



# Project Status Report

## High End Computing Capability Strategic Capabilities Assets Program

July 10, 2017

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# Pleiades and Electra Get Major Operating System Upgrade



- HECC staff upgraded the Pleiades and Electra compute nodes to SUSE Linux Enterprise Server 12, Service Pack 2 (SLES12 SP2), after significant user testing. This replaces SLES11, which was in use for six years with different service packs.
- SLES12 SP2 brings a much newer Linux kernel, version 4.4, which supports kernel updates without rebooting. HECC staff will evaluate this feature with the intent of utilizing it to further minimize downtime and improve security.
- Along with the SLES upgrade, HECC adopted a new software management policy that clarifies how user software requests will be satisfied and when software will be removed. This policy allows more software to be made available to users through third-party projects, such as the NetBSD Packages Collection (pkgsrc), requiring less effort by HECC staff.

**Mission Impact:** Operating system upgrades and new software management policies keep HECC at the forefront of system administration and productivity, providing NASA with an extensive and reliable software environment.



SUSE Linux has been the operating system for Pleiades and Electra since their inception

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# I/O Improvement Delivers 120x Checkpoint Speedup, Accelerates User Code



- HECC systems staff actively monitor the health of the shared Lustre filesystems. Recently, they identified a user's Lattice Boltzmann Method (LBM) code as the cause of intermittent high loads on one of the Lustre filesystems.
- Experts from the Application Performance and Productivity group analyzed the I/O patterns of the LBM with their in-house mpiprof and licensed IOT tools, and found that the high loads were caused by all MPI ranks reading or writing to large, shared checkpoint files with a single stripe.
- By increasing the stripe count from 1 to 32, the checkpointing time dropped from 20 minutes to ~10 seconds for the 1036-rank production cases—a 120x speedup. In addition, the Lustre contention was greatly reduced improving performance for all users accessing that file system.
- The LBM code is used in support of ARMD's High-Fidelity Modeling of Multi-Rotor Flows Project to perform pilot studies of rotational blade geometries.

**Mission Impact:** I/O performance improvements provided by HECC applications experts greatly reduce the time-to-solution of simulations and enables faster development work by scientists.



An unmanned aerial vehicle (UAV) known as SUI Endurance, with the T-Motor 15x5 propellers. NASA Ames researcher Patricia Ventura uses a Lattice Boltzmann Method code to study the performance of the propeller at different rotational velocities. HECC applications experts provided Ventura with two optional methods for improving code performance.

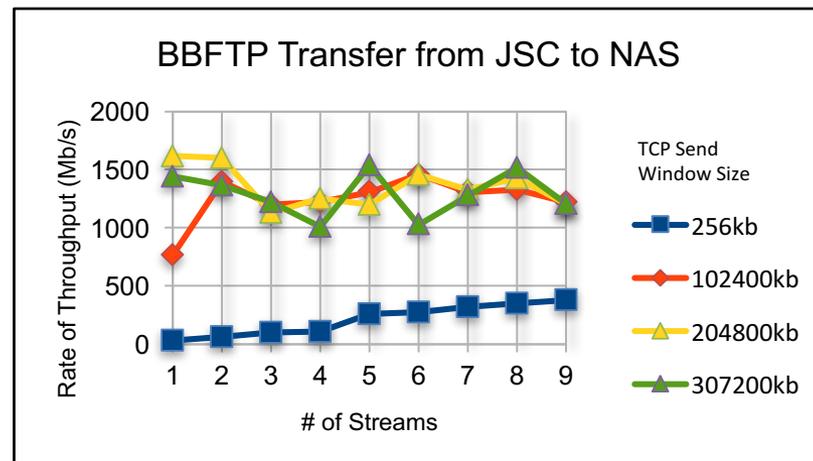
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# HECC Network Engineers Work with JSC to Improve Data Transfer Rates Between Sites



- HECC network engineers detected suboptimal transfer speeds from the JSC AeroLab to the NAS facility across a 2x1-gigabit (Gb) Ethernet link. These links were later upgraded to a 1x10 Gb link with a software limit of 2 Gb.
- Before the upgrade, throughput for single- and multi-stream transfers averaged 125 Mbps, depending on the protocol used and the data transfer method.
- The network team worked with JSC engineers to tune TCP window sizes and network stack for AeroLab hosts and upgrade links, resulting in throughput speeds up to 1.5 Gb/s for the bbSCP transfer method and 1.2 Gbps for the rsync method—about a 10x performance improvement.
- By actively working with JSC engineers, the HECC team identified areas where we can improve the network and help the users understand the most effective way to use different file transfer tools.

**Mission Impact:** By taking responsibility for network problems end-to-end, HECC network engineers ensure that users are provided optimal network performance to efficiently move large amounts of scientific data into and out of the NAS facility.



This chart shows data transfer rates (throughput) and the number of parallel streams for a single transfer between Johnson Space Center and NASA Ames using the bbFTP utility. HECC engineers achieved end-to-end performance tuning by adjusting the TCP window size (represented by each line on the graph.) TCP window size is simply the amount of data in bytes that a sender is willing to send at any point in time.

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# myNAS Principal Investigator (PI) Edition Released to Beta Testers



- The HECC Tools team released a beta version of the myNAS PI website on June 28 to a selected group of test users. The site provides PIs with near-real-time information on jobs across all their GIDs. Job listings can be filtered by users, machines, queues, models, and other parameters. PIs can also view bar and pie charts that show detailed allocation and accounting information at a glance.
- The HECC Application Performance and Productivity team, and the Tools team collaborated to develop the myNAS website, which is hosted on the new portal.nas.nasa.gov server. PIs must authenticate using Launchpad, with either a NASA Smartcard or RSA token to access the site.
- The myNAS website currently utilizes:
  - Eight backend scripts to collect, store, and process job and accounting information from several sources.
  - Five backend API calls to send the data to the myNAS website front end.
  - Ten front-end scripts to display the information in a series of interactive tables and charts.
- After the production release of the PI edition, a version of the myNAS website is planned for individual users.

**Mission Impact:** The myNAS website now provides principal investigators with new tools to analyze and optimize their use of HECC resources.

Filter: <input type="text"/>				
Elapsed (m)	Exit Status	Failure Status	Actual SBU's	Last App
84	255	none detected	233.80	chem
32	271	Exceeded time limit	89.07	chem
3	271	none detected	8.35	chem
2	255	none detected	5.57	chem
2	255	none detected	5.57	chem
13	271	none detected	36.18	chem
5	271	job experienced out of memory (oom)	13.92	chem
2	255	none detected	5.57	chem
2	255	none detected	5.57	chem
1	255	none detected	2.78	chem
<< < 1 of 4 > >>				

myNAS tables list currently running, waiting, held, and recently finished jobs from the user's GID(s). This screenshot from the finished jobs table highlights jobs that failed, and provides additional information integrated from Lumber analysis.

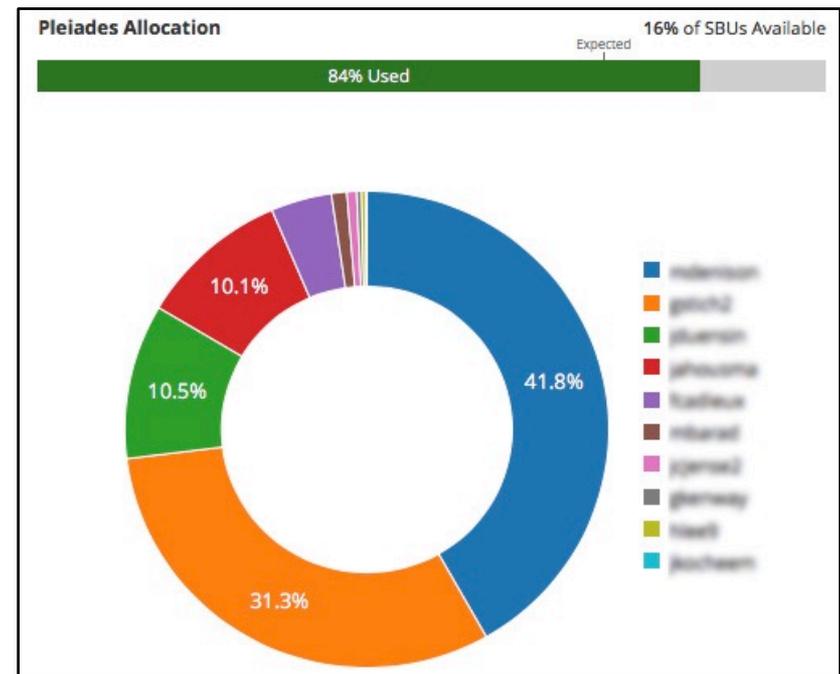
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# Tools Team Continues Development and Automation of HECC Tools and Websites



- The HECC Tools team develops and support applications, web tools, and databases that help to automate processes for our HECC team and users. Recent work includes:
  - Continued improvements to the HECC and HEC monthly accounting reports by automating the ongoing setup of the report files.
  - Released the Electra page for the myNAS application and beta release for the myNAS Principal Investigators (PI) version to provide PIs with near-real-time data on their project's jobs.
  - Released the Remedy workflow for Downtime Processing that automatically notifies affected users about scheduled system downtime and creates outage records for the downtime.
  - Released the RSA Fob Replacement website that allows users to renew their expiring RSA fobs and choose a soft token or physical fob for replacement.
  - Added new features in the Remedy Purchase Request workflow to provide additional request statuses and improve the approval process.
- New projects under development: a Status website for user and staff communication during outages; Modular Supercomputer Facility (MSF) reporting; a Special Access website for requesting elevated privileges; and a Remedy workflow for travel request approval.

**Mission Impact:** HECC applications, web tools, and reports provide NASA users with enhanced accounting and request processes, along with visibility into the performance of their jobs.



The myNAS Principal Investigator edition shows PIs what percentage of their allocation for a GID has been used to date, compares that to expected (linear) usage, and breaks down the total usage by individual user.

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# NAS Facility Passes Safety Audit with Flying Colors



- A team from the NASA Ames Occupational Safety, Health, and Medical Services Division (Code QH) conducted a safety audit of all Code TN facilities on the Ames campus.
- The team lead, Ahleah Rohr-Daniel, remarked that she “looks forward to working with Code TN on safety audits because we take safety so seriously.” The audit included a comprehensive review of building N258 and all Code TN-managed areas of N233A.
- Some minor findings were noted during the audit (e.g., a daisy-chained heater), all of which were addressed within a week of the audit.
- The team identified two best practices during the audit:
  - Safety netting keeping items on shelves from falling out in the N258 shipping/receiving area.
  - Pallets of hardware labeled with pertinent information (such as POC, date of removal).
- Running a supercomputing facility involves many potentially hazardous elements, including high voltage, heavy equipment, and construction activities. By making it priority one, HECC continues to demonstrate our commitment to safety.

**Mission Impact:** Working in a supercomputing environment poses a great number of potential safety hazards. By continually training, documenting, and raising safety awareness with staff, HECC continues to provide a safe working environment to NASA's most vital assets: its people.



One of the best practices identified by a safety audit of Code TN facilities: netting was installed to protect people from falling objects in the event of an earthquake.

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# HECC Successfully Completes Annual Equipment Inventory in 2017



Property custodians responsible for HECC/NAS property completed the 2017 Annual Equipment Inventory of more than 1,300 pieces of decaled equipment with a 99.93% scan rate, an improvement over last year. The audit was completed in early June, three months earlier than in 2016.

- One item was not located. To close out this item, a Property Survey Report (Form NF598) was completed to identify the asset as missing equipment and have it removed from the NASA property database.
- The Property staff's active tracking and updating of the HECC/NAS data created an efficient and successful inventory. Ongoing tracking and management of equipment during FY17 included:
  - Tagged 171 new pieces of equipment.
  - Excessed 130 pieces of equipment.
  - Closed 442 tickets, most relating to equipment location and ownership updates.

**Mission Impact:** Accurate tracking of assets through their life cycle and removal of NASA data prior to system disposal ensures control of government equipment and prevents loss of NASA data.



During the annual equipment inventory, HECC property custodians account for all equipment associated with the NASA Advanced Supercomputing (NAS) facility, including all components of the Pleiades supercomputer.

