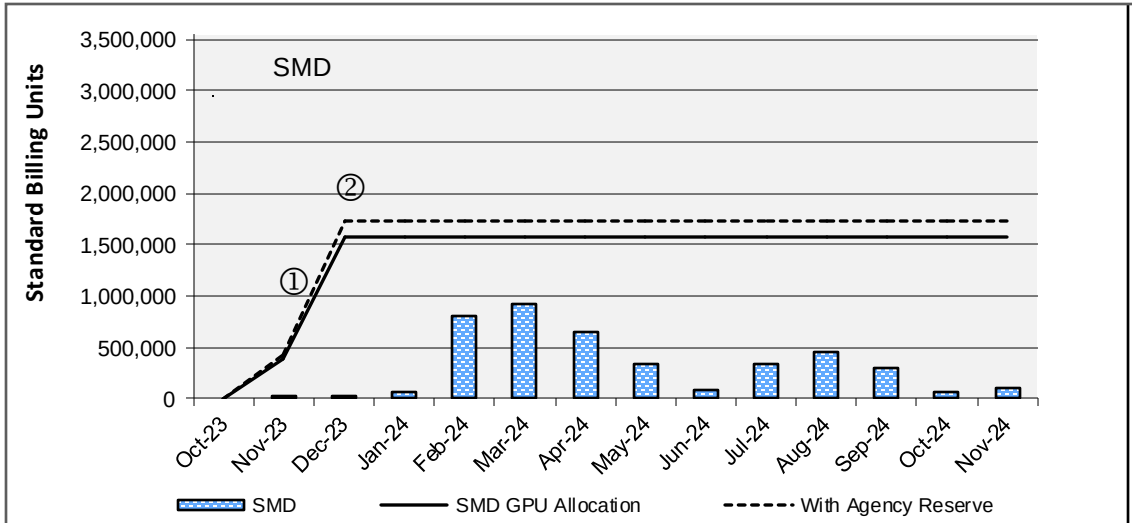
② Aitken Milan nodes added

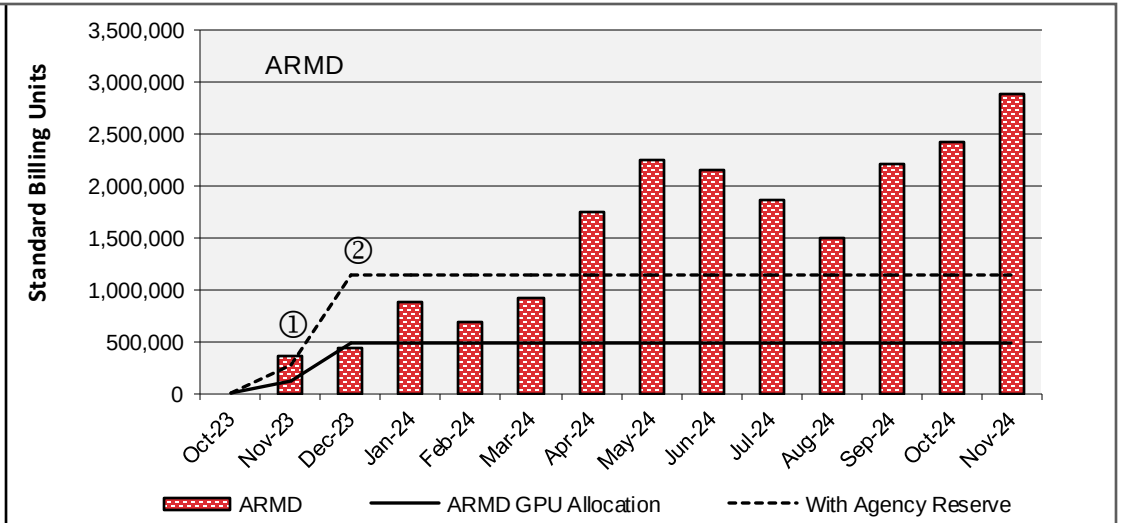
③ Sandy Bridge temporarily removed

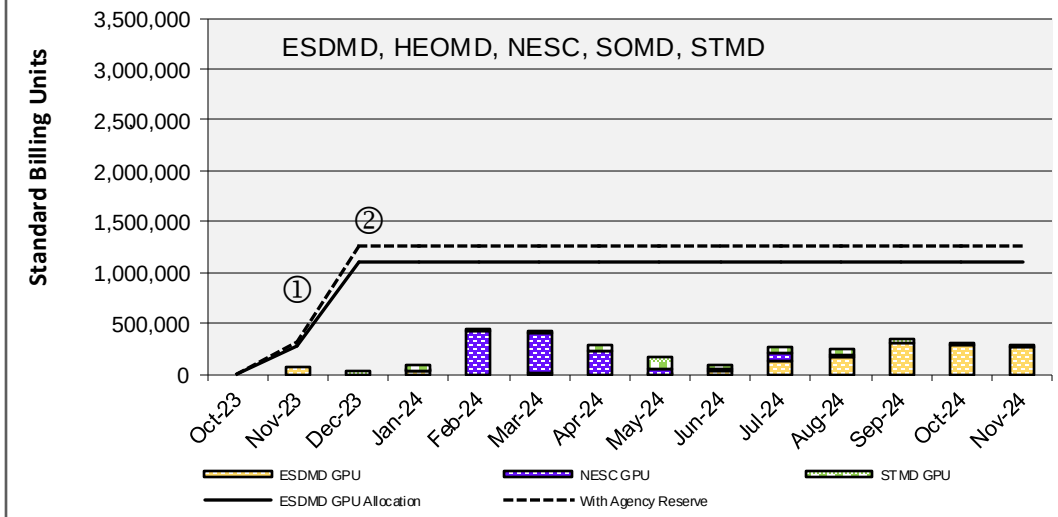
GPU Only Normalized Data



GPU Only Normalized Data



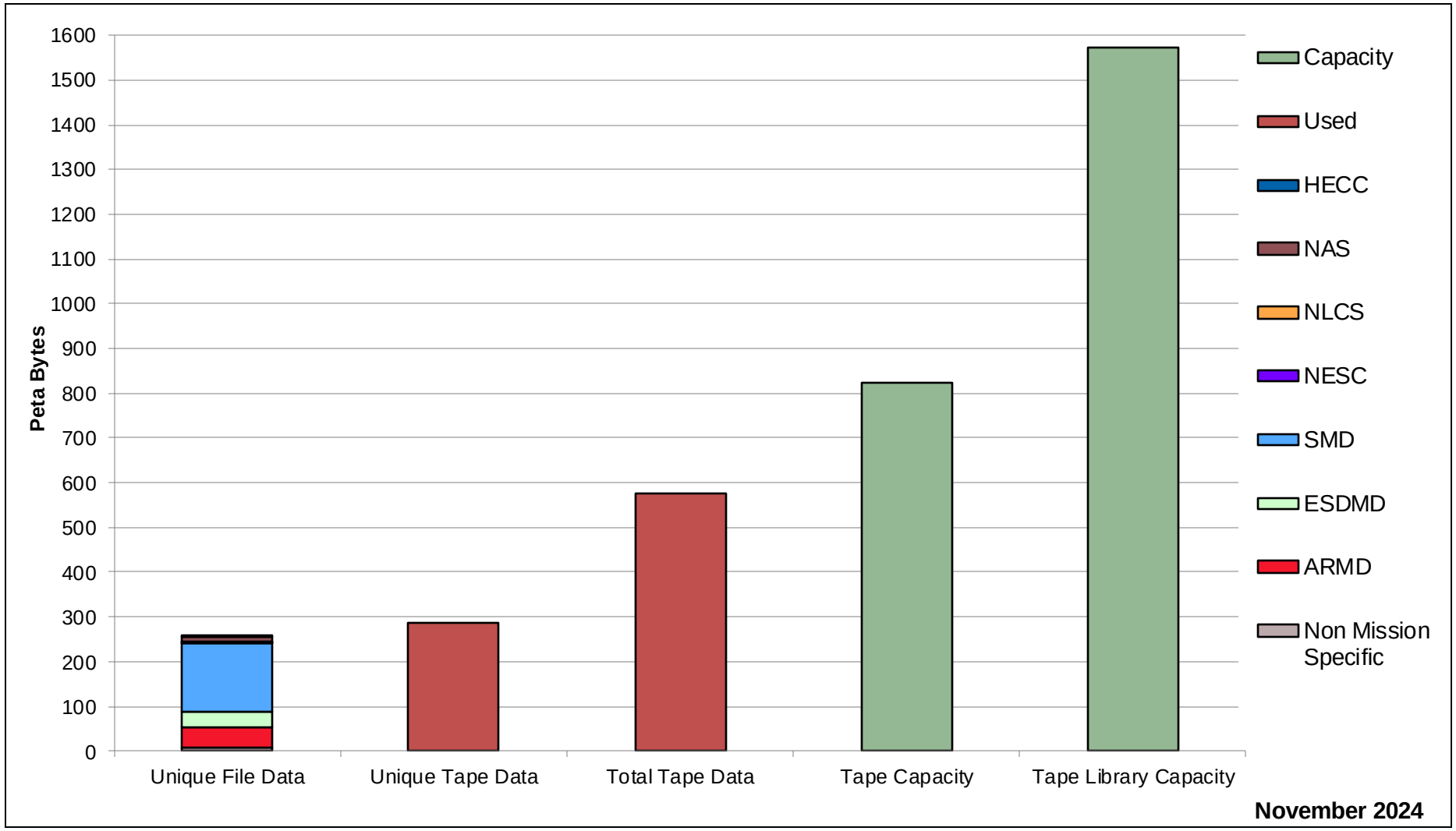




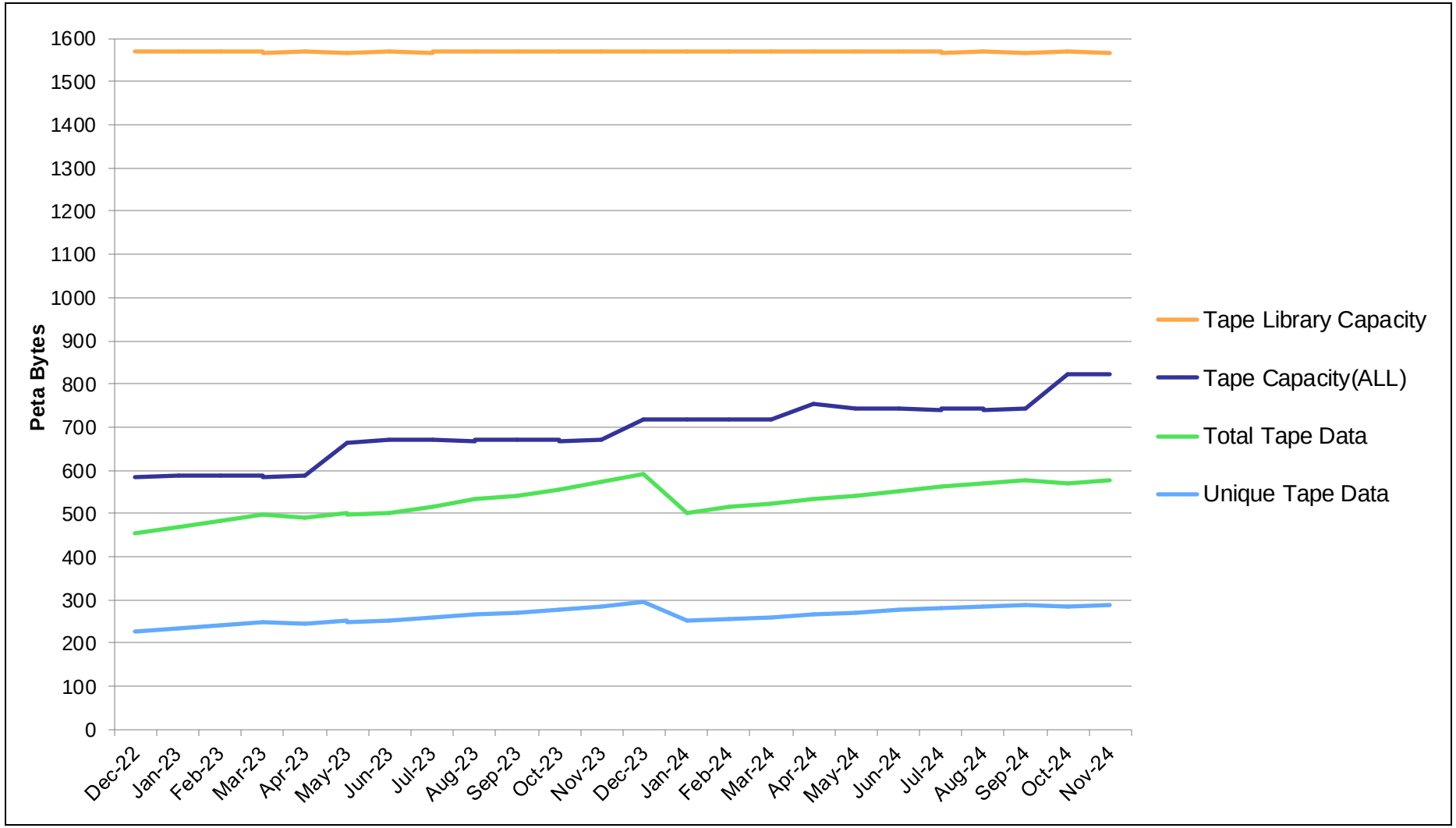
① Cabeus v100 nodes added

② Cabeus a100 nodes added