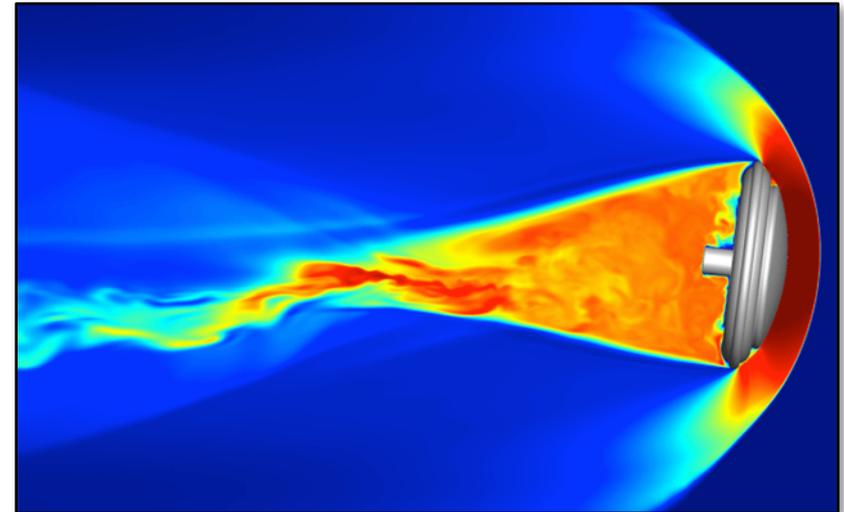
**POC:** Judy Kohler, [judy.j.kohler@nasa.gov](mailto:judy.j.kohler@nasa.gov), (650) 604-4303, NASA Advanced Supercomputing Division, CSRA LLC

# Predictive Modeling for NASA Entry, Descent, and Landing Missions \*



- Researchers in NASA's Entry Systems Modeling (ESM) Project are developing modeling and simulation technologies for new entry, descent, and landing (EDL) concepts, helping to define mission concepts, quantify risk, ensure correct system operation, and analyze data from previous missions.
- Using the Pleiades supercomputer, the ESM team made several key impacts on EDL modeling and simulation in 2016, including:
  - Provided new data on shock layer radiation and updates to the Orion margin policy for Exploration Mission-1, saving significant thermal protection system mass.
  - Demonstrated that infrared radiation from CO<sub>2</sub> could account for the difference between flight data and predictions for the Mars Science Laboratory EDL instrument sensors, which measured the temperatures and atmospheric pressures during entry. Their data provided the justification needed to include a radiometer on the instrument aboard the Mars 2020 entry vehicle.
  - Produced a full, dynamic trajectory-based simulation of an entry body from hypersonic to subsonic flow; results were combined with detailed experimental data to enhance the credibility of CFD for use in analyzing and predicting capsule dynamic stability.

**Mission Impact:** Entry, descent, and landing modeling and simulation methods have supported NASA missions such as the Mars Science Laboratory, which successfully landed in 2012, and are helping engineers design the thermal protection system for the Orion spacecraft's upcoming Exploration Mission-1.



Desktop ballistic range: A visualization of the temperature around a free-flying model tested in the NASA Ames Ballistic Range. The model is allowed to rotate freely according to predicted aerodynamic moments. Observed and simulated flight dynamics are compared in order to validate the computational model. *Joe Brock, NASA/Ames*

**POC:** Michael Wright, michael.j.wright@nasa.gov, (650) 604-4210, NASA Ames Research Center

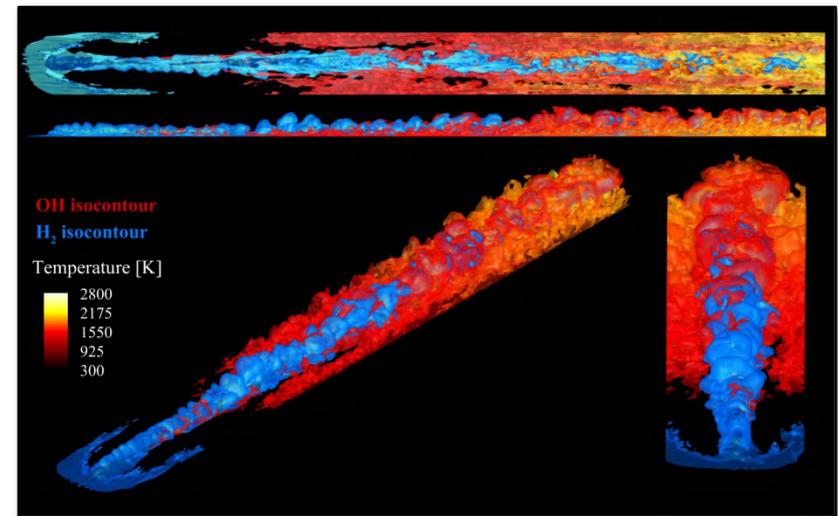
\* HECC provided supercomputing resources and services in support of this work.

# Simulations Improve Understanding of Scramjet Physics, Advance Hypersonic Transportation \*



- In scramjet engines, air compression results naturally from a complex system of multiple shock-turbulent boundary layer interactions (“shock train”), where external perturbations can delay ignition and decrease thrust.
- Researchers at the University of Michigan ran direct numerical simulations (DNS) on Pleiades to investigate the impact of static and dynamic inlet boundary layer variations over the shock train. Achievements included:
  - Identified—for the first time—a resonance frequency that could potentially lead to critical engine failure.
  - Used the shock train’s dynamic response to upstream perturbation in the simulation to identify the resonating frequencies that are of critical interest in designing a stable compressor.
  - Investigated a model hydrogen-fueled scramjet combustor coupled with *an ab initio* comprehensive hypersonic chemistry model, revealing how non-equilibrium thermodynamics is relevant to scramjet engines.
- These large-scale simulations, using computationally expensive numerical models, would not have been possible without the capability provided by HECC.

**Mission Impact:** Large-scale direct numerical simulations, enabled by the Pleiades supercomputer, are helping researchers improve their understanding of the underlying physics of scramjet engine components and contribute to further development of hypersonic transportation.



Video showing 3D views of a supersonic flame in a model hydrogen-fueled scramjet combustor. *Romain Fiévet, University of Michigan*

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

# HECC Facility Hosts Several Visitors and Tours in June 2017



- HECC hosted 15 tour groups in June; guests learned about the agency-wide missions being supported by HECC assets, and some groups also viewed the D-Wave 2X quantum computer system. Visitors this month included:
  - Janet Kavandi, Director of Glenn Research Center, along with Deputy Director Marla E. Perez-Davis and Associate Director Janet Watkins.
  - Ludovico Vecchione, Director, Italian Aerospace Research Center.
  - Several visitors from the Naval Post Graduate School, Monterey, CA.
  - Craig Kundrot, Director of Space Life and Physical Sciences Division at NASA Headquarters; and other attendees of the Space Life Physical Sciences Quarterly Review from Jet Propulsion Laboratory, Marshall Space Flight Center, Glenn Research Center, Kennedy Space Center, and Headquarters also visited.
  - Josef Aschbacher, Director of the European Space Agency's Earth Observation program.
  - 30 interns from the 2017 NASA Ames summer intern program.
  - 25 Howard University Computer Science juniors who are participating in a Google summer program.
  - His Excellency Professor Manuel Heitor, Portugal's Minister of Science, Technology and Higher Education.



Chris Buchanan, HECC/CSRA networking, security, and facilities lead, gives students a tour of the NAS facility's quantum computing room and an overview of HECC capabilities to students from the 2017 NASA Ames summer intern program.

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- **AIAA Aviation Forum**, Denver, Colorado, June 5-9, 2017.
  - **“A Comparative Study of Simulated and Measured Main Landing Gear Noise for Large Civil Transports,”** B. Köing, E. Fares, P. Ravetta, M. Khorrami. \*  
<https://arc.aiaa.org/doi/pdfplus/10.2514/6.2017-3013>
  - **“On the Importance of Spatial Resolution for Flap Side Edge Noise Prediction,”** R. Mineck, M. Khorrami. \*  
<https://arc.aiaa.org/doi/pdfplus/10.2514/6.2017-3694>
  - **“Computations of Crossflow Instability in Hypersonic Boundary Layers,”** M. Choudhari, F. Li, P. Paredes, L. Duan. \*  
<https://arc.aiaa.org/doi/pdf/10.2514/6.2017-4300>
  - **“Stabilization of Hypersonic Boundary Layers by Linear and Nonlinear Optimal Perturbations,”** P. Paredes, M. Choudhari, F. Li. \*  
<https://arc.aiaa.org/doi/pdfplus/10.2514/6.2017-3634>
  - **“Identifying Dynamic Modes of Separated Flow Subject to ZNMF-based Control from Surface Pressure Measurements,”** E. Deem, et al. \*  
<https://arc.aiaa.org/doi/pdfplus/10.2514/6.2017-3309>
  - **“Effect of Synthetic Jet Amplitude Modulation Schemes on the Response of a Separation Bubble,”** J.-H. Seo, F. Cadieux, R. Mittal, E. Deem, L. Cattafesta. \*  
<https://arc.aiaa.org/doi/pdf/10.2514/6.2017-3316>
  - **“Wall-Modeled Large Eddy Simulation of Transonic Flow over an Axisymmetric Bump with Shock-Induced Separation,”** P. Iyer, G. Park, M. Malik. \*  
<https://arc.aiaa.org/doi/pdfplus/10.2514/6.2017-3953>

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



- **AIAA Aviation Forum (cont.)**
  - **“High Ice Water Concentrations in the 19 August 2015 Coastal Mesoconvective System,”** F. Proctor, S. Harrah, G. Switzer, J. Strickland, P. Hunt. \*  
<https://arc.aiaa.org/doi/pdfplus/10.2514/6.2017-4370>
  - **“Transonic and Viscous Potential Flow Method Applied to Flexible Wing Transport Aircraft,”** D. Chaparro, G. Fujiwara, E. Ting, N. Nguyen. \*  
<https://arc.aiaa.org/doi/pdf/10.2514/6.2017-4221>
  - **“Prediction of Turbulent Temperature Fluctuations in Hot Jets,”** J. DeBonis. \*  
<https://arc.aiaa.org/doi/pdf/10.2514/6.2017-3610>
- **“MERPSYS: An Environment for Simulation of Parallel Application Execution on Large Scale HPC Systems,”** P. Czumel, et al., Simulation of Modeling Practice and Theory, vol. 77, published online June 7, 2017. \*  
<http://www.sciencedirect.com/science/article/pii/S1569190X17300916>
- **“The Origin of Fast Molecular Outflows in Quasars: Molecule Formation in AGN-driven Galactic Winds,”** A. Richings, C.-A. Faucher-Giguere, arXiv:1706.03784 [astro-ph.GA], June 12, 2017. \*  
<https://arxiv.org/abs/1706.03784>
- **“Excitation of Flare-Induced Waves in Coronal Loops and the Effects of Radiative Cooling,”** E. Provornikova, et al., arXiv:1706.04219 [astro-ph.SR], June 13, 2017. \*  
<https://arxiv.org/abs/1706.04219>

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



- **“Photoelectrons in the Quiet Polar Wind,”** A. Glocer, G. Khazanov, M. Liemohn, Journal of Geophysical Research: Space Physics, June 14, 2017. \*  
<http://onlinelibrary.wiley.com/doi/10.1002/2017JA024177/full>
- **“Dwarf Galaxy Mass Estimators vs. Cosmological Simulations,”** A. Gonzalez-Samaniego, et al., arXiv:1706.05383 [astro-ph.GA], June 16, 2017. \*  
<https://arxiv.org/abs/1706.05383>
- **“Formation and Transport of Entropy Structures in the Magnetotail Simulated with a 3-D Global Hybrid Code,”** Y. Lin, et al., Geophysical Research Letters, June 17, 2017. \*  
<http://onlinelibrary.wiley.com/doi/10.1002/2017GL073957/full>
- **“Impact of Assimilated Precipitation-Sensitive Radiances on the NU-WRF Simulation of the West African Monsoon,”** S. Zhang, et al., American Meteorological Society: Monthly Weather Review, June 22, 2017. \*  
<http://journals.ametsoc.org/doi/abs/10.1175/MWR-D-16-0389.1>
- **“Origin and Evolution of Short-Period Comets,”** D. Nesvorny, et al., arXiv:1706.07447 [astro-ph.EP], June 22, 2017. \*  
<https://arxiv.org/abs/1706.07447>
- **“SIDM on FIRE: Hydrodynamical Self-Interacting Dark Matter Simulations of Low-Mass Dwarf Galaxies,”** V. Robles, et al., arXiv:1706.07514 [astro-ph.GA], June 22, 2017. \*  
<https://arxiv.org/abs/1706.07514>

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

# Papers (cont.)



- **“Coronal Heating Topology: The Interplay of Current Sheets and Magnetic Field Lines,”** A. Rappazzo, et al., arXiv:1706.08983 [astro-ph.SR], June 27, 2017. \*  
*<https://arxiv.org/abs/1706.08983>*

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



- **AIAA Aviation Forum**, Denver, Colorado, June 5–9, 2017.
  - **“Lattice Boltzmann and Navier-Stokes Cartesian CFD Approaches for Airframe Noise Predictions,”** M. Barad, J. Kocheemoolayil, C. Kiris.  
<https://arc.aiaa.org/doi/pdf/10.2514/6.2017-4404>
  - **“Jet Noise Prediction using Hybrid RANS/LES with Structured Overset Grids,”** J. Housman, G.-D. Stich, C. Kiris, J. Bridges.  
<https://arc.aiaa.org/doi/pdfplus/10.2514/6.2017-3213>
  - **“Implementation of a Body Force Model in OVERFLOW for Propulsor Simulations,”** H. D. Akaydin, S. Pandya.  
<https://arc.aiaa.org/doi/pdfplus/10.2514/6.2017-3572>
  - **“CFD Analysis in Advance of the NASA Juncture Flow Experiment,”** H. Lee, T. Pulliam, D. Neuhart, M. Kegerise.  
<https://arc.aiaa.org/doi/pdfplus/10.2514/6.2017-4127>
  - **“DNS of a Spatially Developing Turbulent Mixing Layer from Co-Flowing Laminar Boundary Layers,”** J. Colmenares, S. Porosova, Y. Peet, S. Murman.  
<https://arc.aiaa.org/doi/pdf/10.2514/6.2017-3641>
  - **“A DGSEM Shock-Capturing Scheme for Scale-Resolving Simulations,”** S. Murman, N. Burgess, L. Diosady, A. Garai.  
<https://arc.aiaa.org/doi/abs/10.2514/6.2017-4106>
  - **“A  $C^1$ -Discontinuous-Galerkin Spectral-Element Shell Structural Solver,”** N. Burgess, L. Diosady, S. Murman.  
<https://arc.aiaa.org/doi/pdfplus/10.2514/6.2017-3727>



- **AIAA Aviation Forum (cont.)**
  - **“A Detailed DSMC Surface Chemistry Modeling of the Oxidation of Light-Weight Carbon Preform Ablators,”** A. Borner, K. Goplan, K. Stephani, V. Murray, S. Poovathingal, T. Minton, F. Panerai, N. Mansour.  
<https://arc.aiaa.org/doi/pdfplus/10.2514/6.2017-3099>
  - **“Error Minimization via Metric-Based Curved-Mesh Adaptation,”** D. Sanjaya, K. Fidkowski, L. Diosady, S. Murman.  
<https://arc.aiaa.org/doi/pdfplus/10.2514/6.2017-3189>
  - **“Computational Modeling of Meteor-Generated Ground Pressure Signatures,”** M. Nemec, M. Aftosmis, P. Brown.  
<https://arc.aiaa.org/doi/pdfplus/10.2514/6.2017-3189>
  - **“Cart3D Simulations for the Second AIAA Sonic Boom Prediction Workshop,”** G. Anderson, M. Aftosmis, M. Nemec.  
<https://arc.aiaa.org/doi/pdf/10.2514/6.2017-3255>
  - **“Near Field Summary and Statistical Analysis of the Second AIAA Sonic Boom Prediction Workshop,”** M. Park, M. Nemec.
  - **“Strategies Toward Automation of Overset Structured Surface Grid Generation,”** W. Chan.  
<https://arc.aiaa.org/doi/pdf/10.2514/6.2017-3451>
  - **“Boundary Condition Study for the Juncture Flow Experiment in the NASA Langley 14x22-Foot Subsonic Wind Tunnel,”** T. Pulliam, H. Lee, C. Rumsey, J.-R. Carlson, J. Hannon, L. Jenkins, S. Bartman.  
<https://arc.aiaa.org/doi/pdfplus/10.2514/6.2017-4126>

# Presentations



- **AIAA Aviation Forum (cont.)**
  - **“USM3D Simulations for 2<sup>nd</sup> Sonic Boom Workshop,”** S. Cliff, A. Elmiligui, M. Carter, S. Nayani, J. Pearl.  
*<https://arc.aiaa.org/doi/pdf/10.2514/6.2017-3254>*
  - **“CFD Vision 2030 and its Implementation,”** M. Rogers, M. Malik.
  - **“OVERFLOW Contribution to HiLiftPW3,”** T. Pulliam, J. Slotnick, A. Sclafani, J. Coder.  
*<https://hiliftpw.larc.nasa.gov/Workshop3/HiLiftPW3-Presentations/022.pdf>*
  - **“LAVA Contribution to HiLiftPW3,”** J. Jensen, M. Denison, G. Stich, J. Housman, C. Kiris.  
*<https://hiliftpw.larc.nasa.gov/Workshop3/HiLiftPW3-Presentations/033.pdf>*
  - **“Overset Mesh Generation for the High-Lift Common Research Model,”** W. Chan.

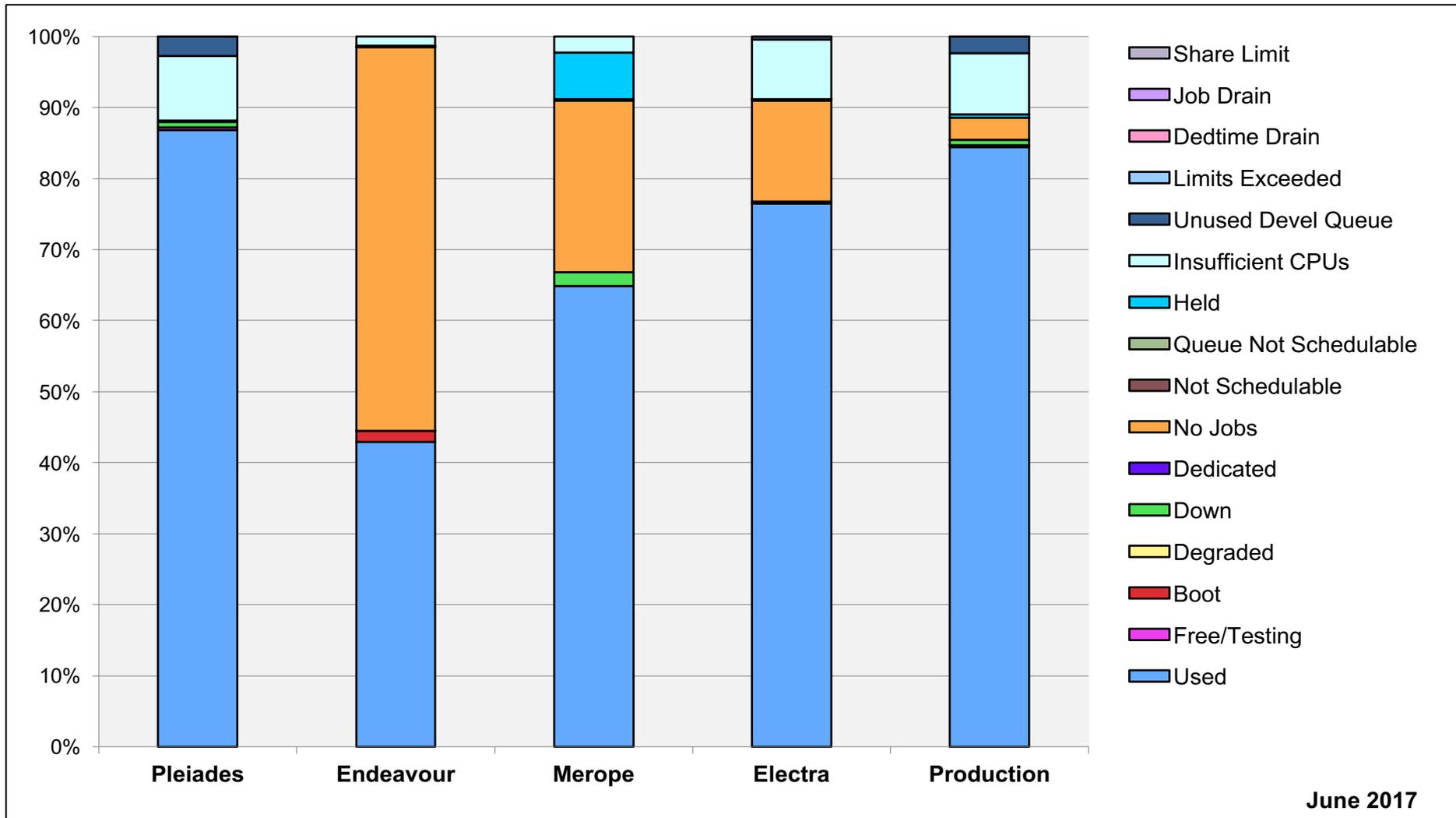


- **OU Astrophysicist Studies Earth-Size Planets**, *University of Oklahoma Research Press Release*, June 10, 2017—An astrophysics researcher from the University of Oklahoma has identified the possible compositions of the seven Earth-sized planets in the TRAPPIST-1 system. Simulations were performed using the Pleiades supercomputer.  
[http://www.ou.edu/web/news\\_events/articles/news\\_2017/ou-astrophysicist-identifies-composition-of-earth-size-planets-.html](http://www.ou.edu/web/news_events/articles/news_2017/ou-astrophysicist-identifies-composition-of-earth-size-planets-.html)
  - **Scientists Identify the Possible Composition of Planets in the TRAPPIST-1 System**, *Tech Times*, June 11, 2017.  
<http://www.techtimes.com/articles/209589/20170611/scientists-identify-the-possible-composition-of-planets-in-the-trappist-1-system.htm>
- **NASA Ames Research Center Selects Mellanox InfiniBand for New Scalable Supercomputer**, *Mellanox Press Release*, June 19, 2017—Mellanox announces that their EDR InfiniBand solutions will be used in the new expansion of the Electra supercomputer, housed at the NASA Advanced Supercomputing facility at NASA Ames Research Center.  
[http://www.mellanox.com/page/press\\_release\\_item?id=1928](http://www.mellanox.com/page/press_release_item?id=1928)
- **Mystery of Floppy Solar Jets is Solved at Last**, *Physics World*, June 23, 2017—Computer simulations done by researchers in the US and Norway, including work done on NASA's Pleiades supercomputer, suggest an interplay between neutral particles and plasma in the Sun's atmosphere that allow tangled magnetic fields to launch spicules.  
<http://physicsworld.com/cws/article/news/2017/jun/23/mystery-of-floppy-solar-jets-is-solved-at-last>