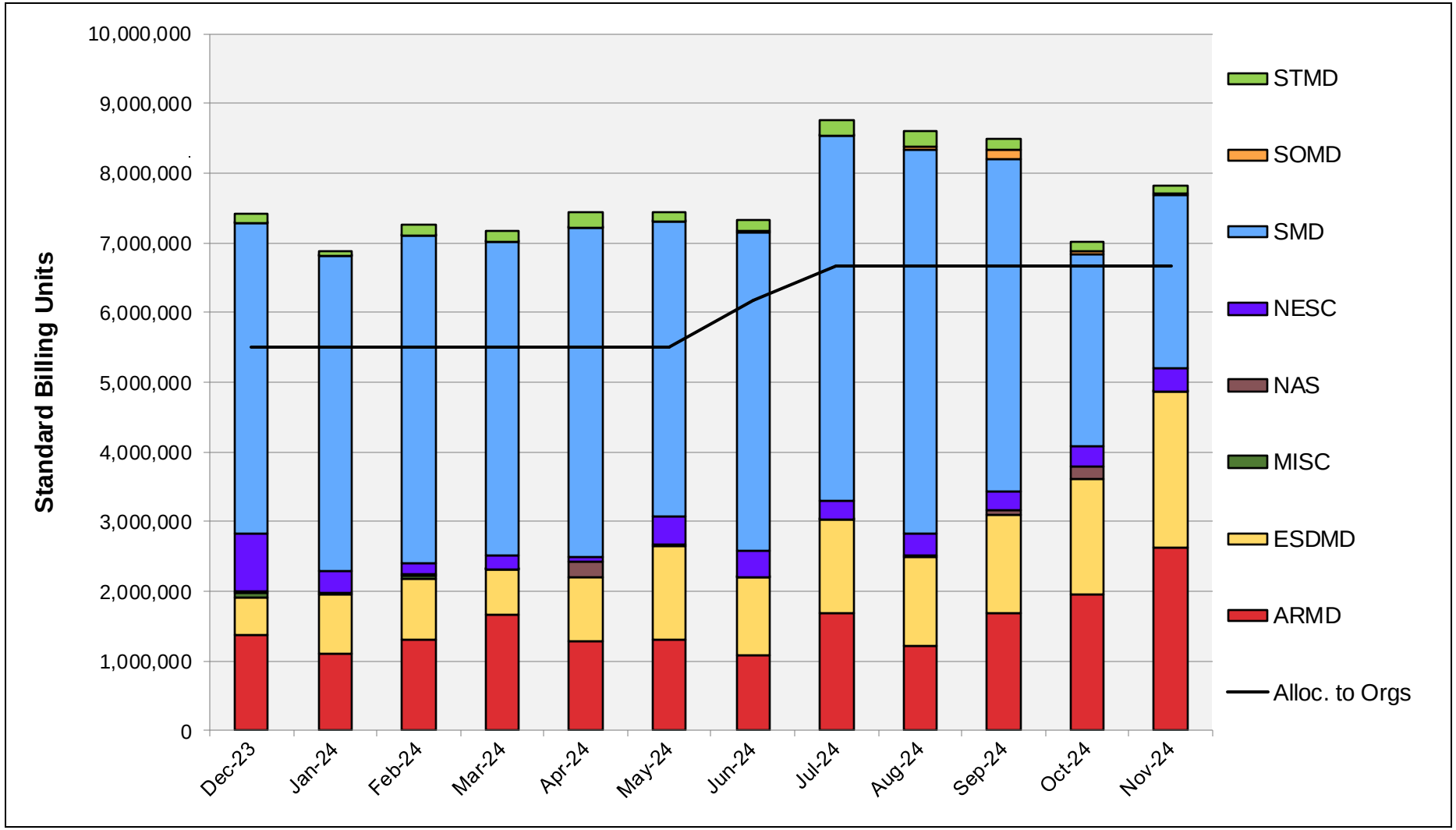
Tape Archive Status



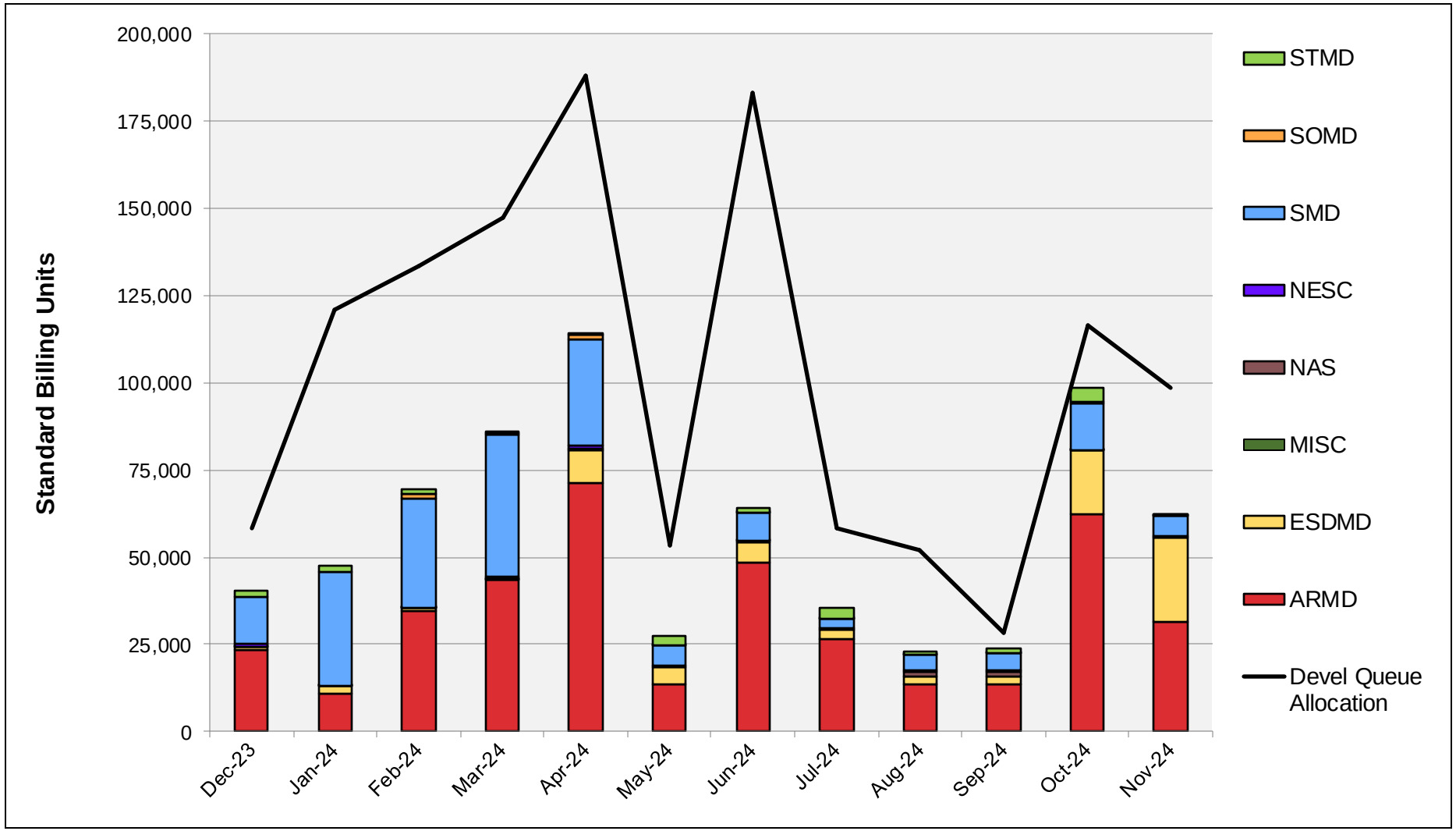
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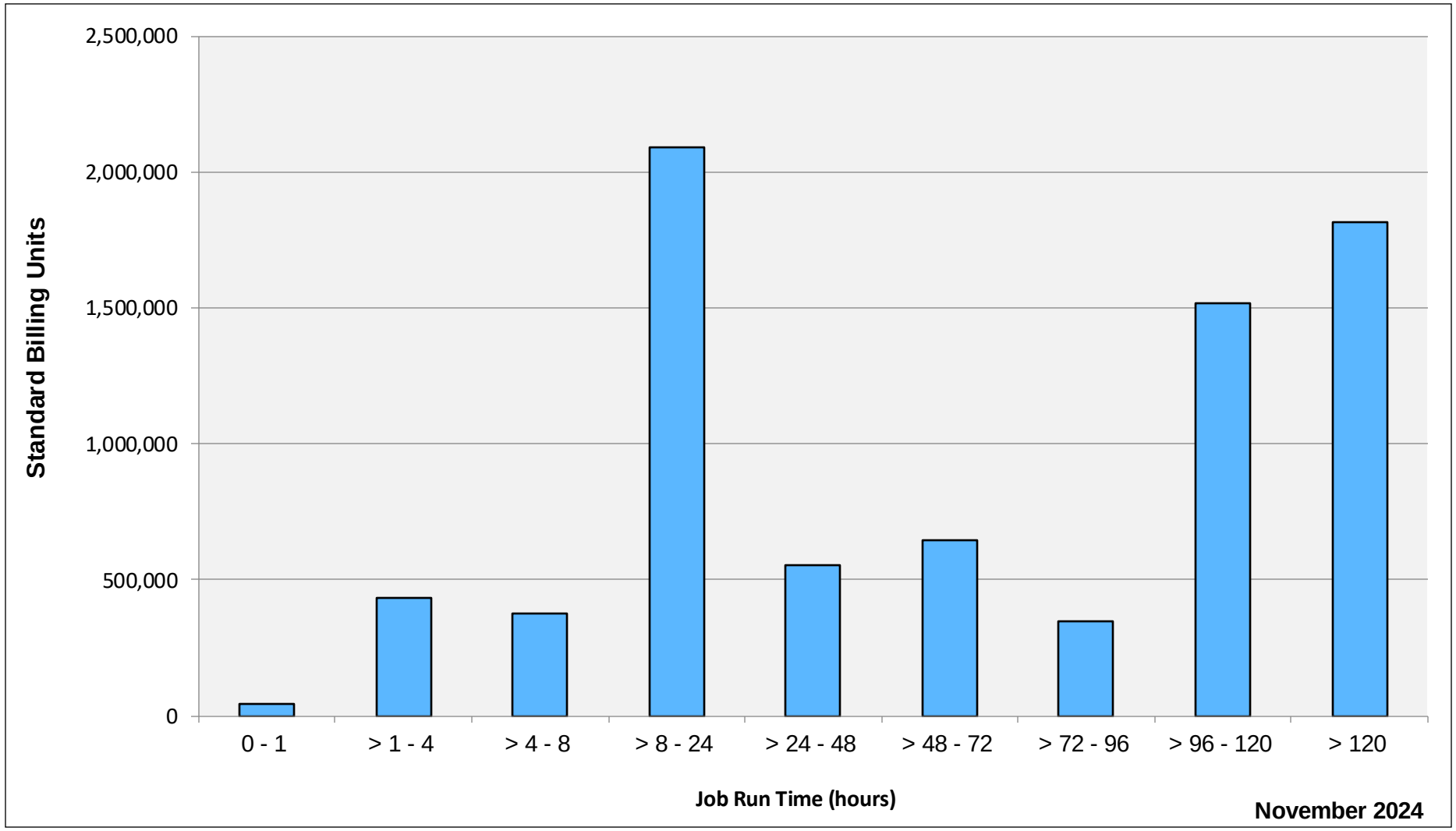
Aitken: SBUs Reported, Normalized to 30-Day Month



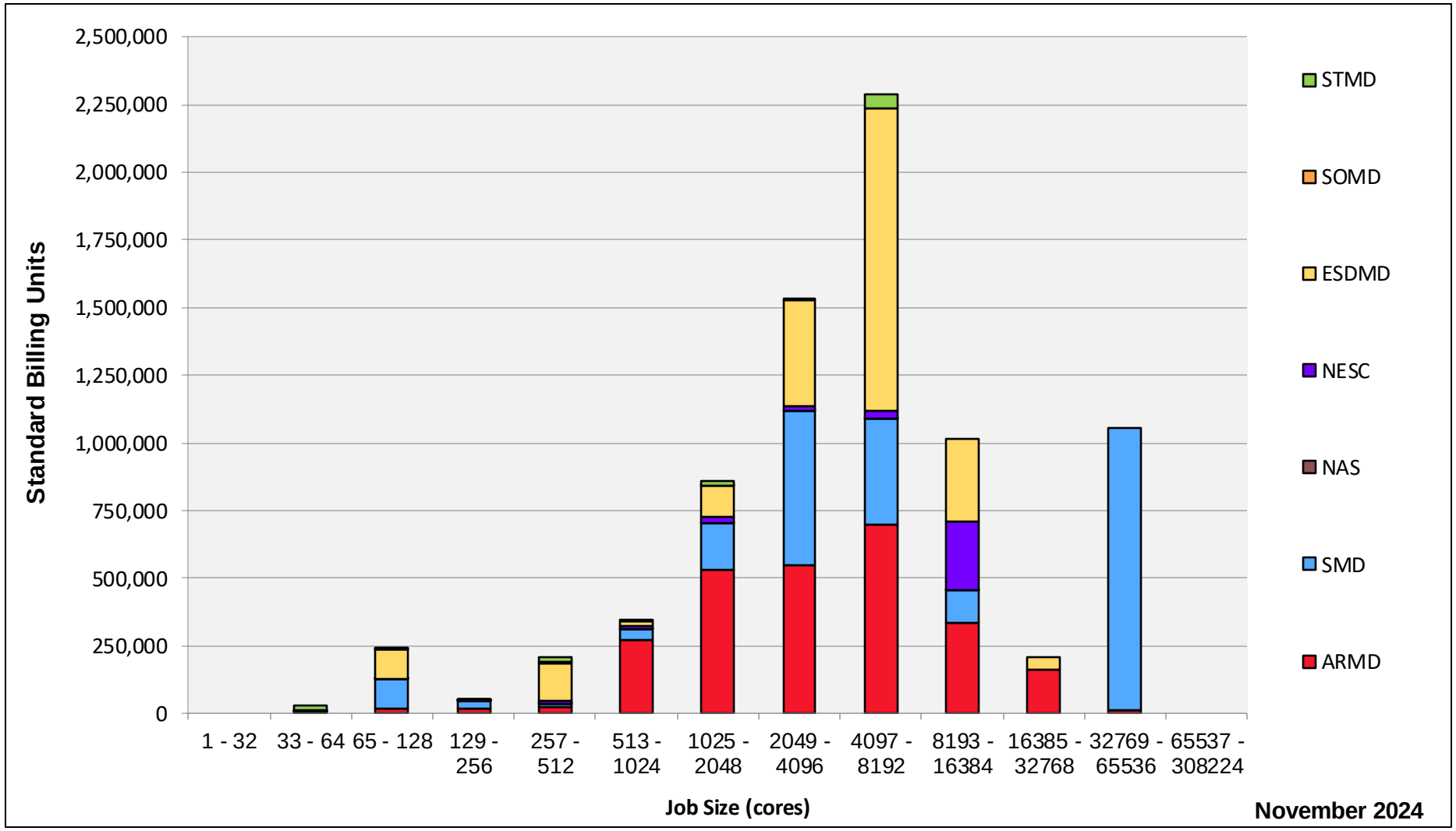
Aitken: Devel Queue Utilization



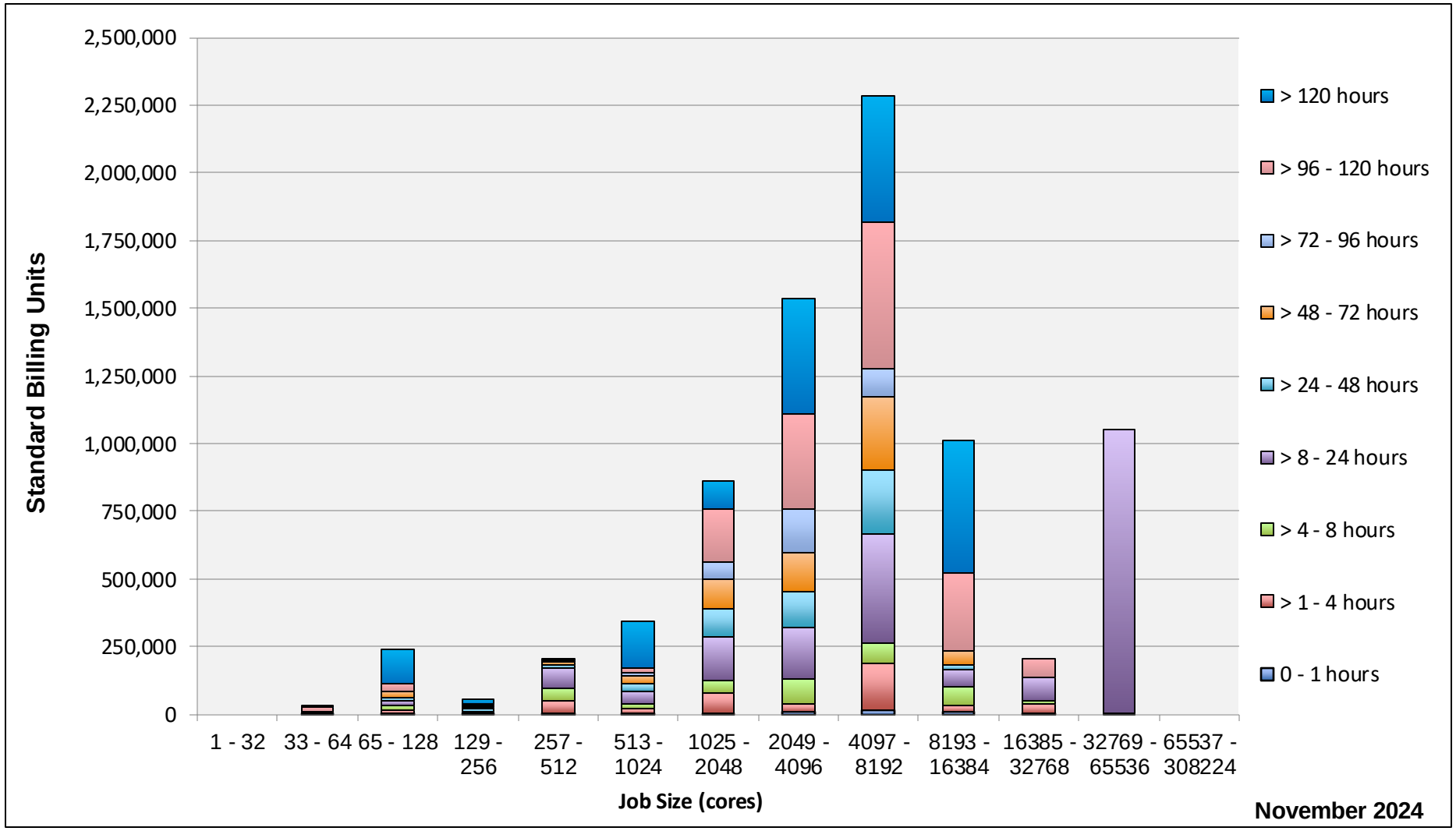
Aitken: Monthly Utilization by Job Length