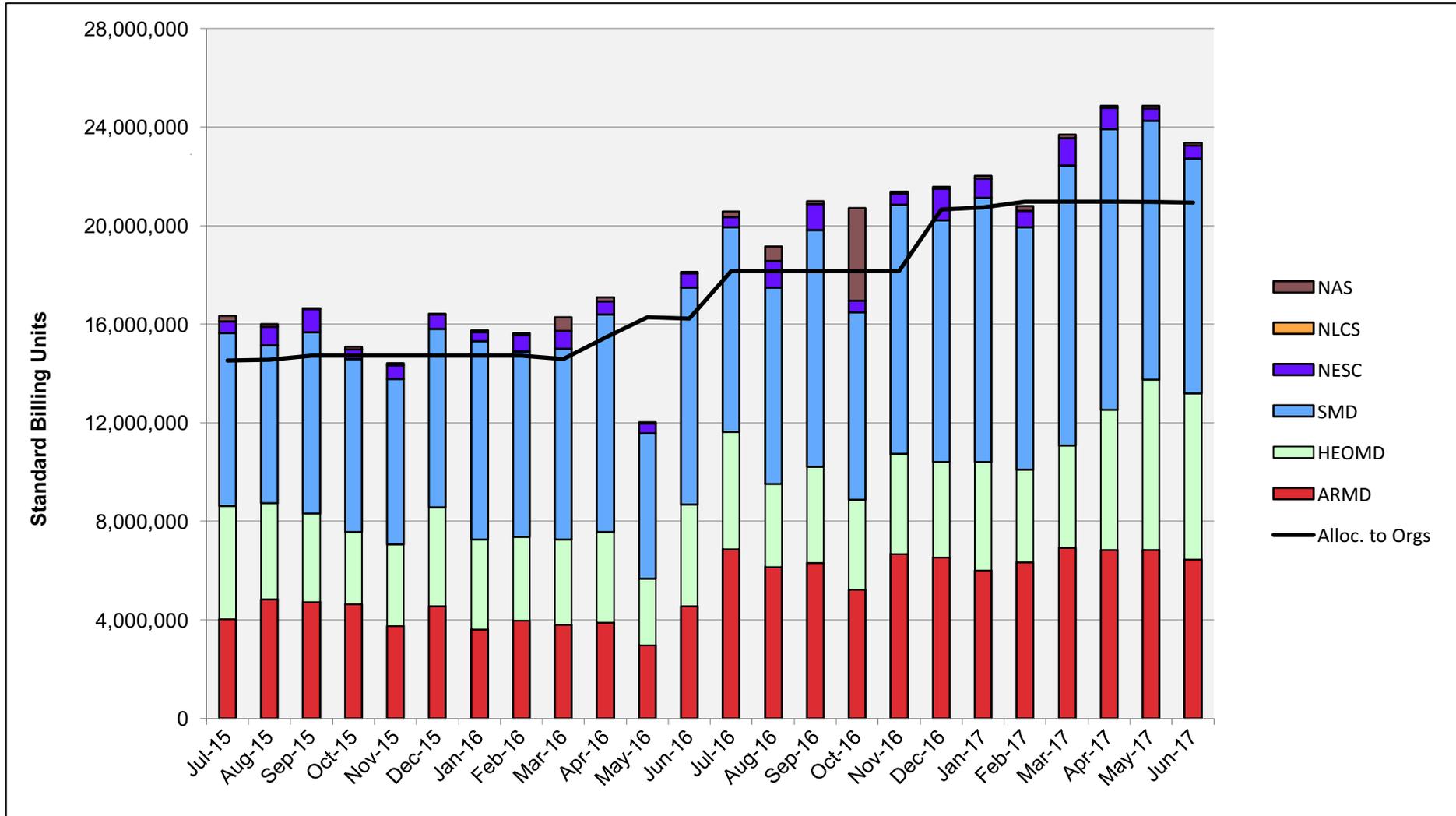


- **Bill Thigpen Talks About How NASA Uses Supercomputers**, *NASA Silicon Valley Podcast*, June 30, 2017—A conversation with Bill Thigpen, Branch Chief of Advanced Computing at NASA's Ames Research Center in Silicon Valley.  
<https://soundcloud.com/nasa/bill-thigpen-talks-about-how-nasa-uses-supercomputers>
- **NASA Researchers Rock the World of Asteroid Simulation**, *NAS Feature Story*, June 29, 2017—Assessing potential damage from an asteroid strike and planning mitigation strategies is now faster and more accurate thanks to simulations and risk models run on NASA supercomputers.  
[https://www.nas.nasa.gov/publications/articles/feature\\_asteroid\\_simulations.html](https://www.nas.nasa.gov/publications/articles/feature_asteroid_simulations.html)
  - **NASA Simulates Asteroid Impacts to Help Identify Possible Life-Threatening Events**, *NASA Ames video feature*, June 29, 2017.  
<https://www.nasa.gov/ames/feature/nasa-simulates-asteroid-impacts-to-help-identify-possible-life-threatening-events>
  - **Watch a Simulated Asteroid Hit the Atmosphere at 45,000 Miles Per Hour**, *Gizmodo*, June 29, 2017.  
<http://gizmodo.com/watch-a-simulated-asteroid-hit-the-atmosphere-at-45-000-1796527537>
  - **NASA Just Showed Off How It Would Help Save the Planet from 'Possible Life-Threatening' Asteroids**, *Fox News*, June 30, 2017.  
<http://www.foxnews.com/tech/2017/06/30/nasa-just-showed-off-how-it-would-help-save-planet-from-possible-life-threatening-asteroids.html>
  - **NASA Simulation Shows How an Asteroid Melts in the Atmosphere**, *Nerdist*, July 2, 2017.  
<http://nerdist.com/nasa-asteroid-simulation-melting-atmosphere/>

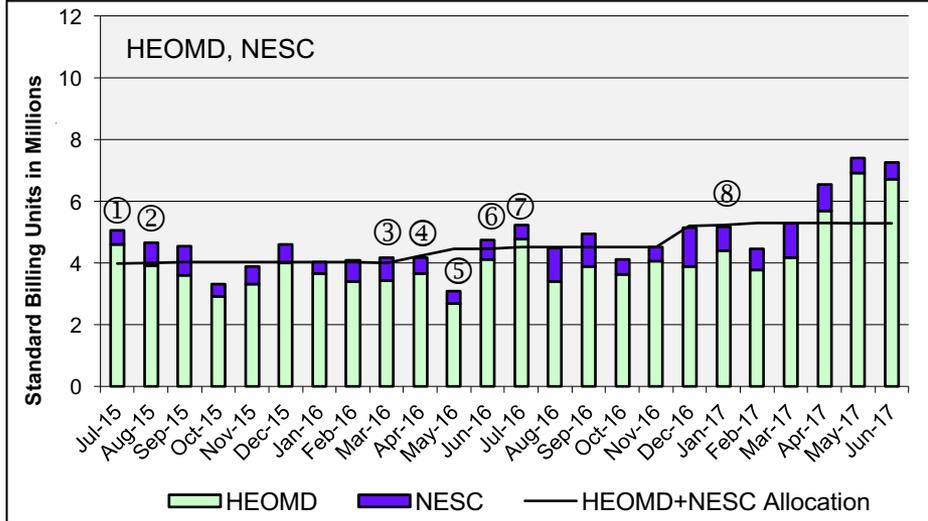
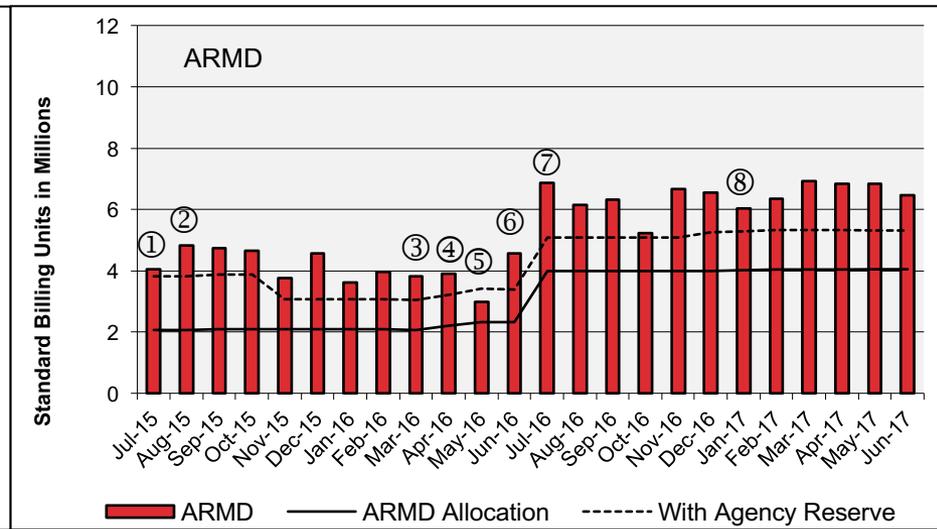
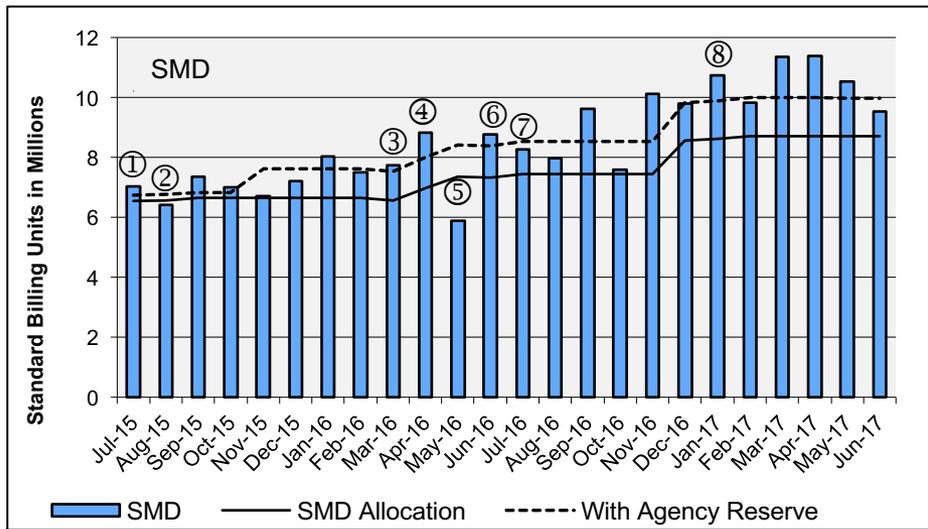
# HECC Utilization



# HECC Utilization Normalized to 30-Day Month

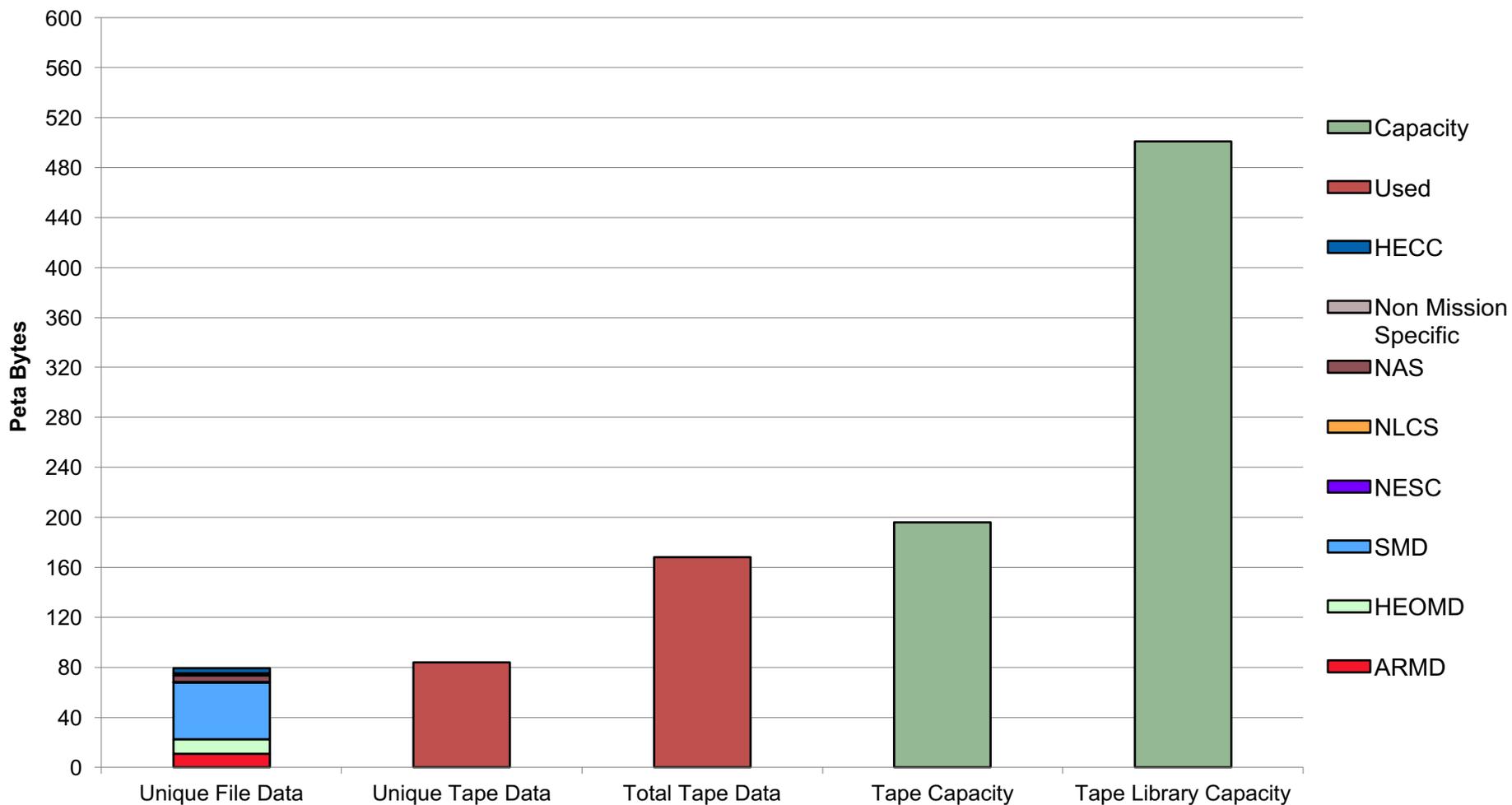


# HECC Utilization Normalized to 30-Day Month



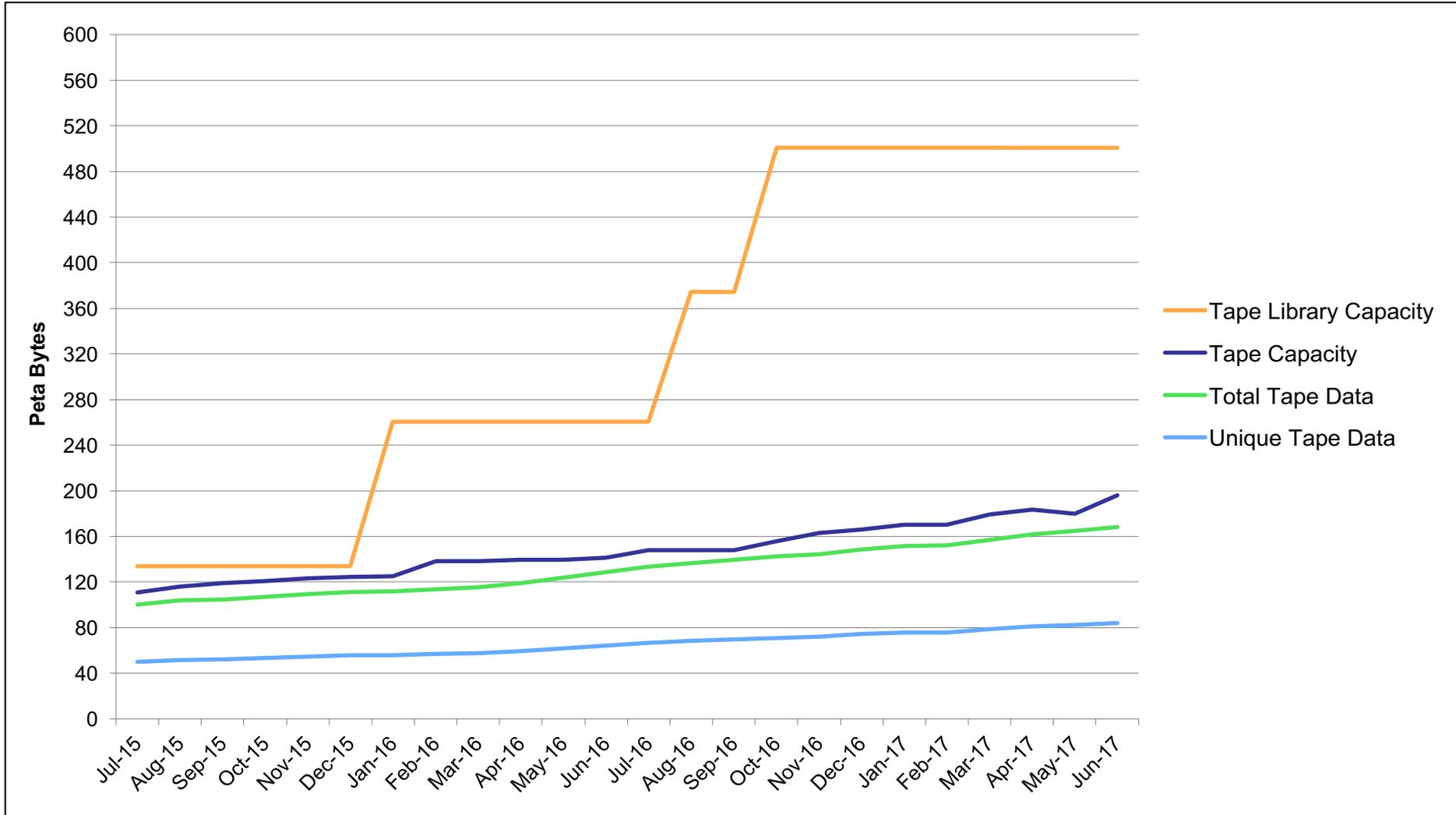
- ① 7 Nehalem ½ racks retired from Merope
- ② 7 Westmere ½ racks added to Merope
- ③ 16 Westmere racks retired from Pleiades
- ④ 10 Broadwell racks added to Pleiades
- ⑤ 4 Broadwell racks added to Pleiades
- ⑥ 14 (All) Westmere racks retired from Pleiades
- ⑦ 14 Broadwell Racks added to Pleiades
- ⑧ 16 Electra Broadwell Racks in Production, 20 Westmere 1/2 racks added to Merope