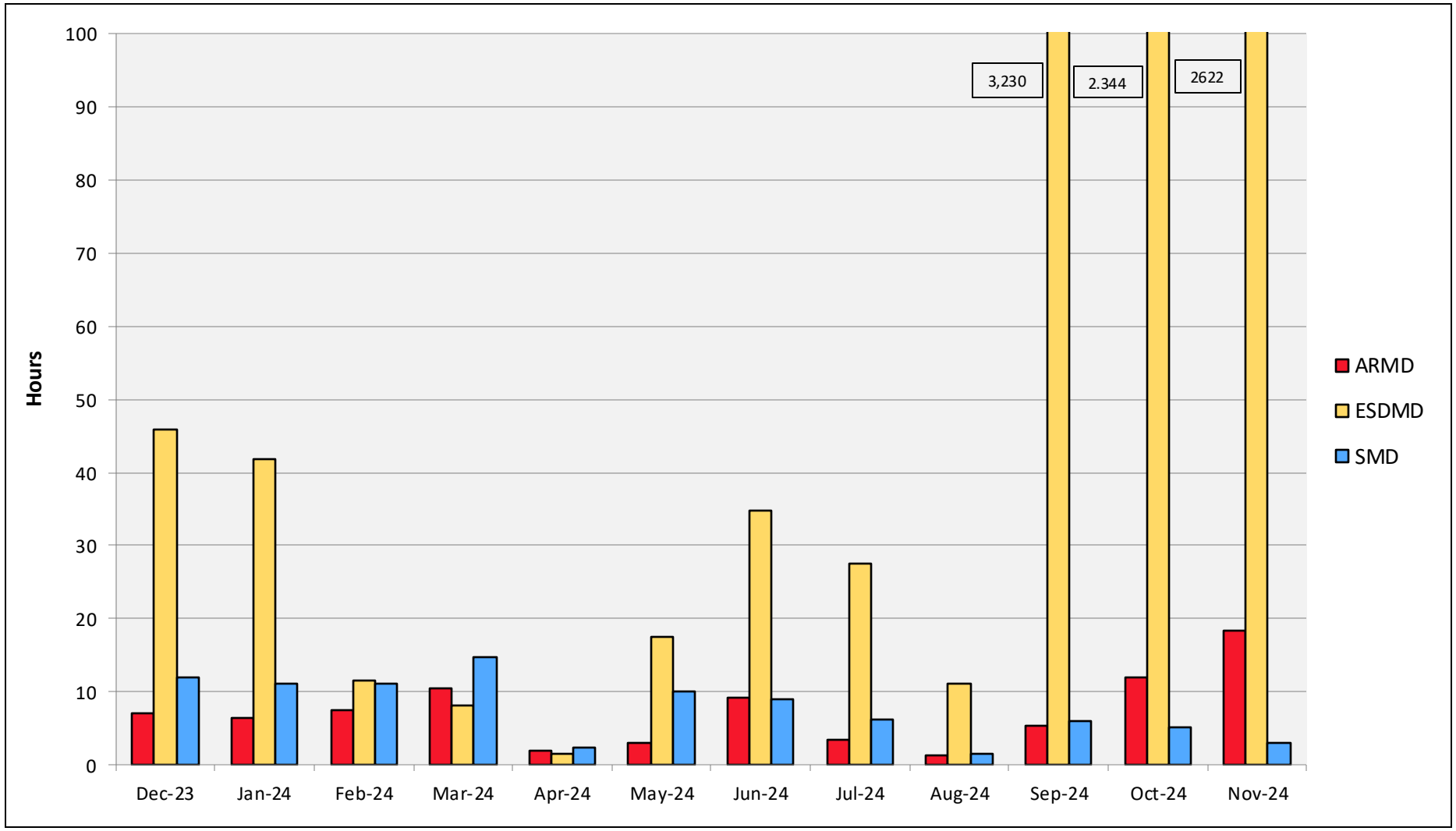
Aitken: Monthly Utilization by Job Size



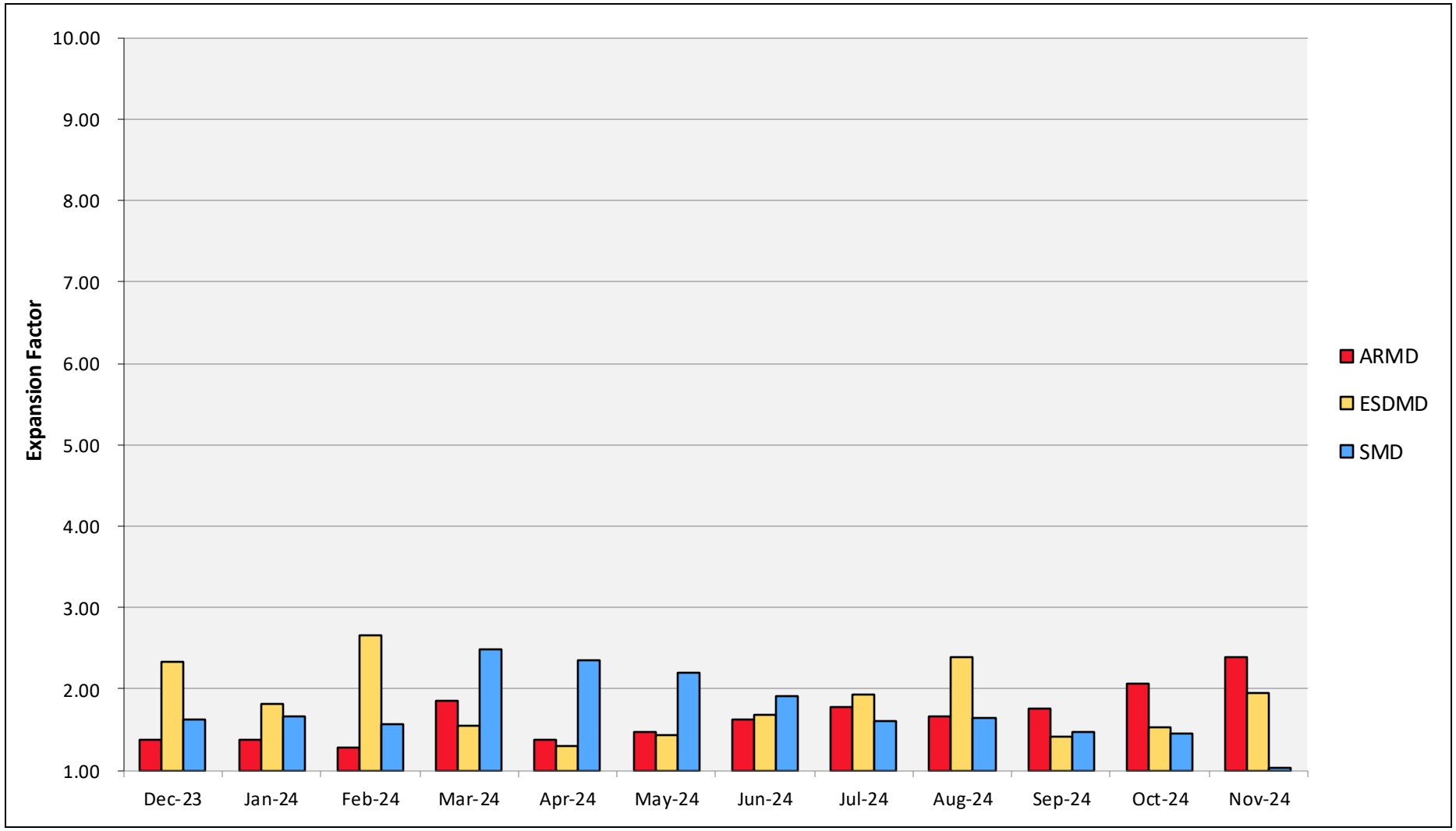
Aitken: Monthly Utilization by Size and Length



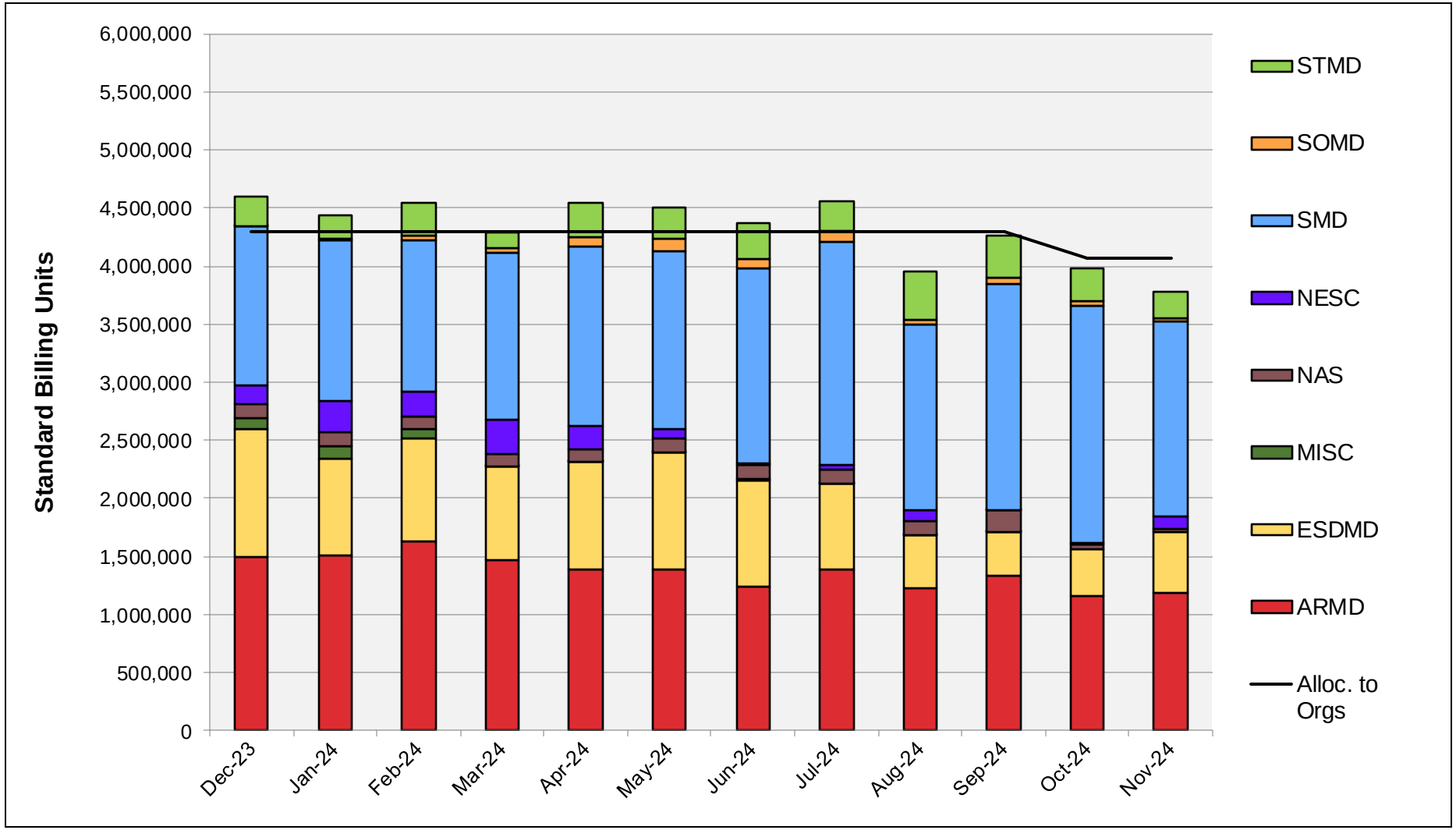
Aitken: Average Time to Clear All Jobs



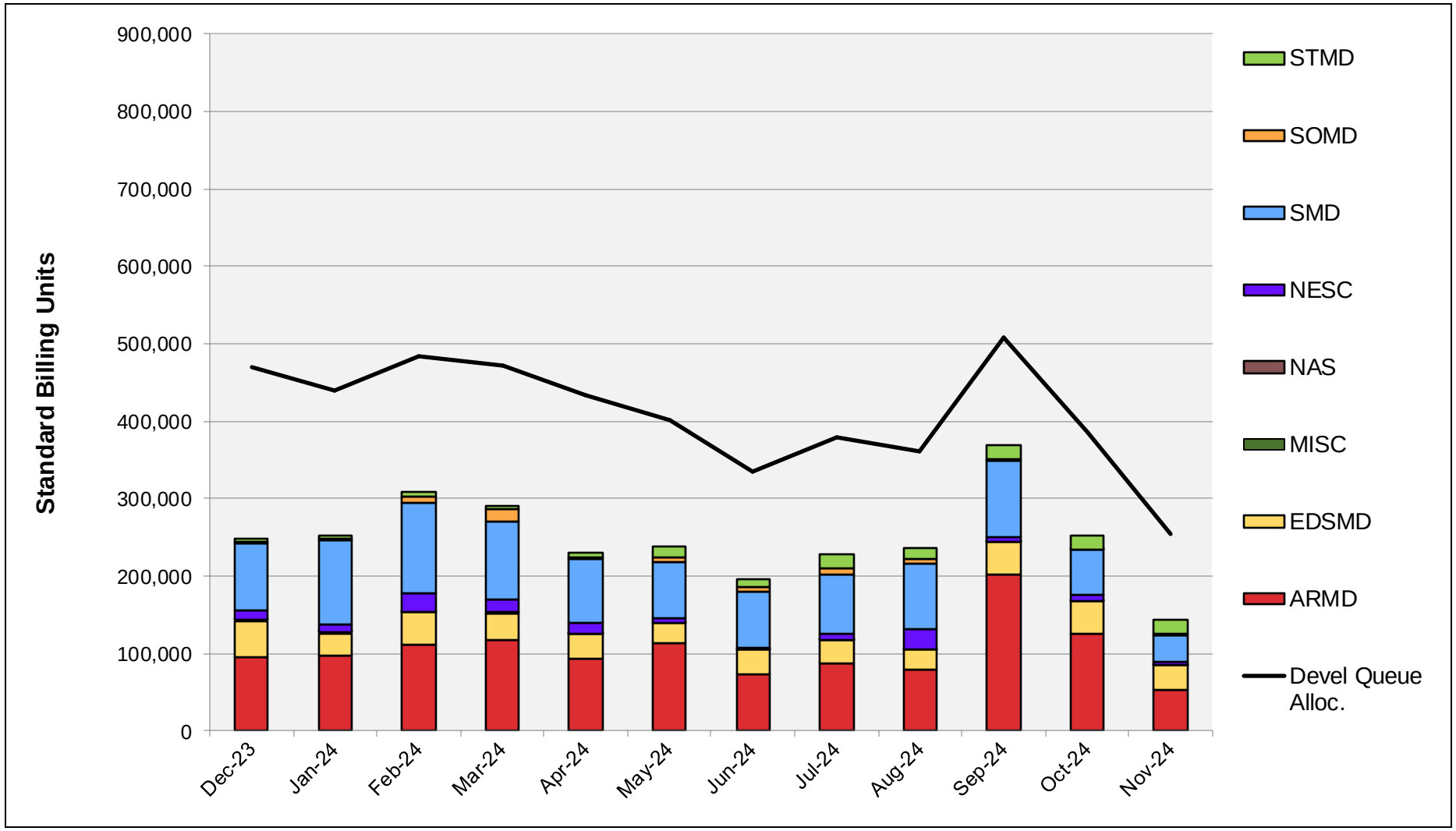
Aitken: Average Expansion Factor



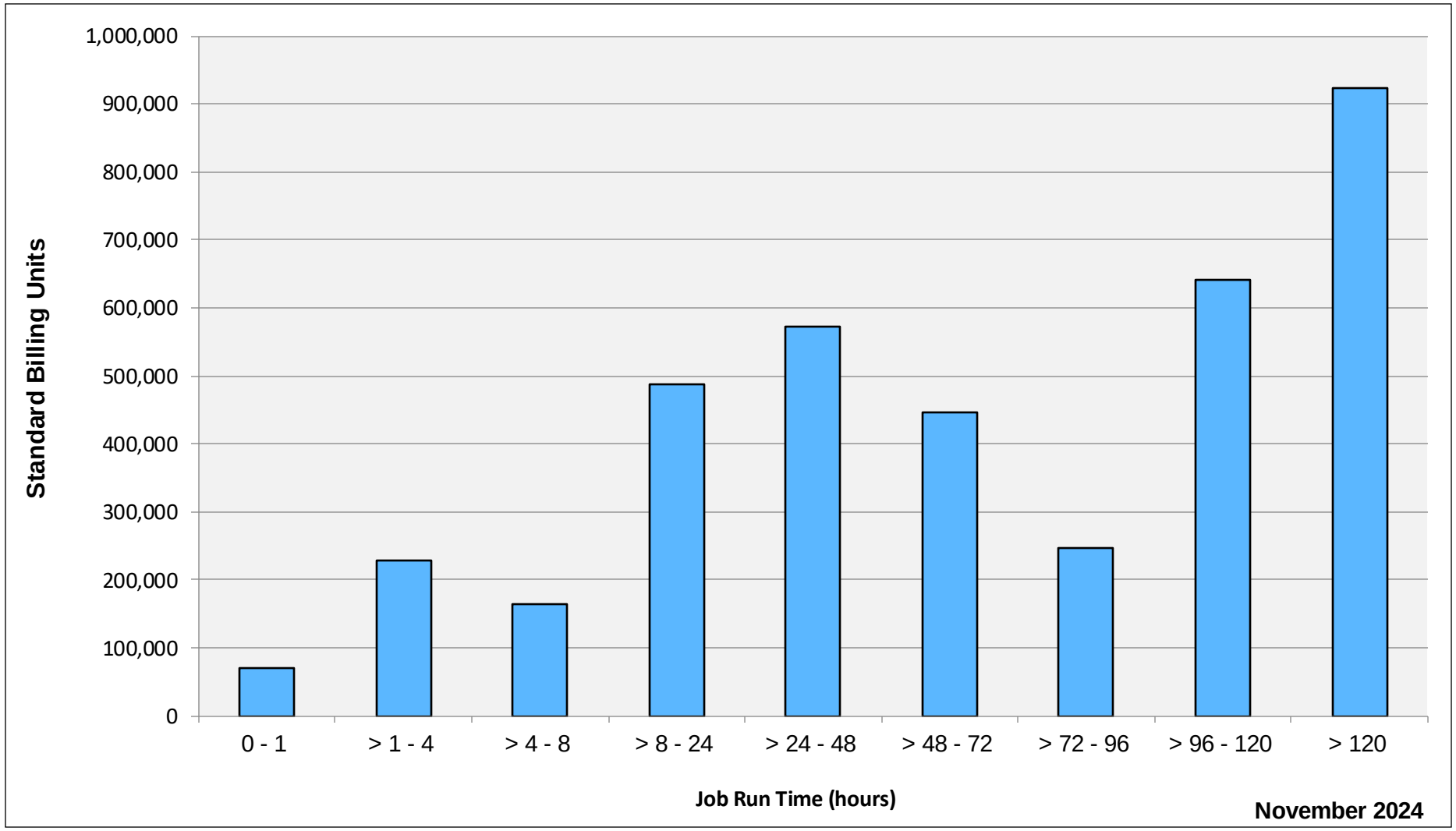
Pleiades: SBUs Reported, Normalized to 30-Day Month



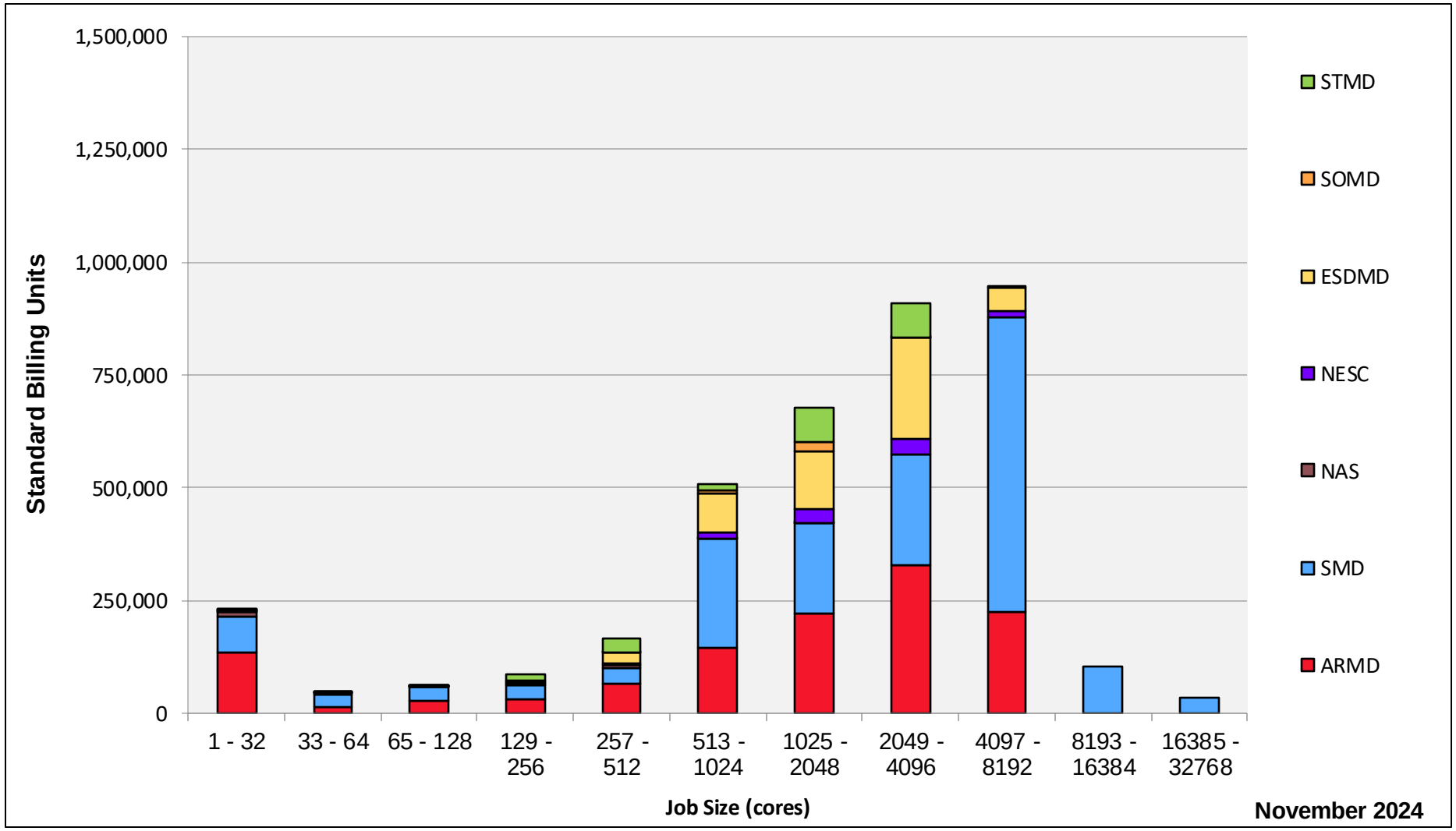
Pleiades: Devel Queue Utilization



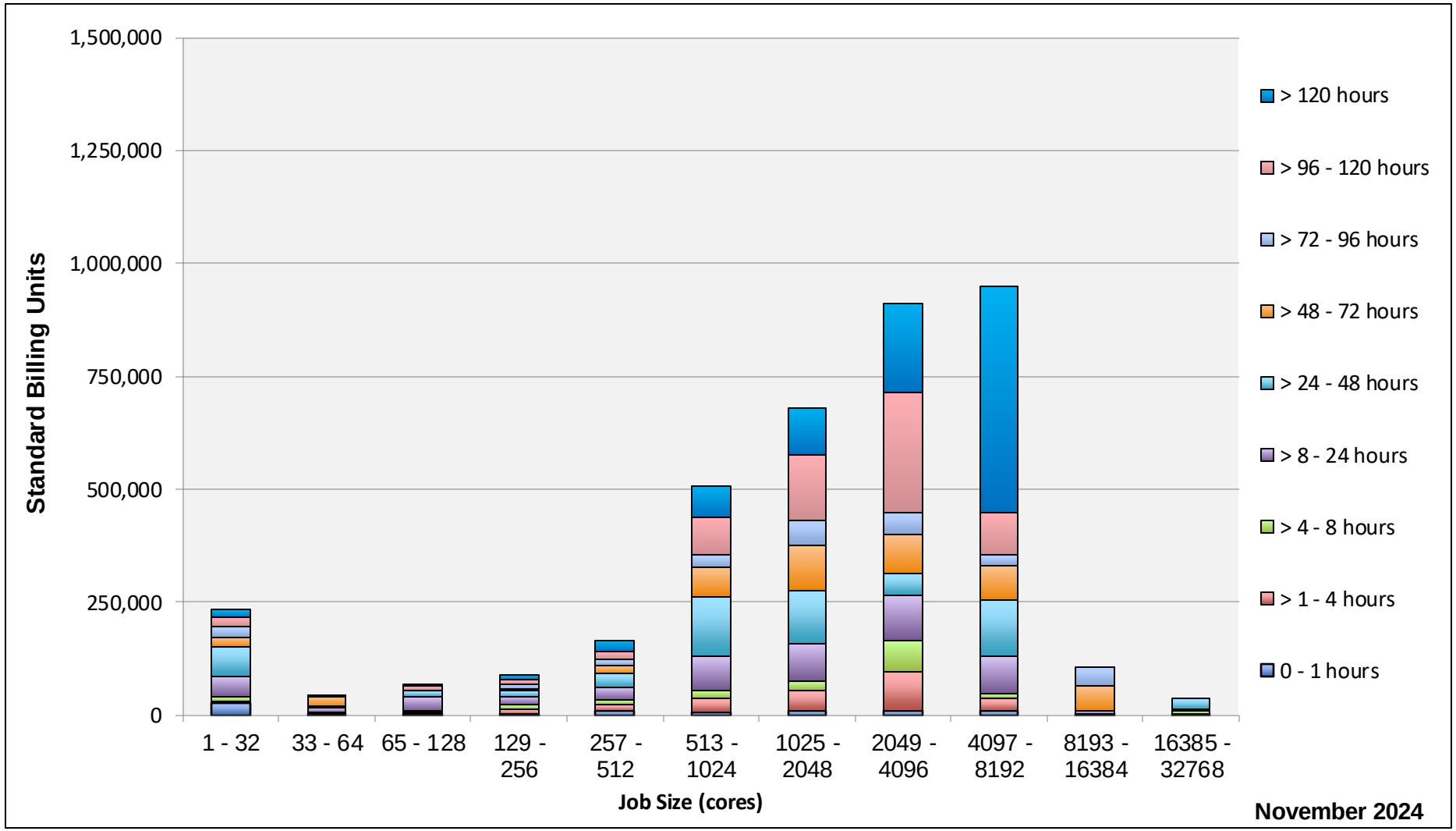
Pleiades: Monthly Utilization by Job Length



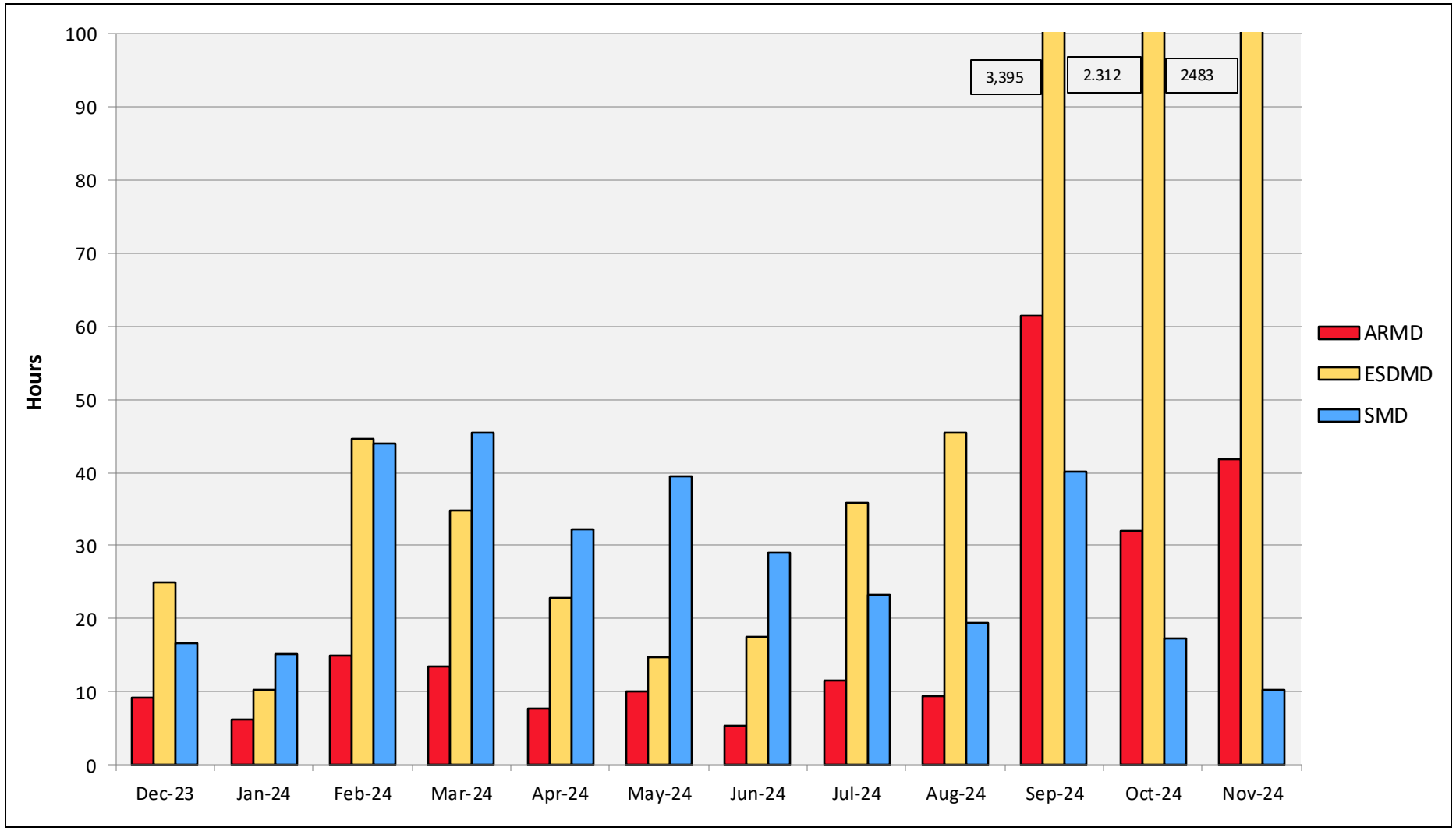
Pleiades: Monthly Utilization by Job Size



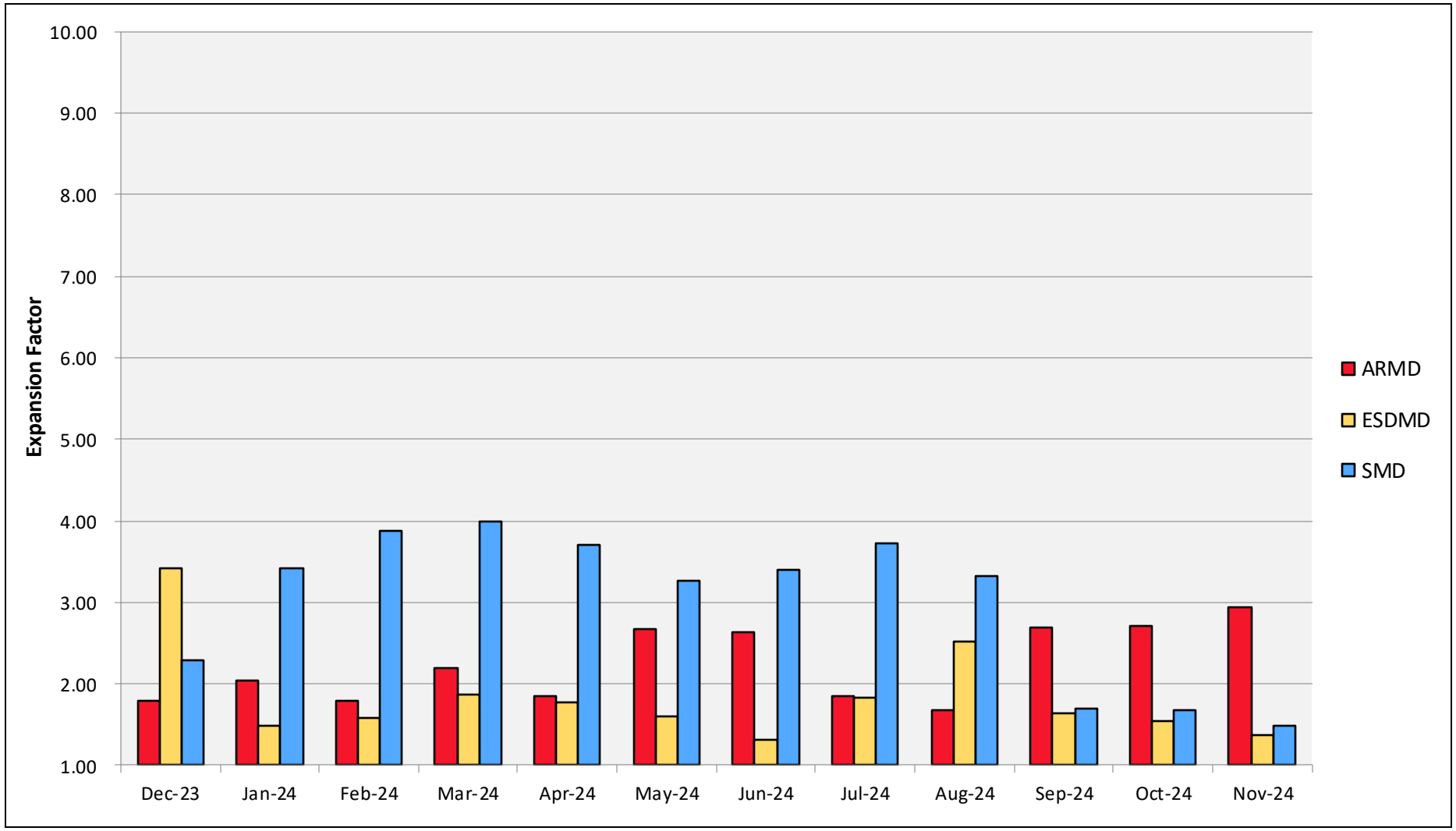
Pleiades: Monthly Utilization by Size and Length