# Tape Archive Status

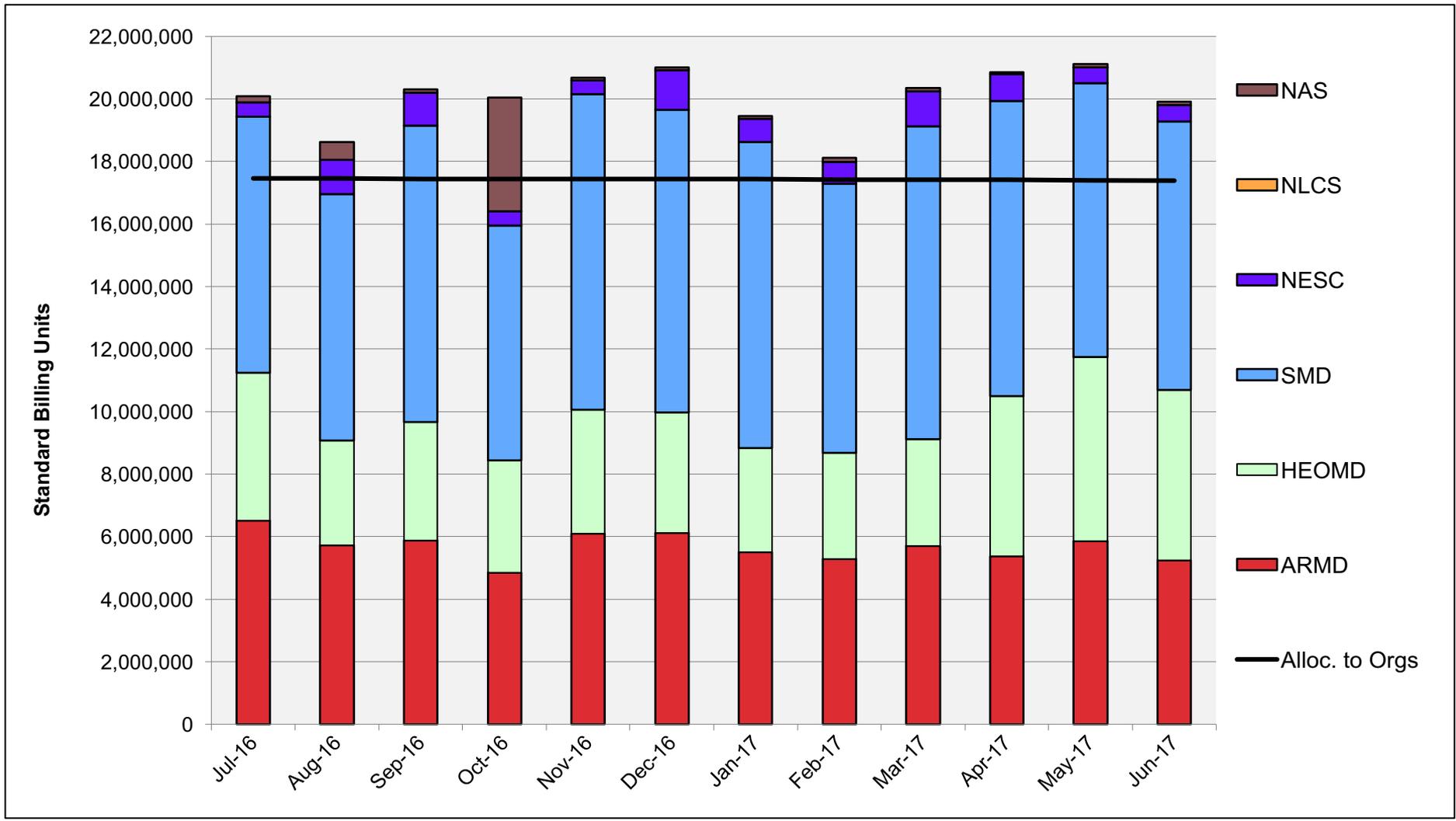


June 2017

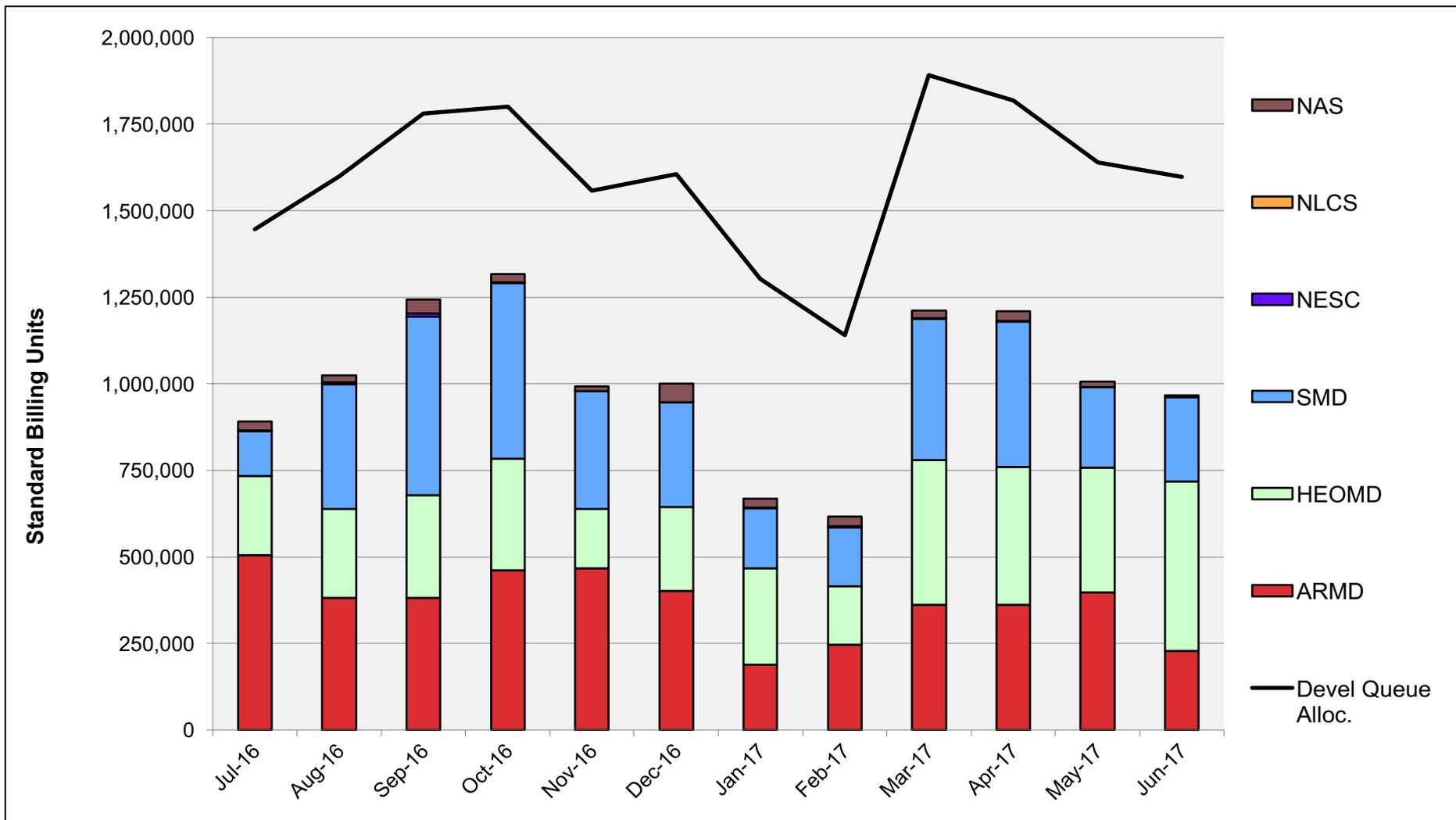
# Tape Archive Status



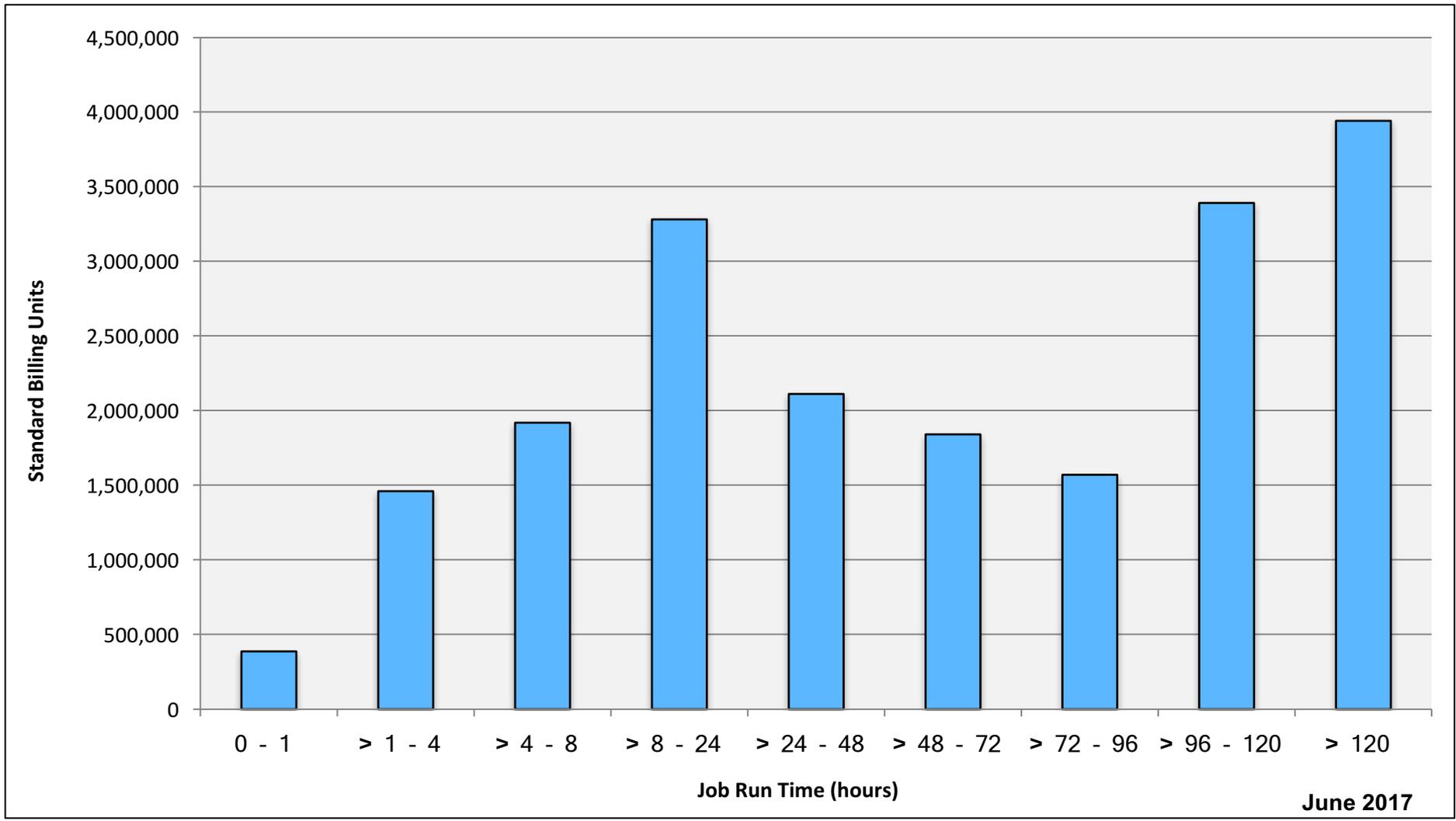
# Pleiades: SBUs Reported, Normalized to 30-Day Month



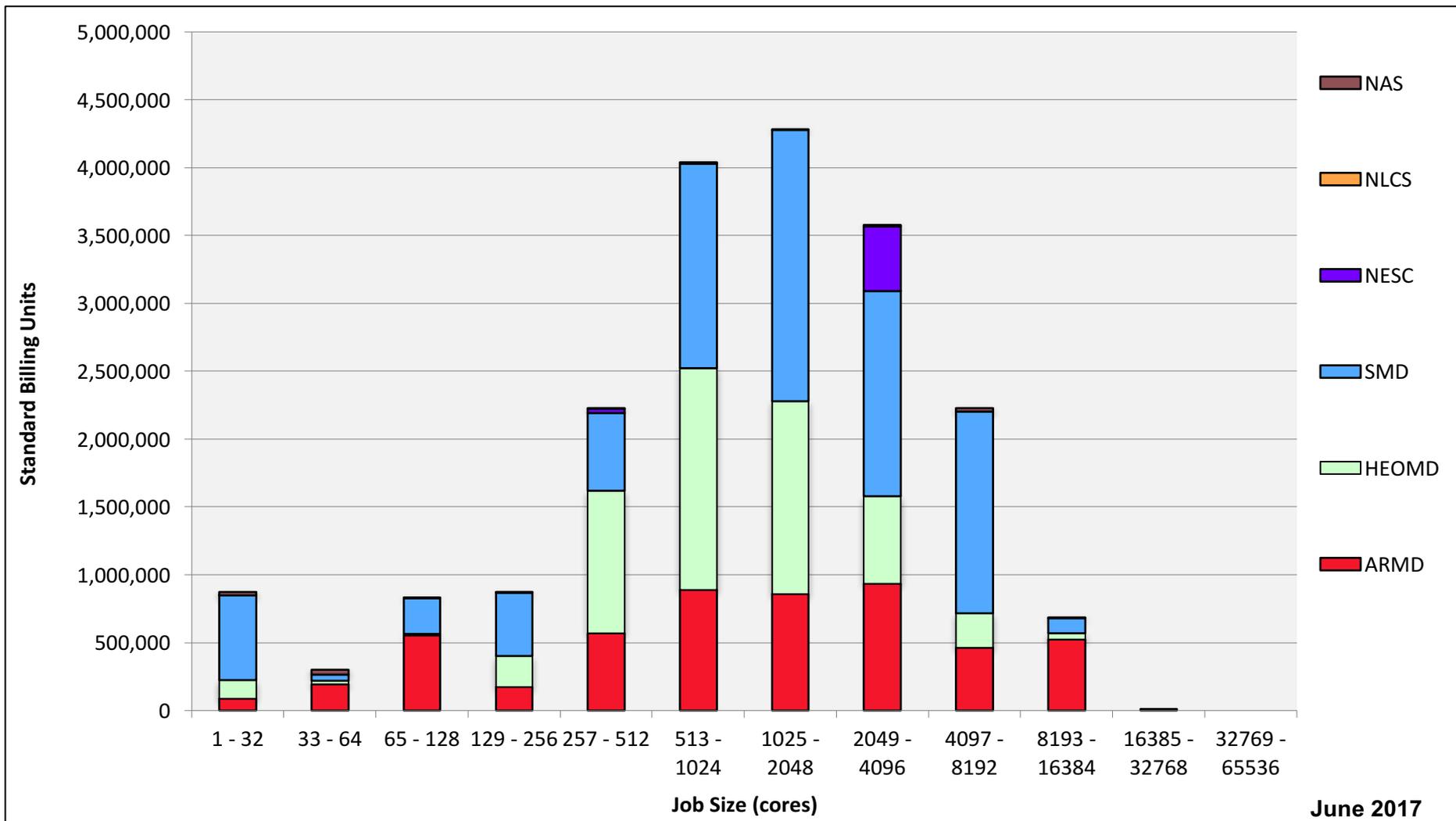
# Pleiades: Devel Queue Utilization



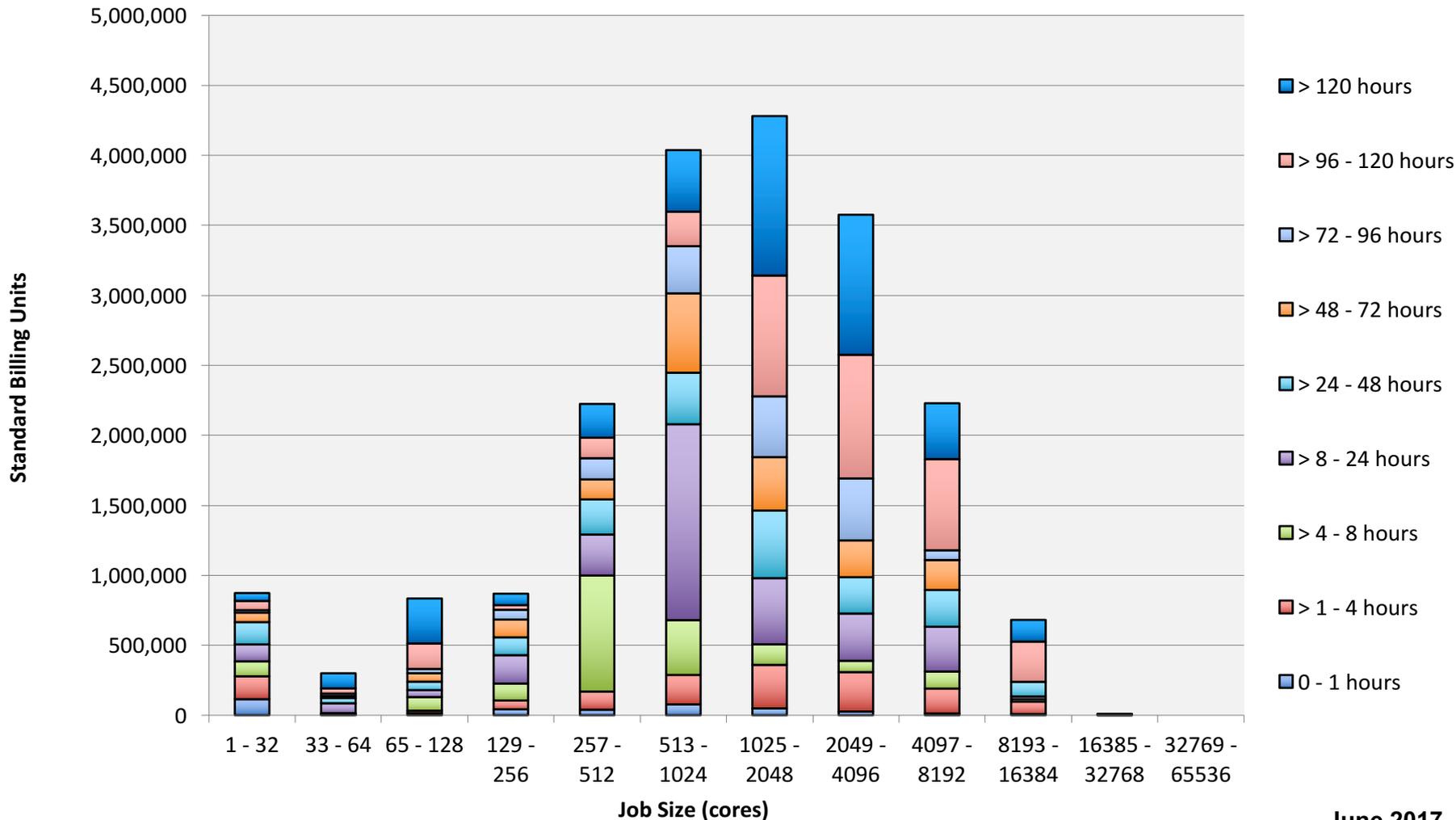
# Pleiades: Monthly Utilization by Job Length