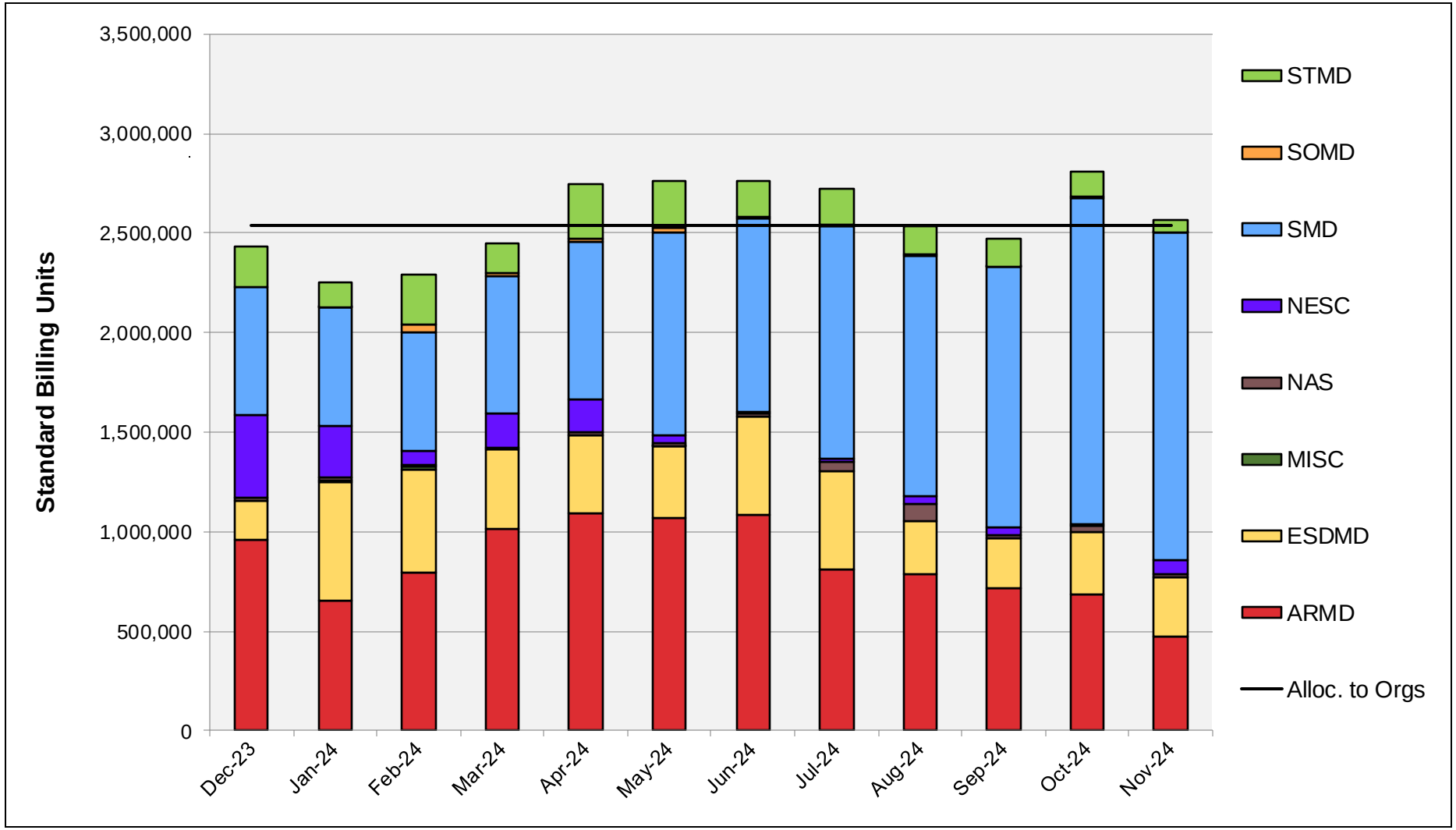
Pleiades: Average Time to Clear All Jobs



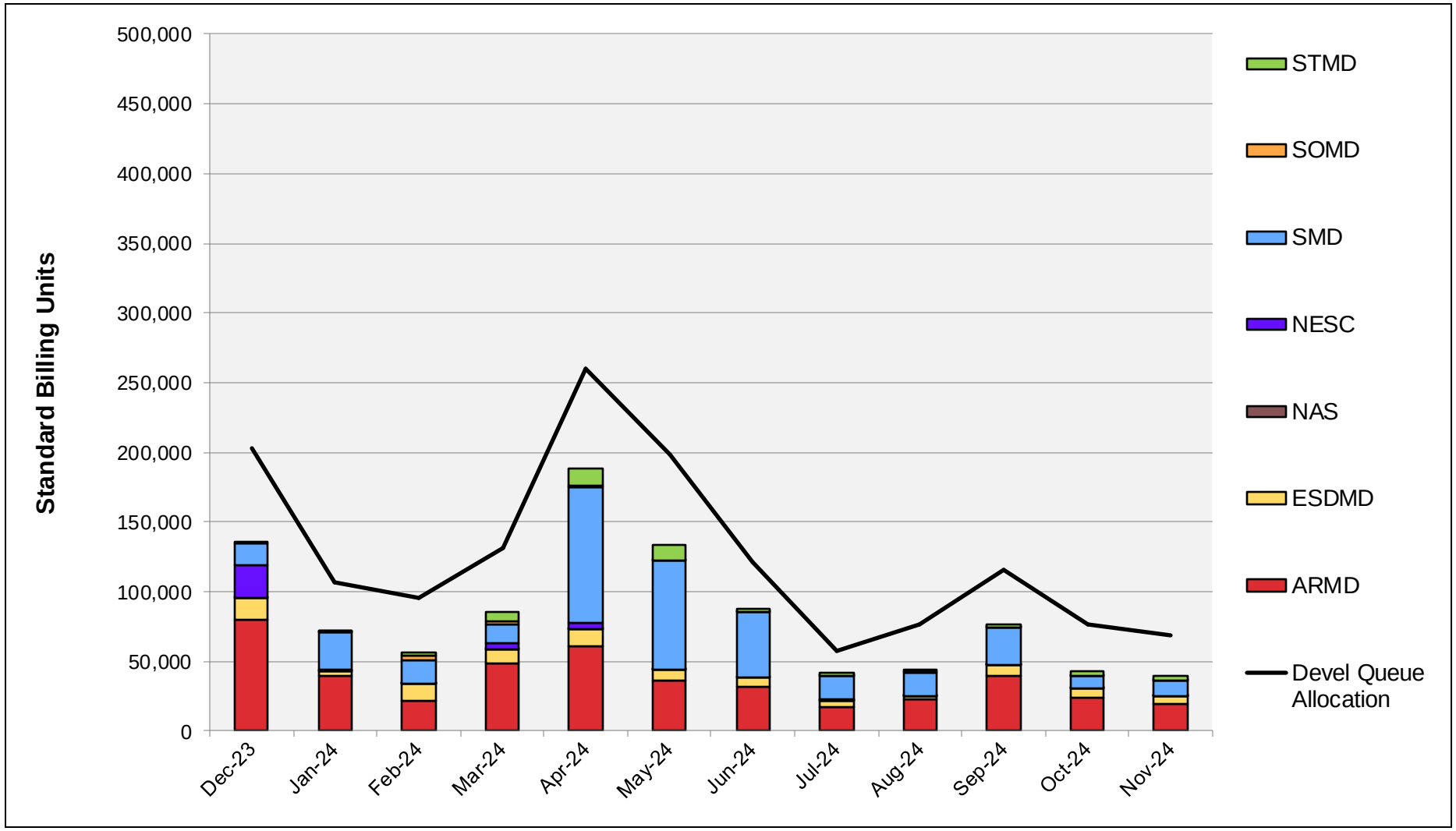
Pleiades: Average Expansion Factor



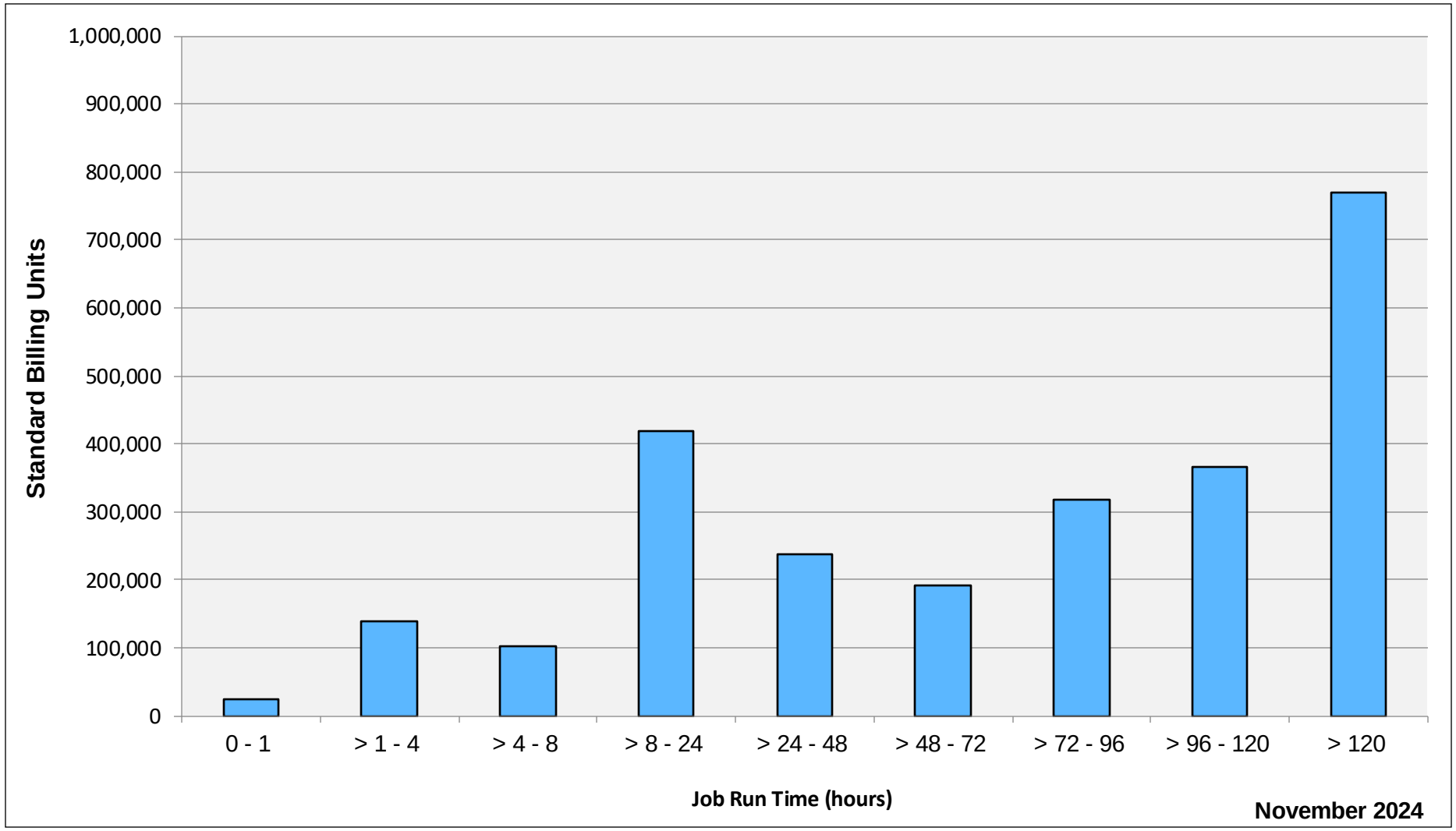
Electra: SBUs Reported, Normalized to 30-Day Month