# Pleiades: Monthly Utilization by Size and Mission

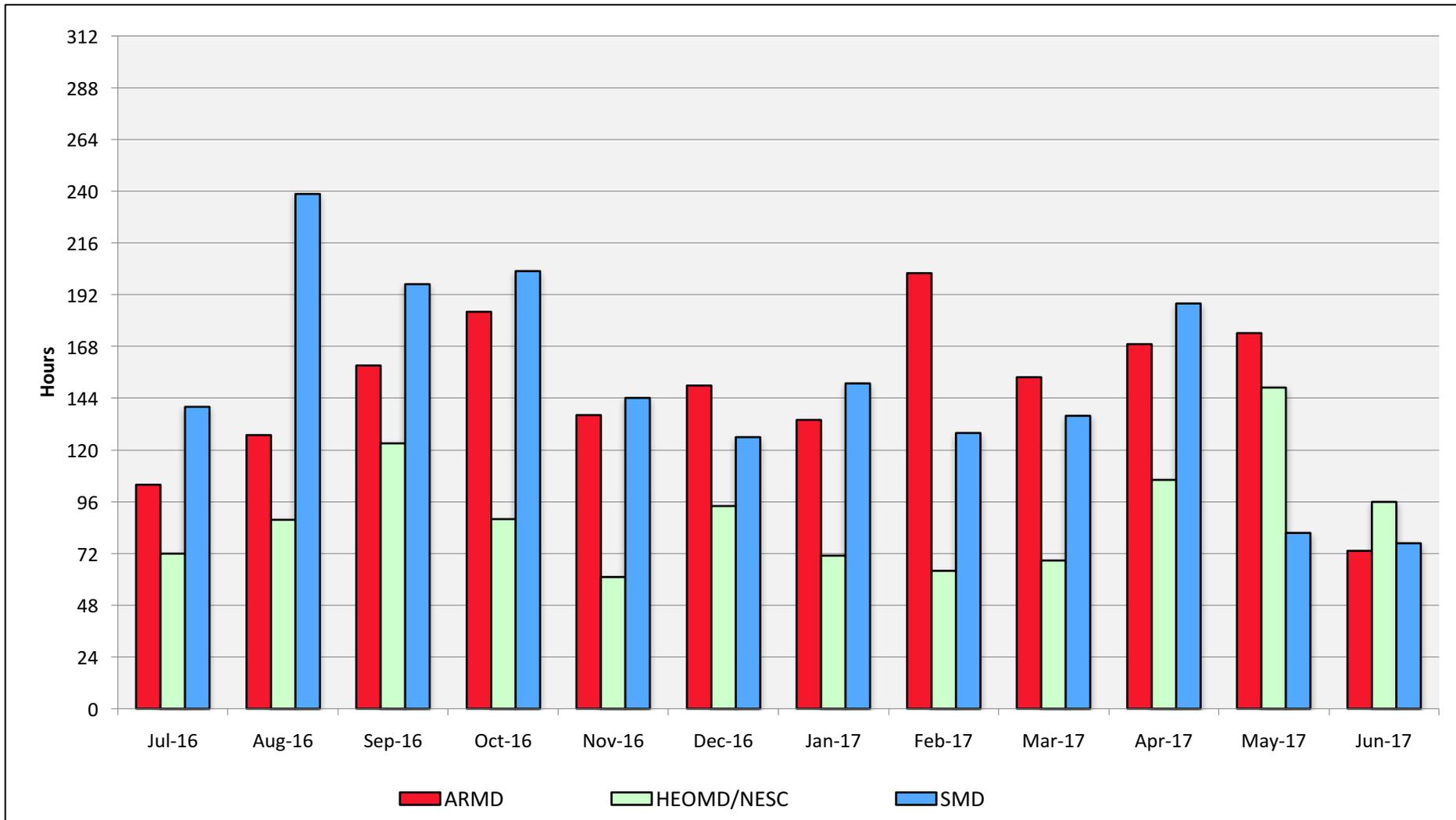


# Pleiades: Monthly Utilization by Size and Length

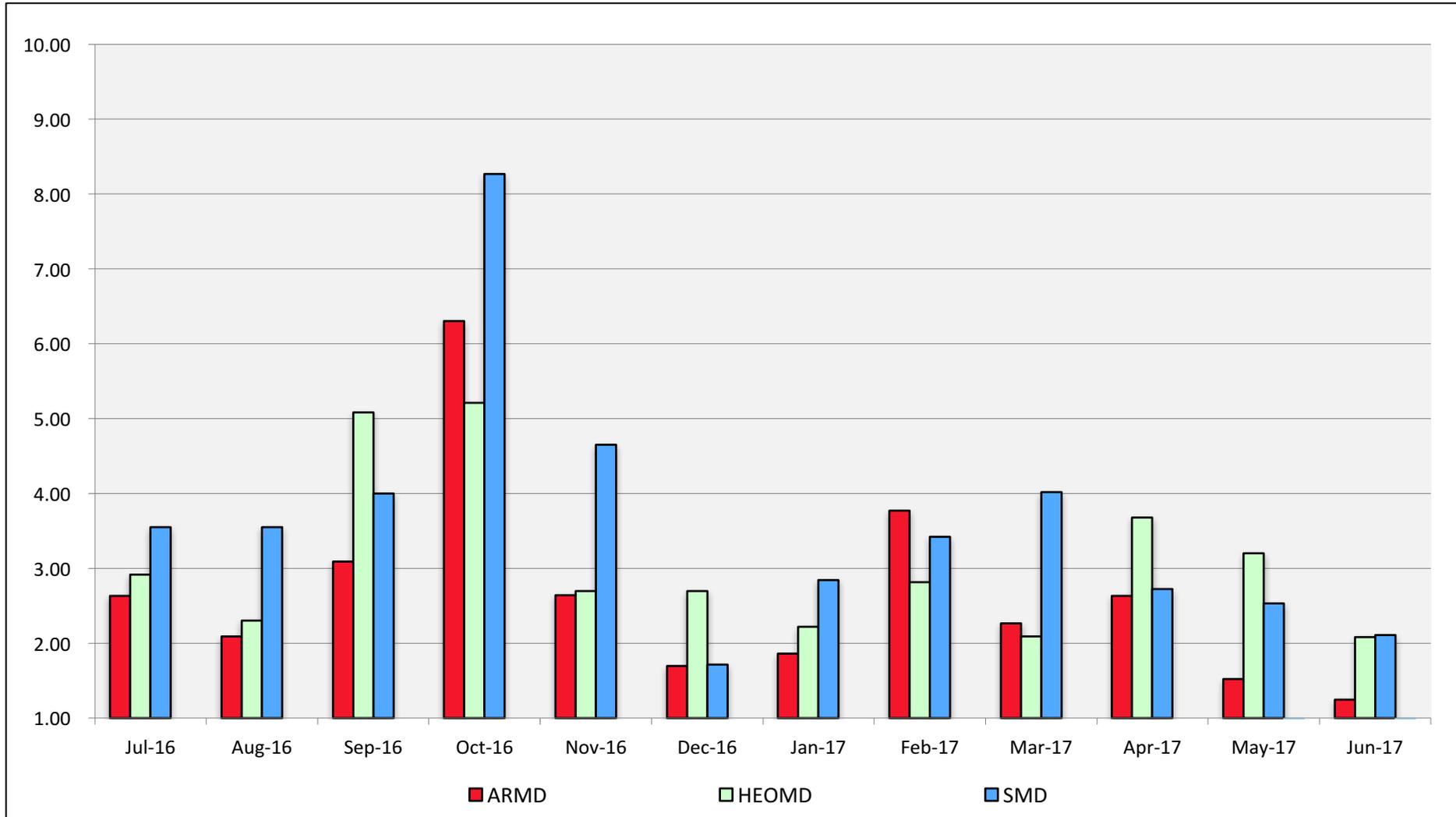


June 2017

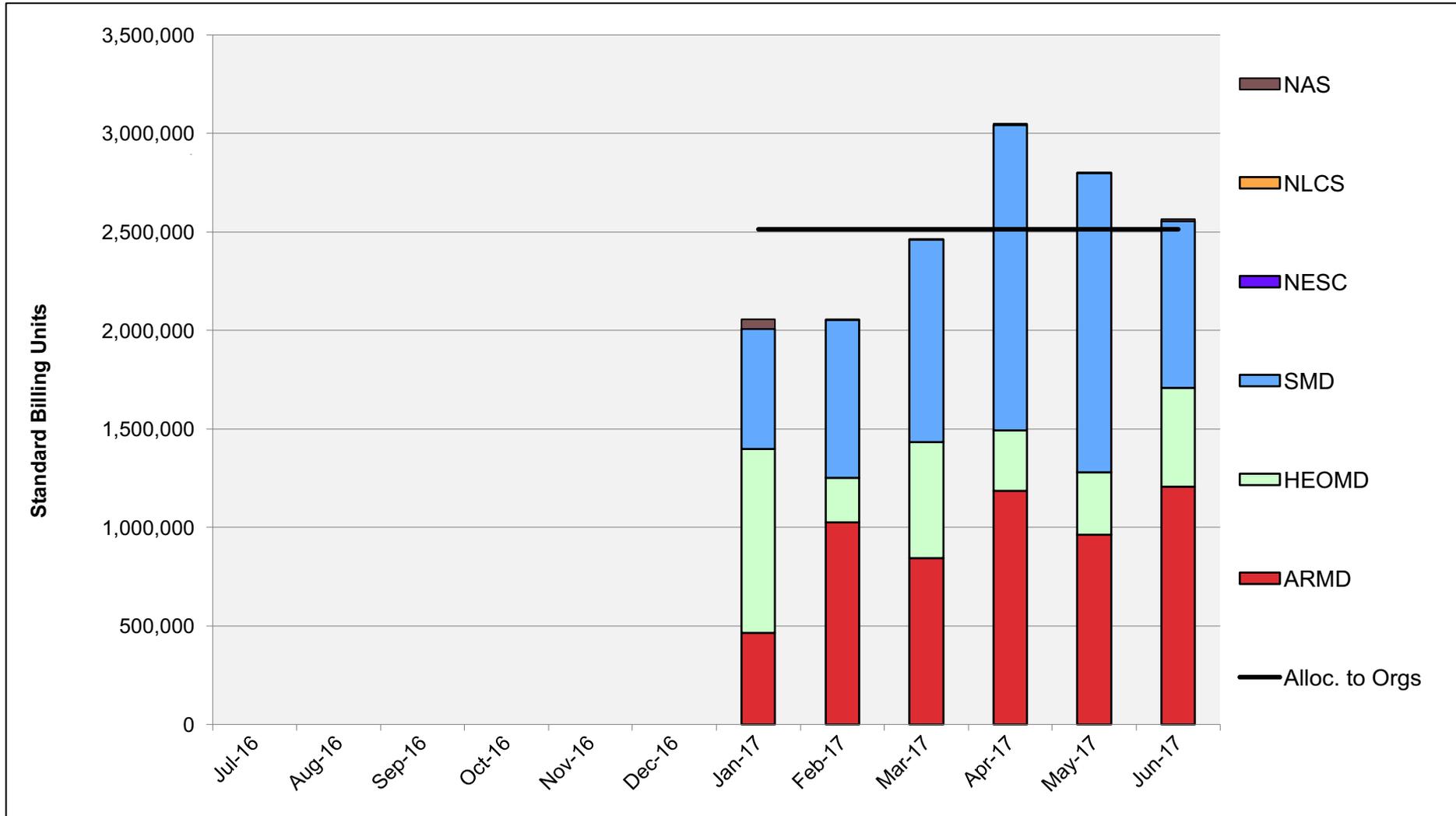
# Pleiades: Average Time to Clear All Jobs