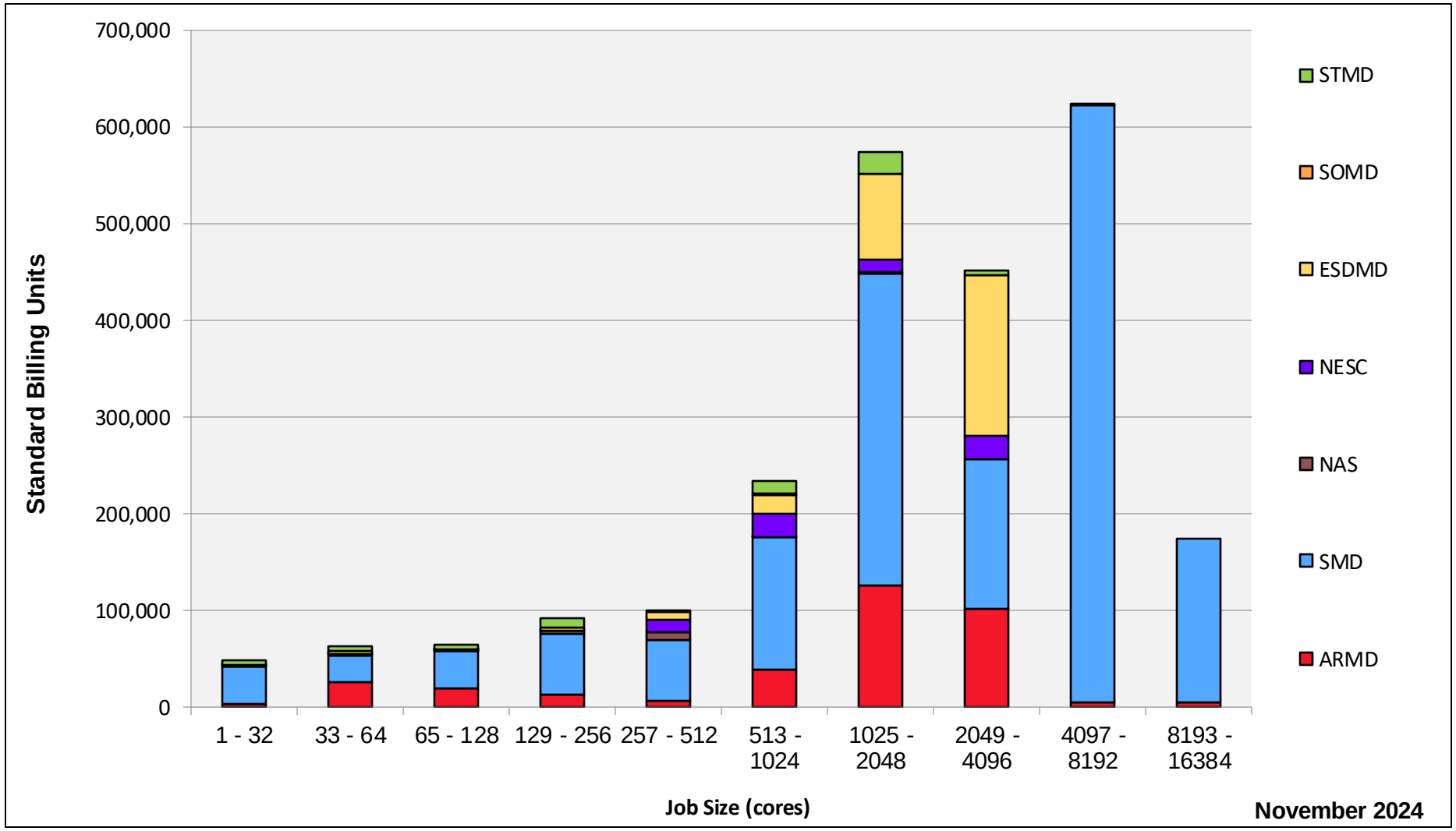
Electra: Devel Queue Utilization



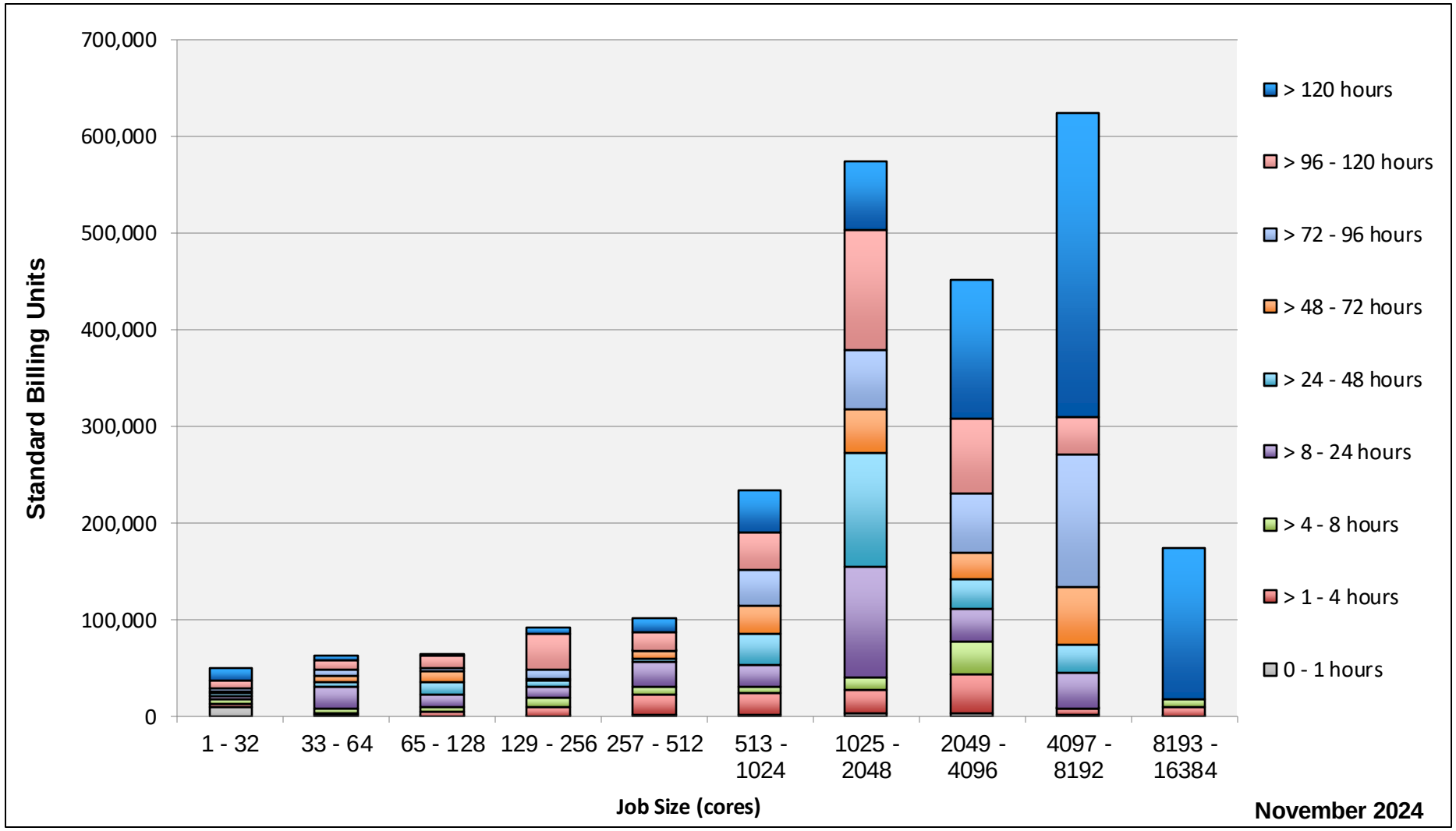
Electra: Monthly Utilization by Job Length



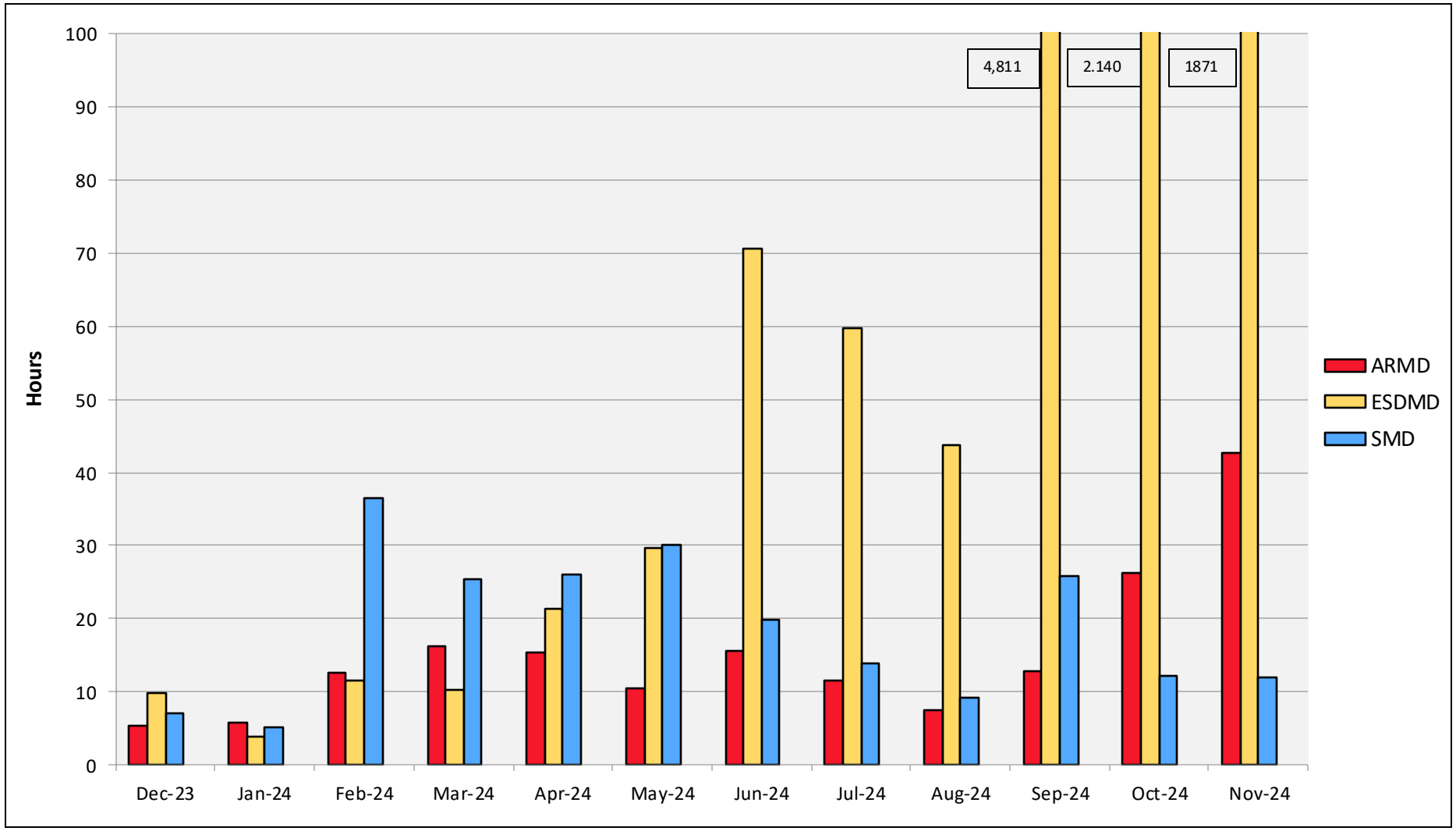
Electra: Monthly Utilization by Job Size



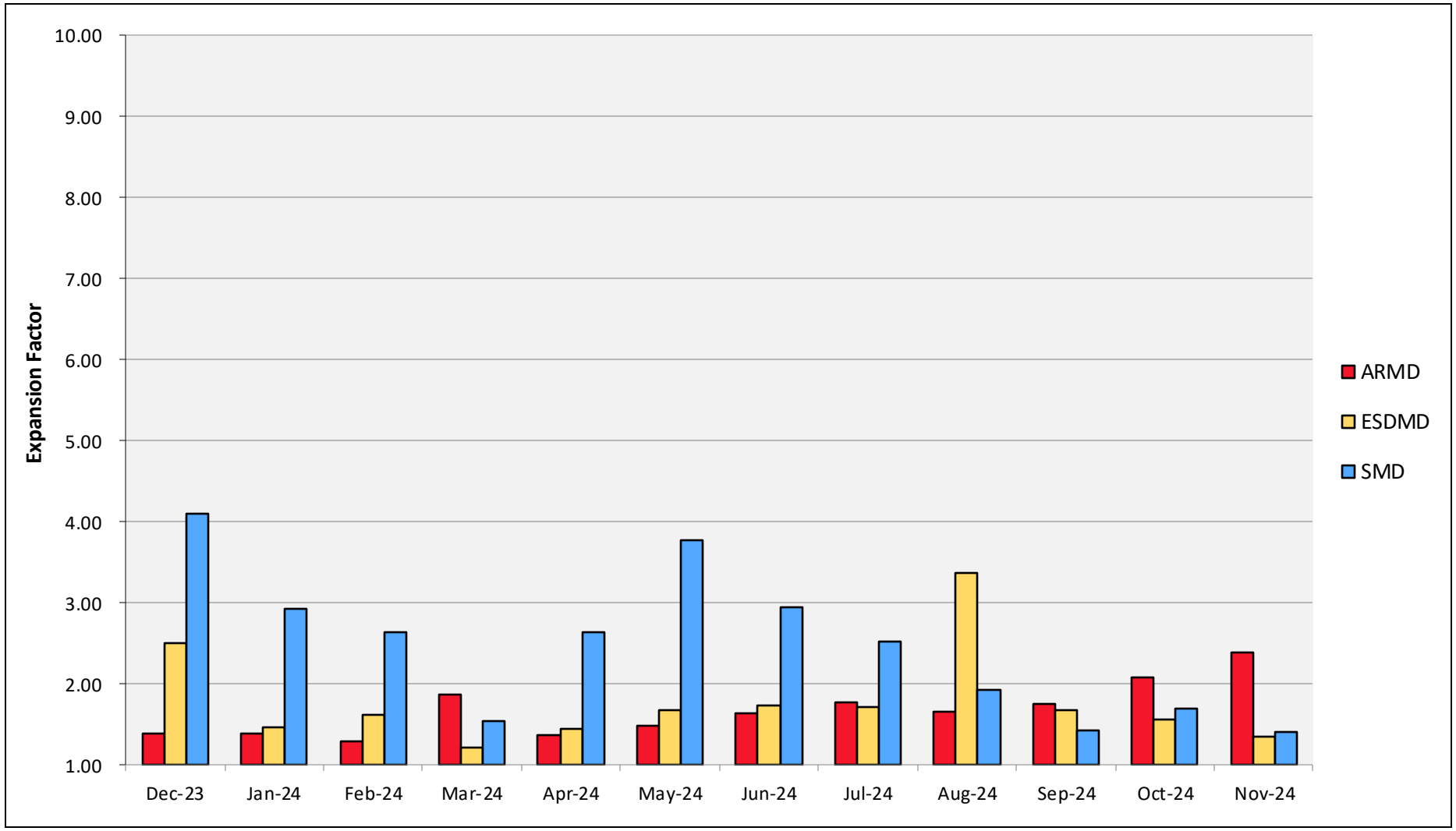
Electra: Monthly Utilization by Size and Length



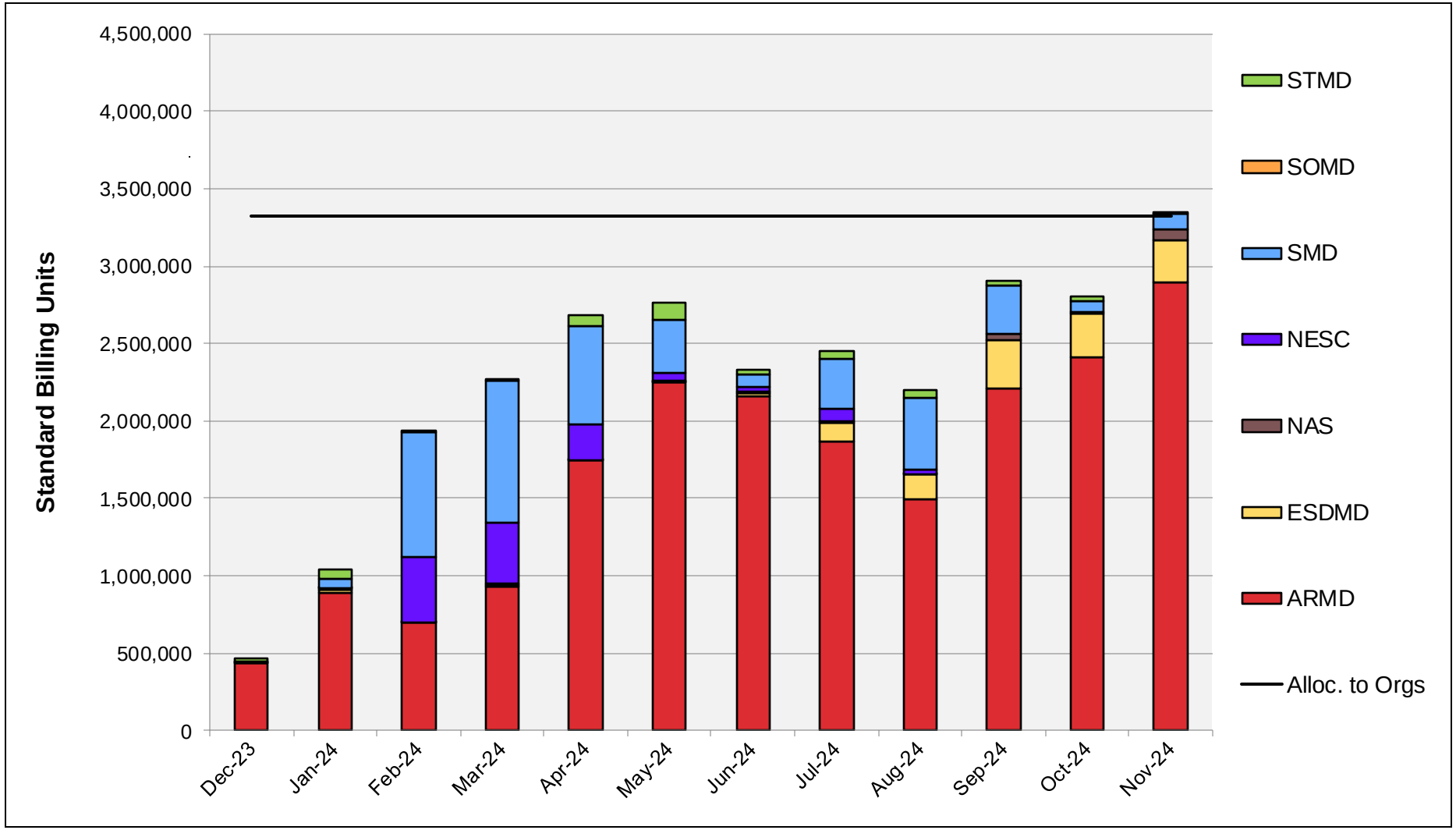
Electra: Average Time to Clear All Jobs



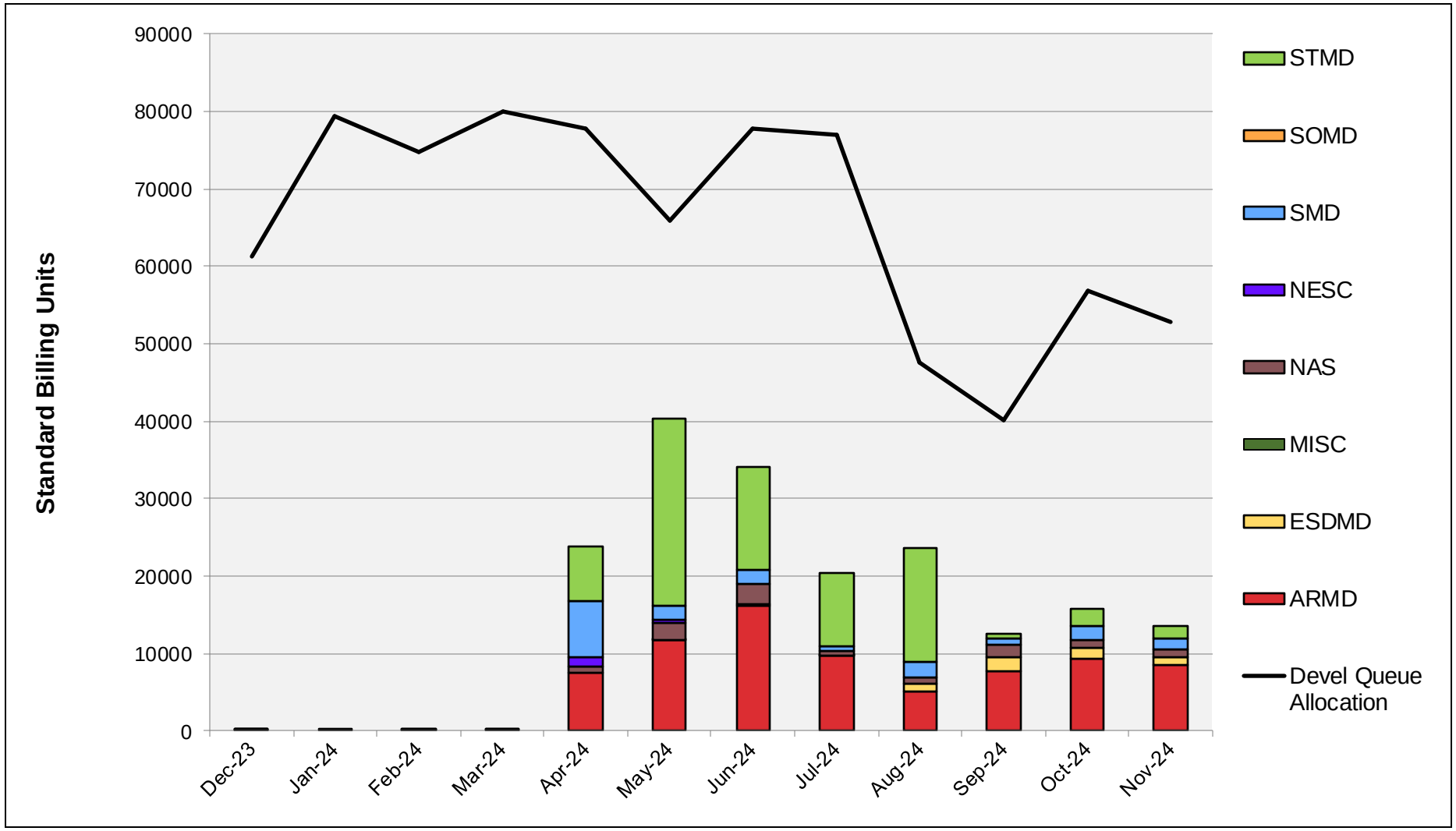
Electra: Average Expansion Factor



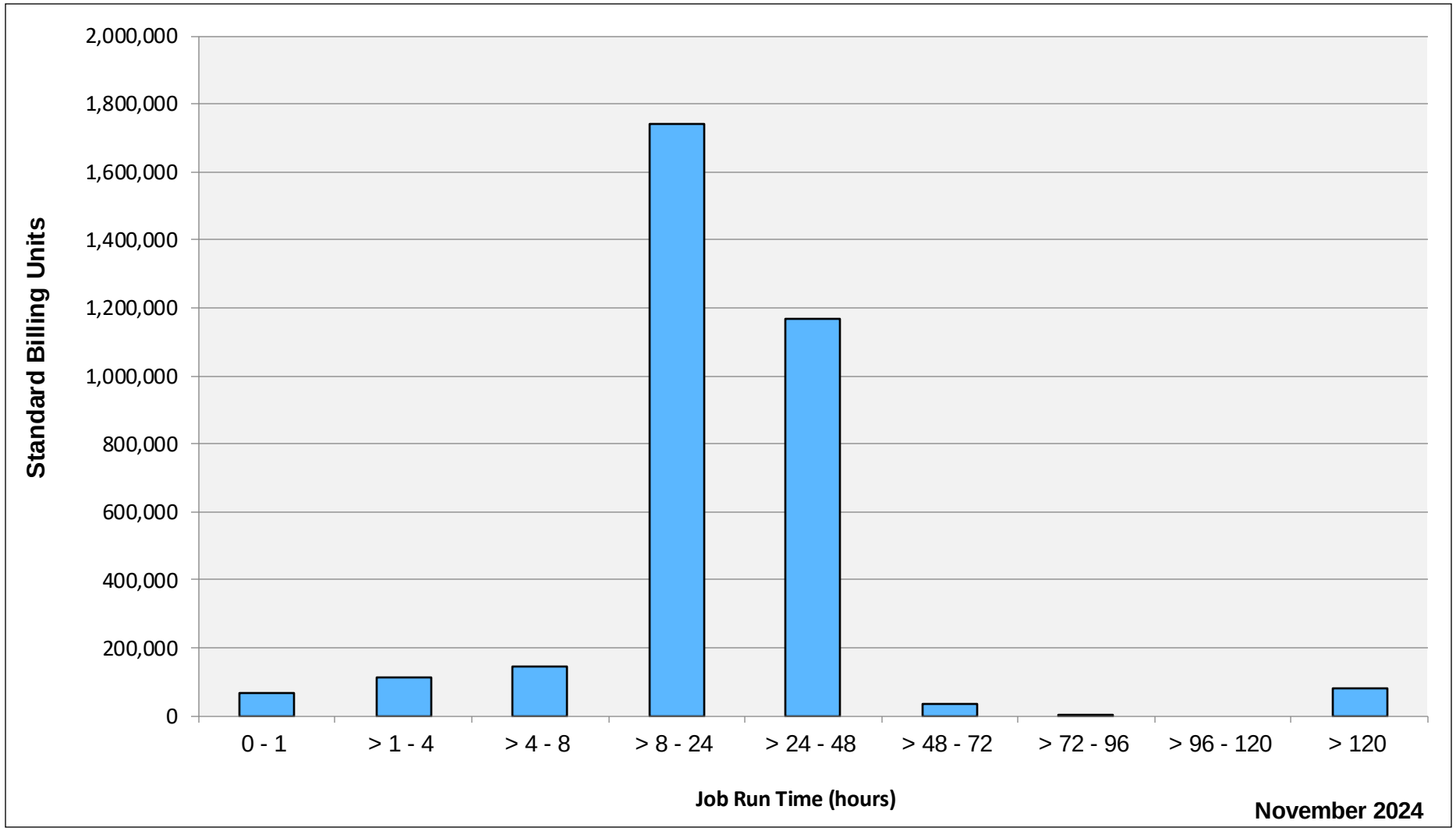
Cabeus: SBUs Reported, Normalized to 30-Day Month



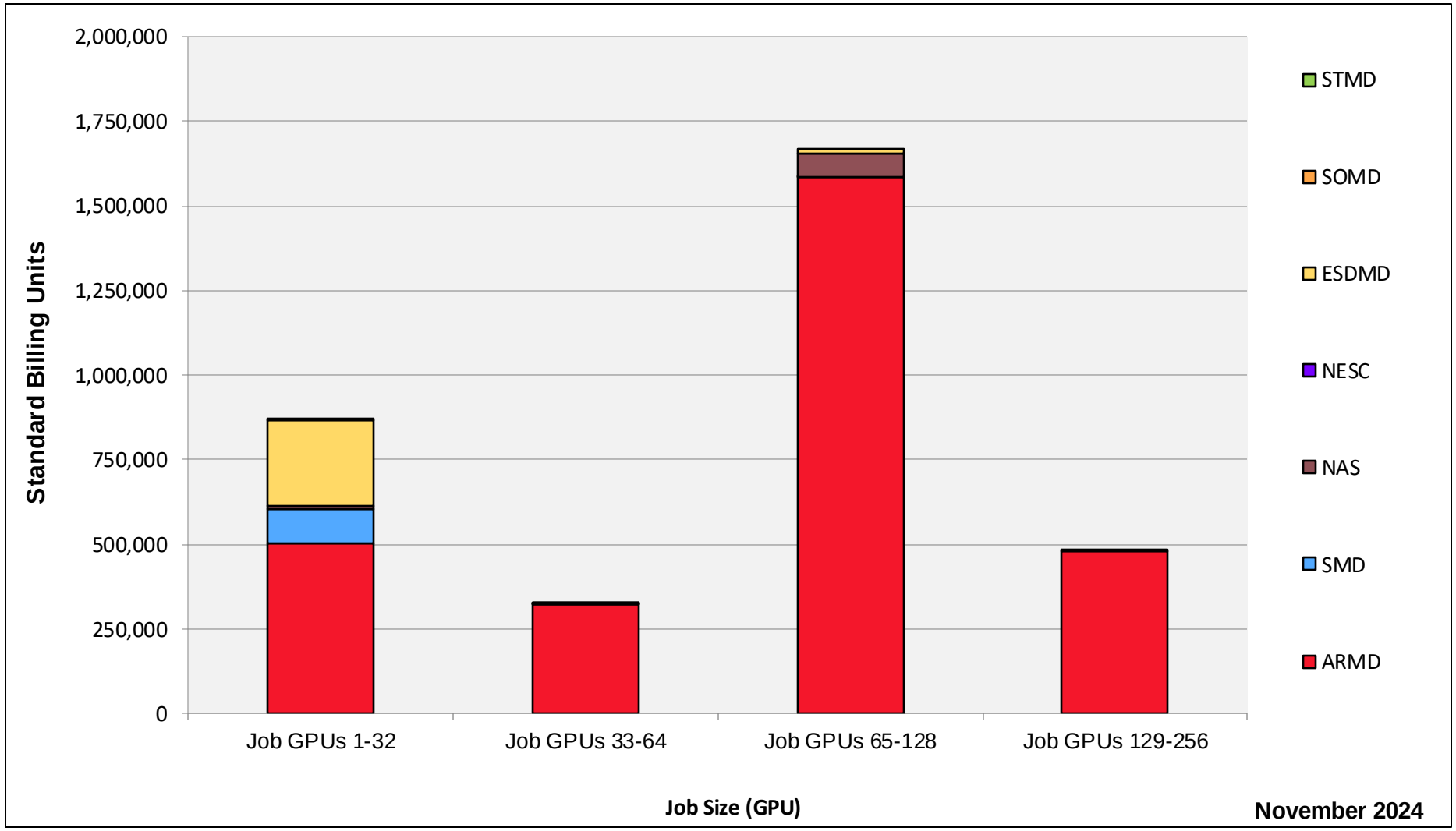
Cabeus: Devel Queue Utilization



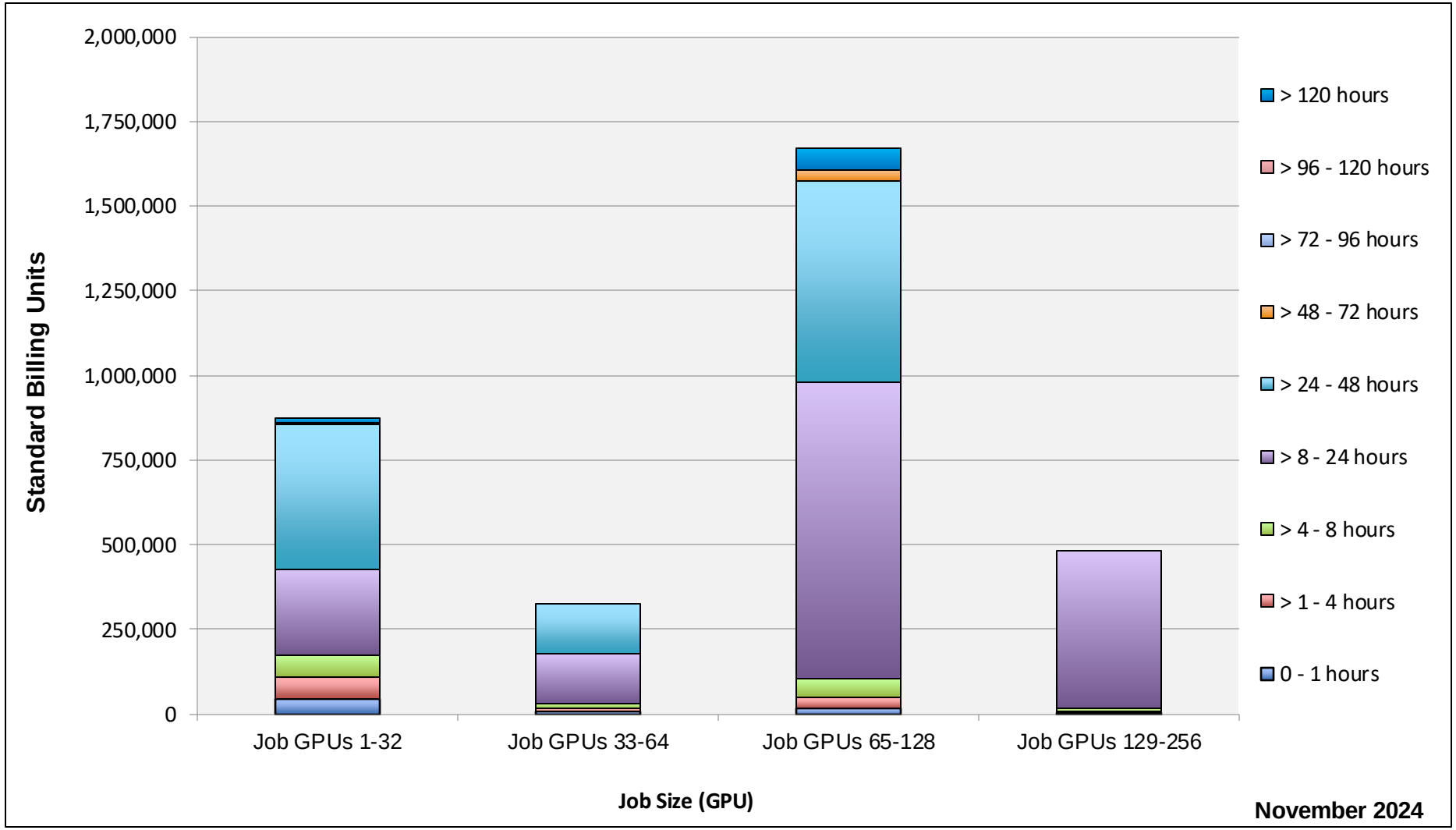
Cabeus: Monthly Utilization by Job Length



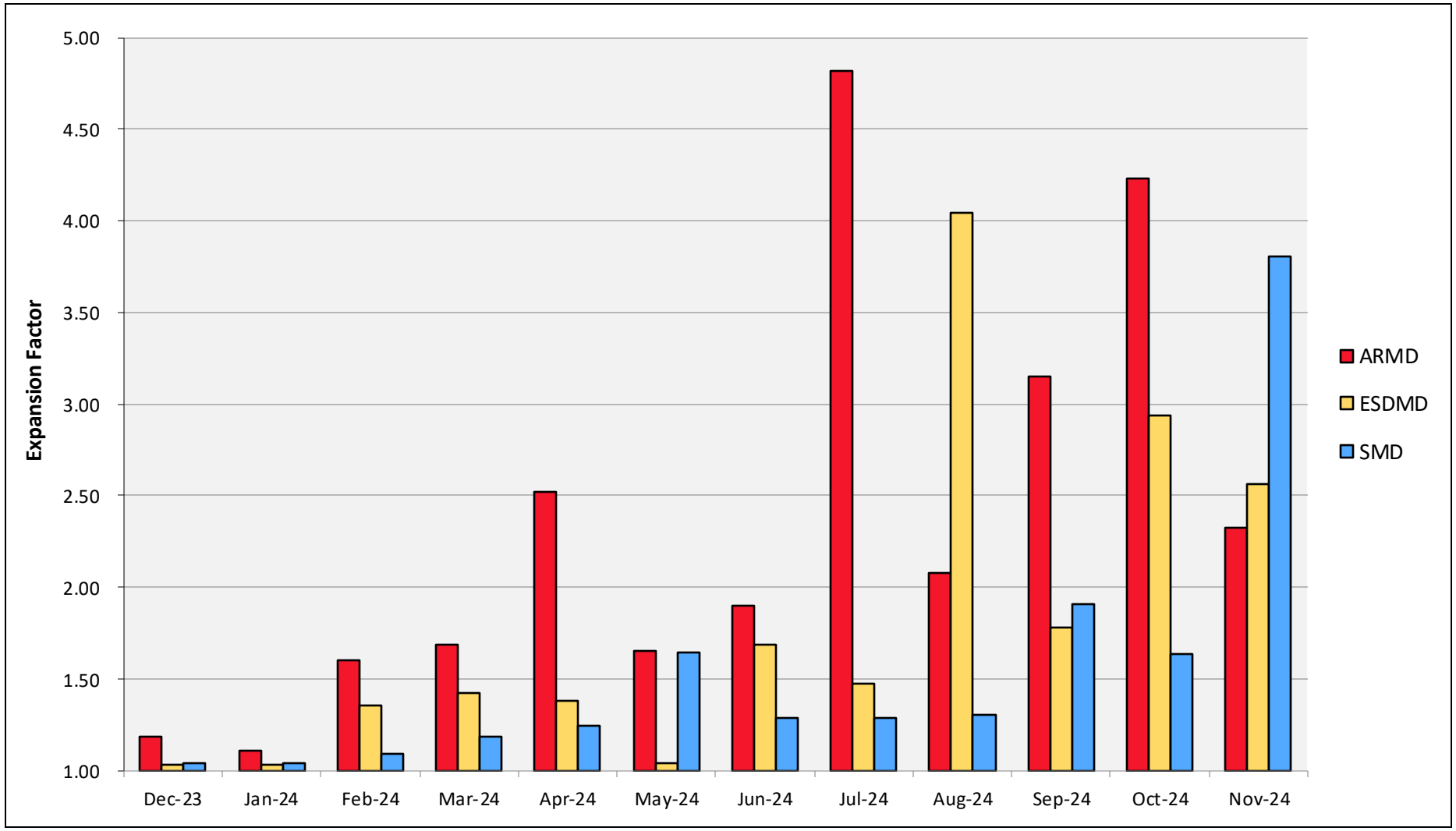
Cabeus: Monthly Utilization by Job Size



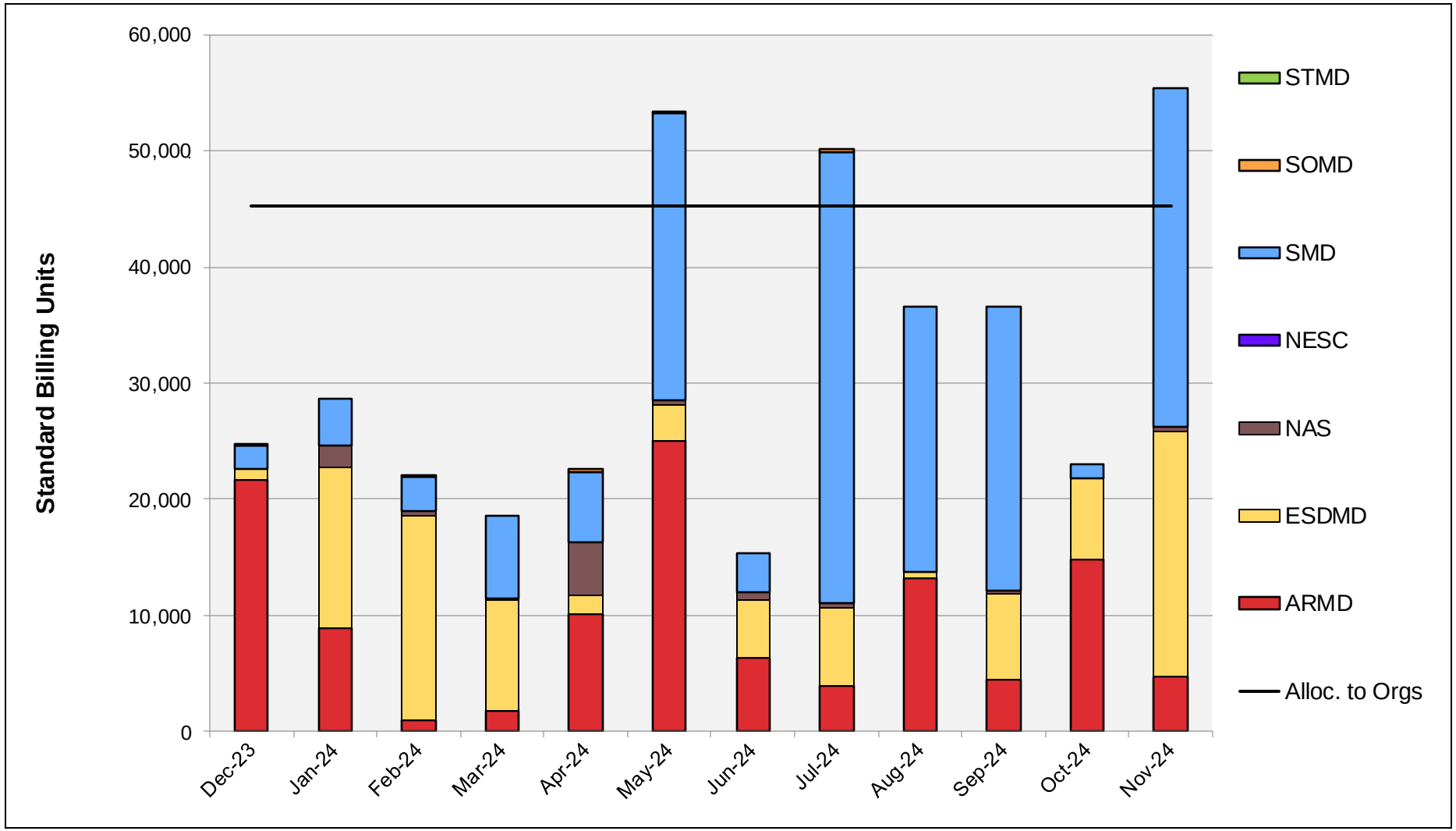
Cabeus: Monthly Utilization by Size and Length



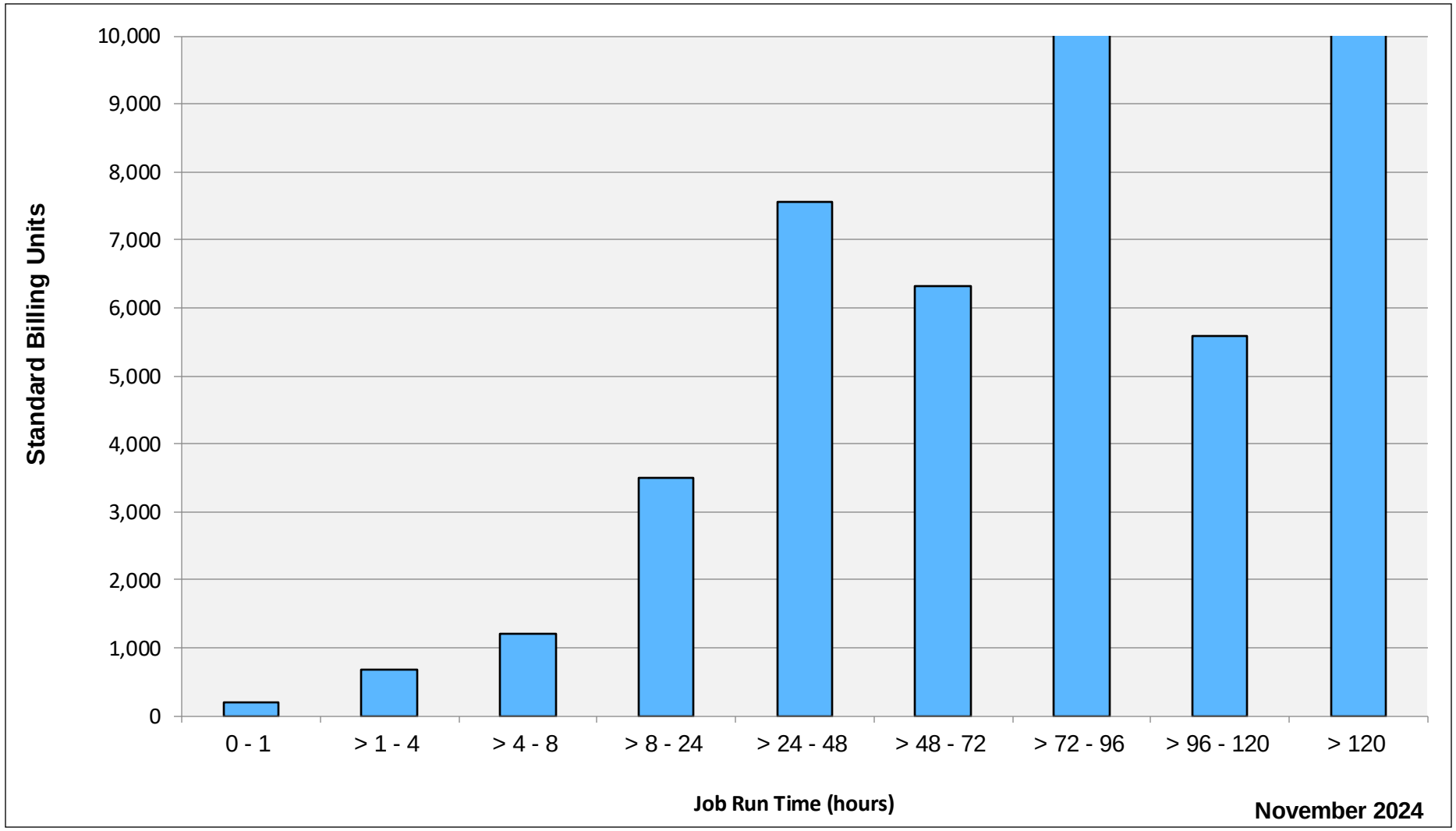
Cabeus: Average Expansion Factor



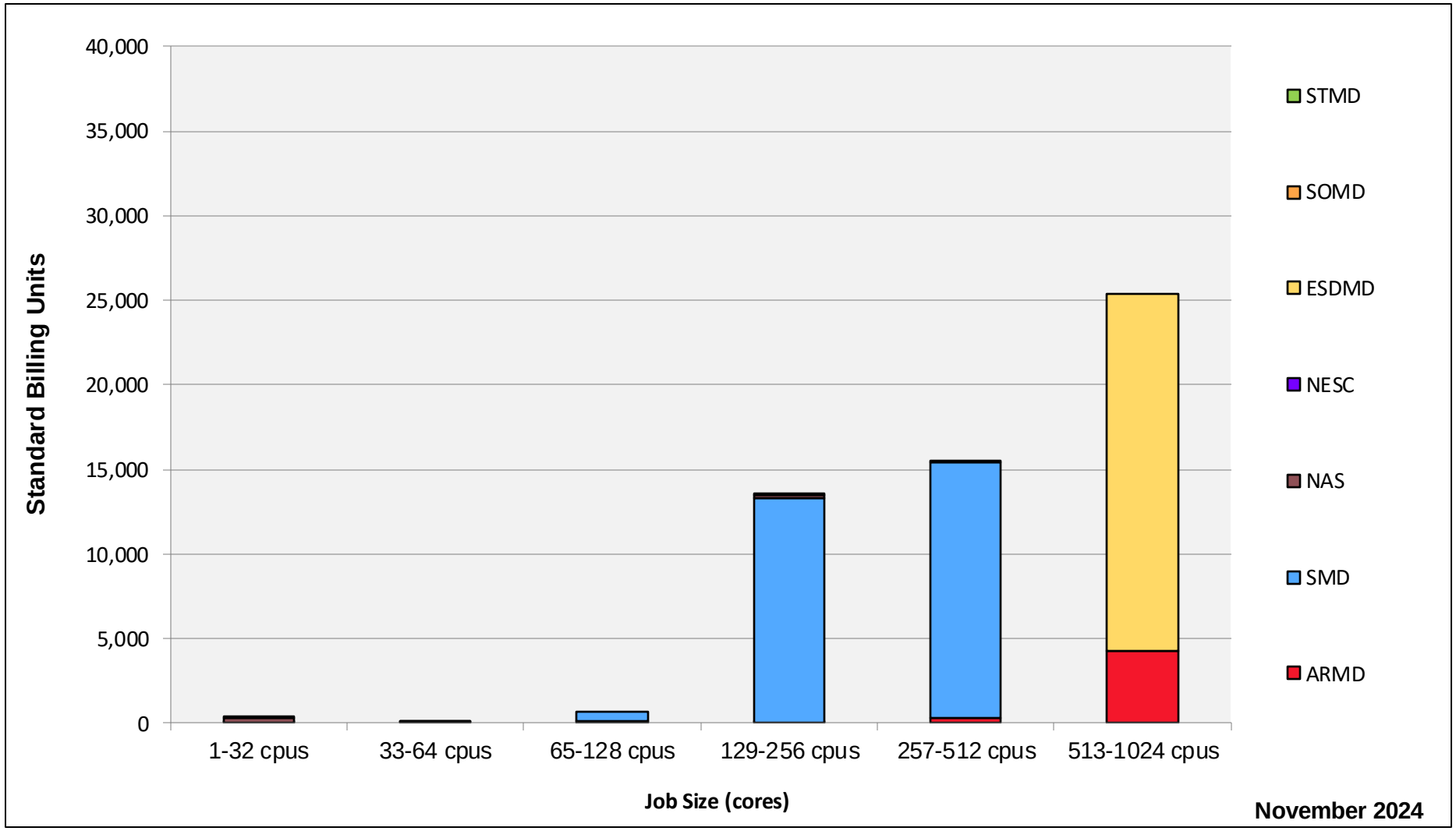
Endeavour: SBUs Reported, Normalized to 30-Day Month



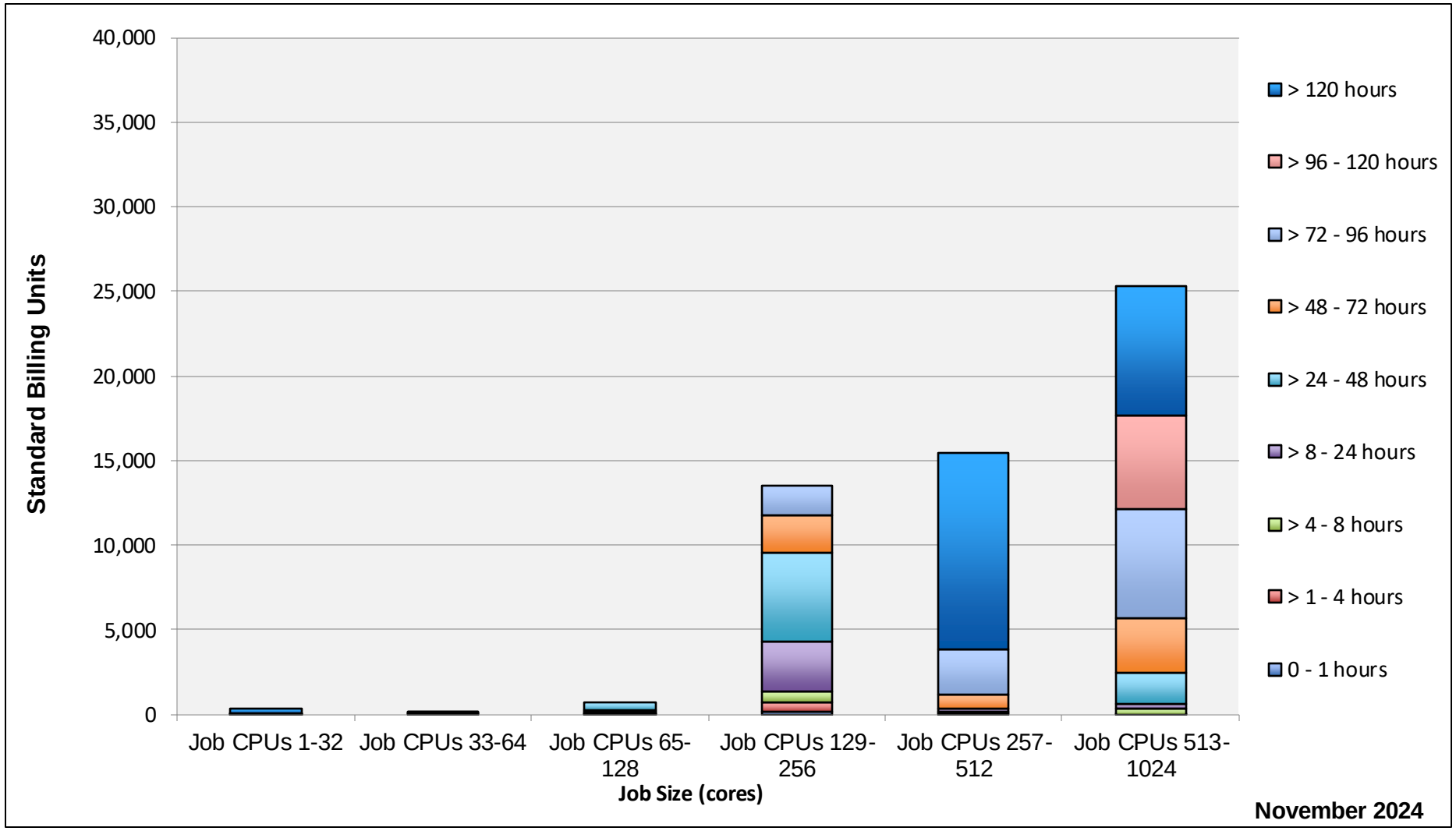
Endeavour: Monthly Utilization by Job Length



Endeavour: Monthly Utilization by Job Size



Endeavour: Monthly Utilization by Size and Length



Endeavour: Average Expansion Factor