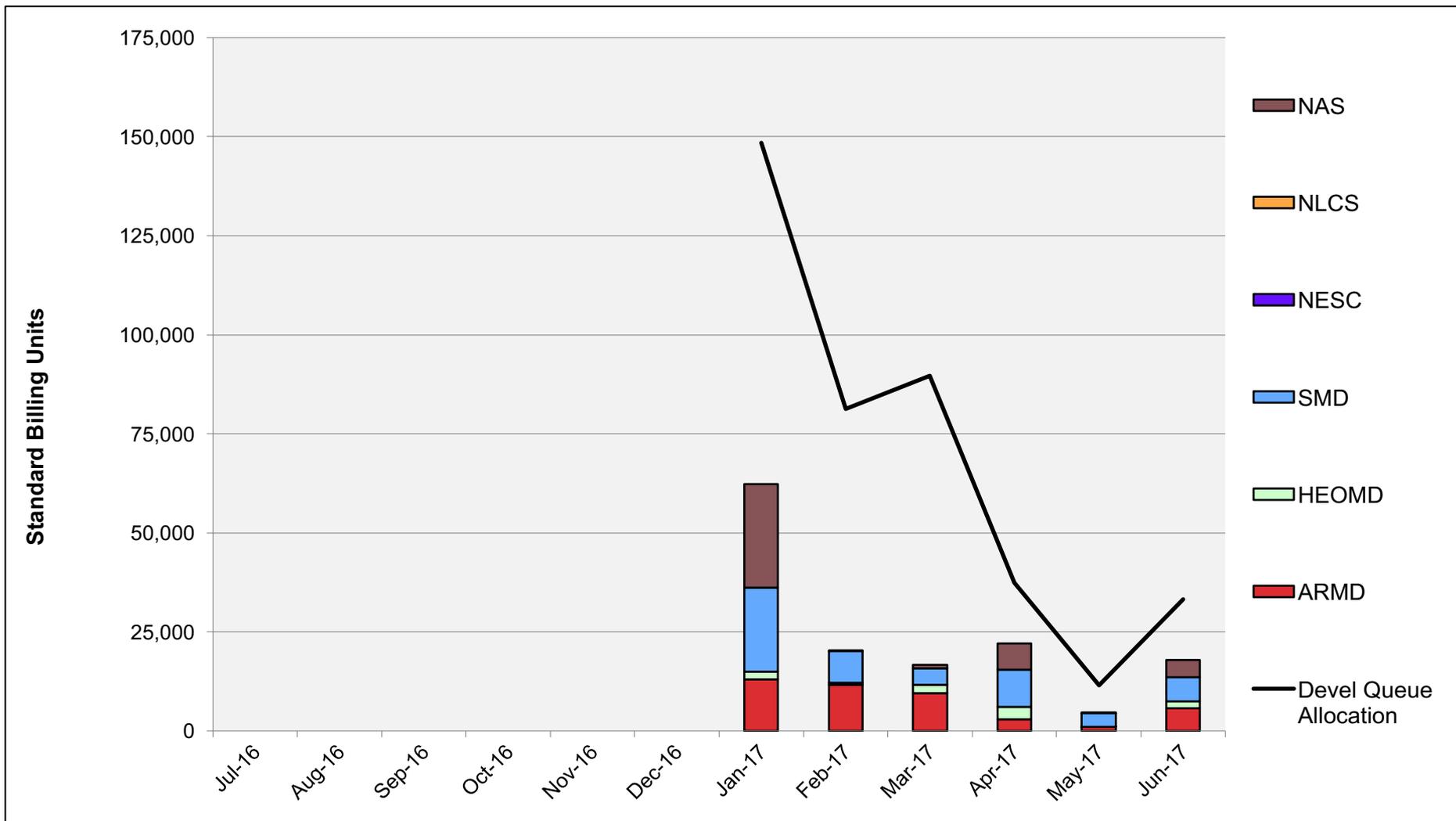
# Pleiades: Average Expansion Factor



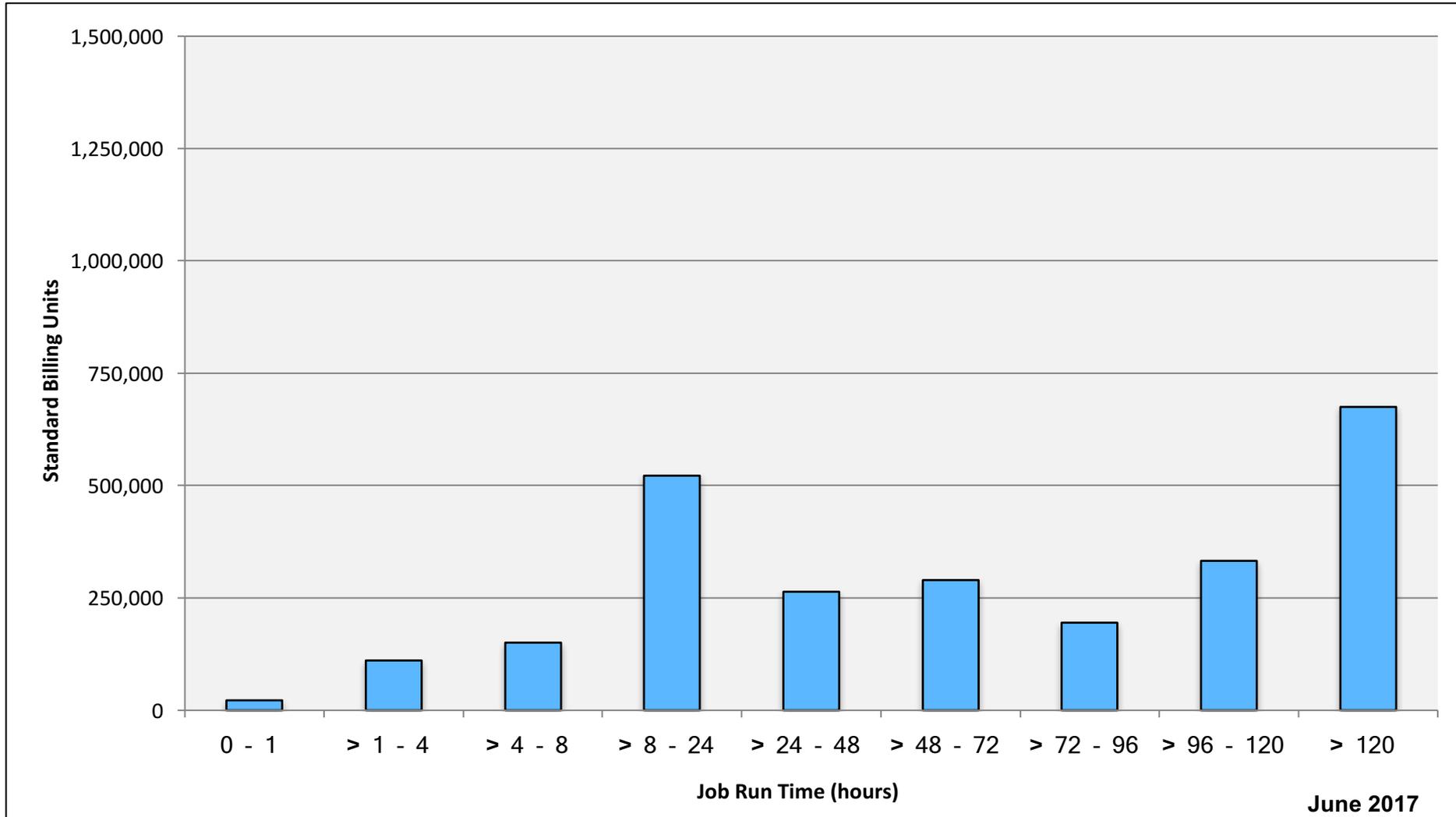
# Electra: SBUs Reported, Normalized to 30-Day Month



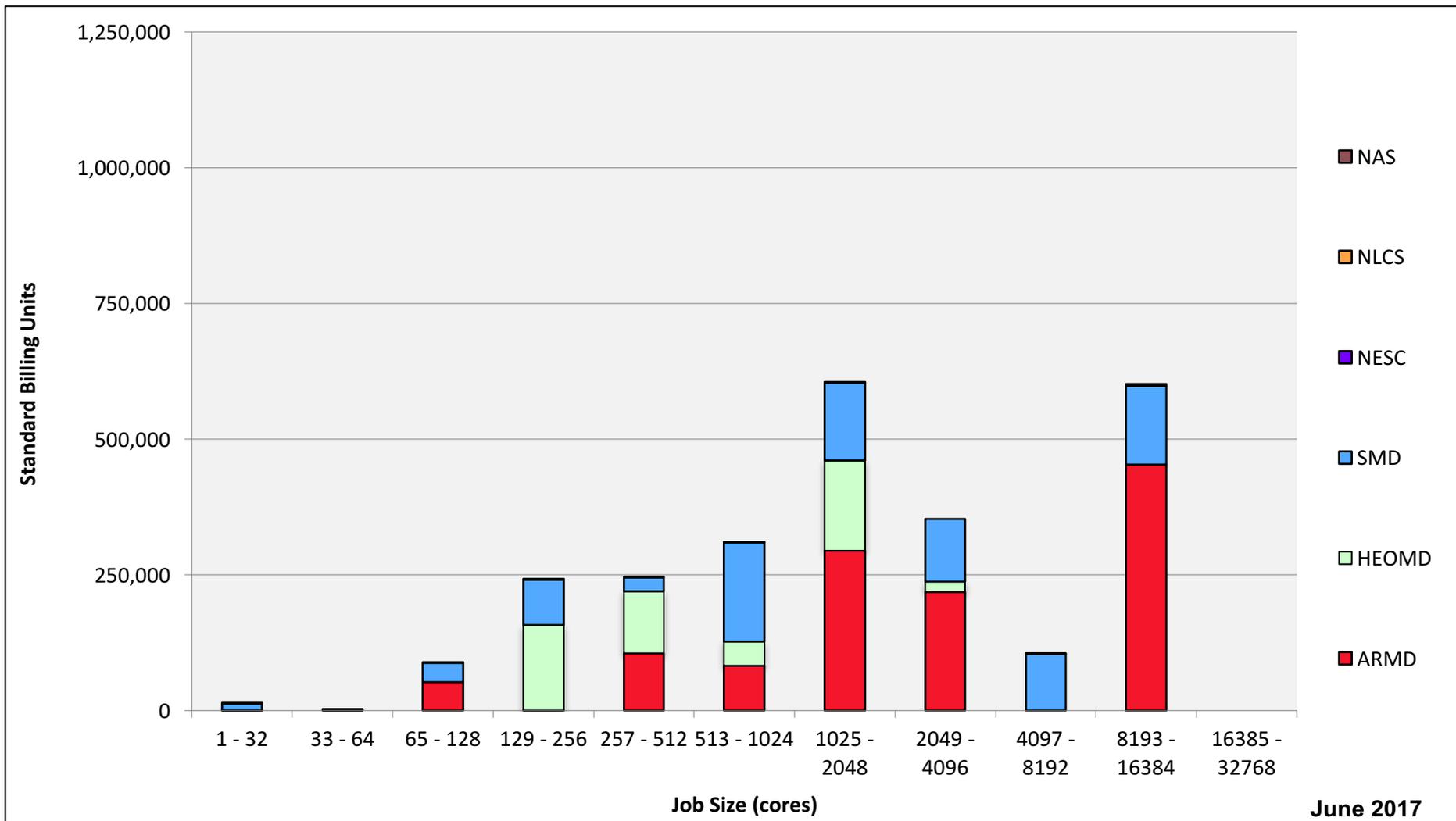
# Electra: Devel Queue Utilization



# Electra: Monthly Utilization by Job Length

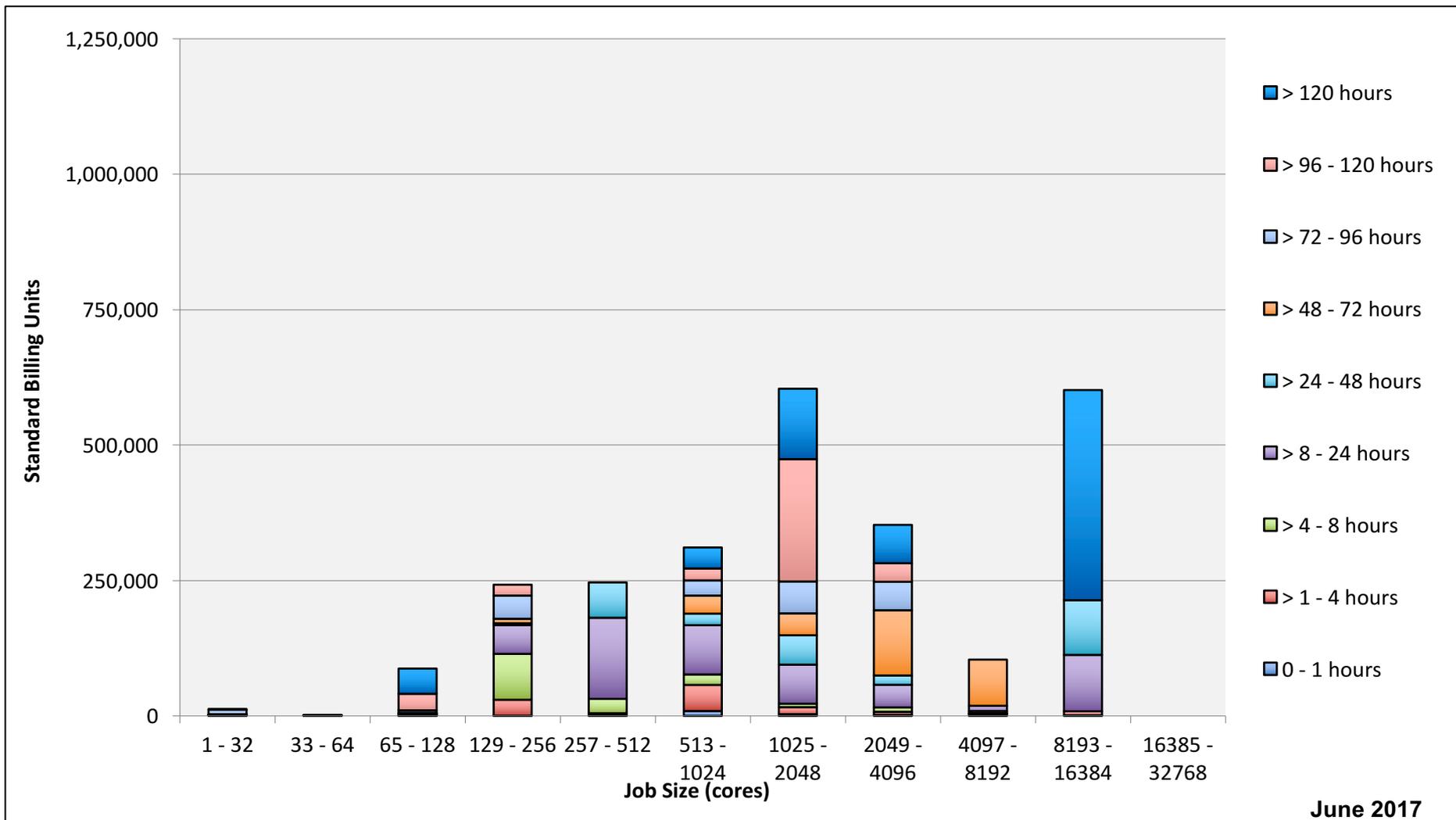


# Electra: Monthly Utilization by Size and Mission



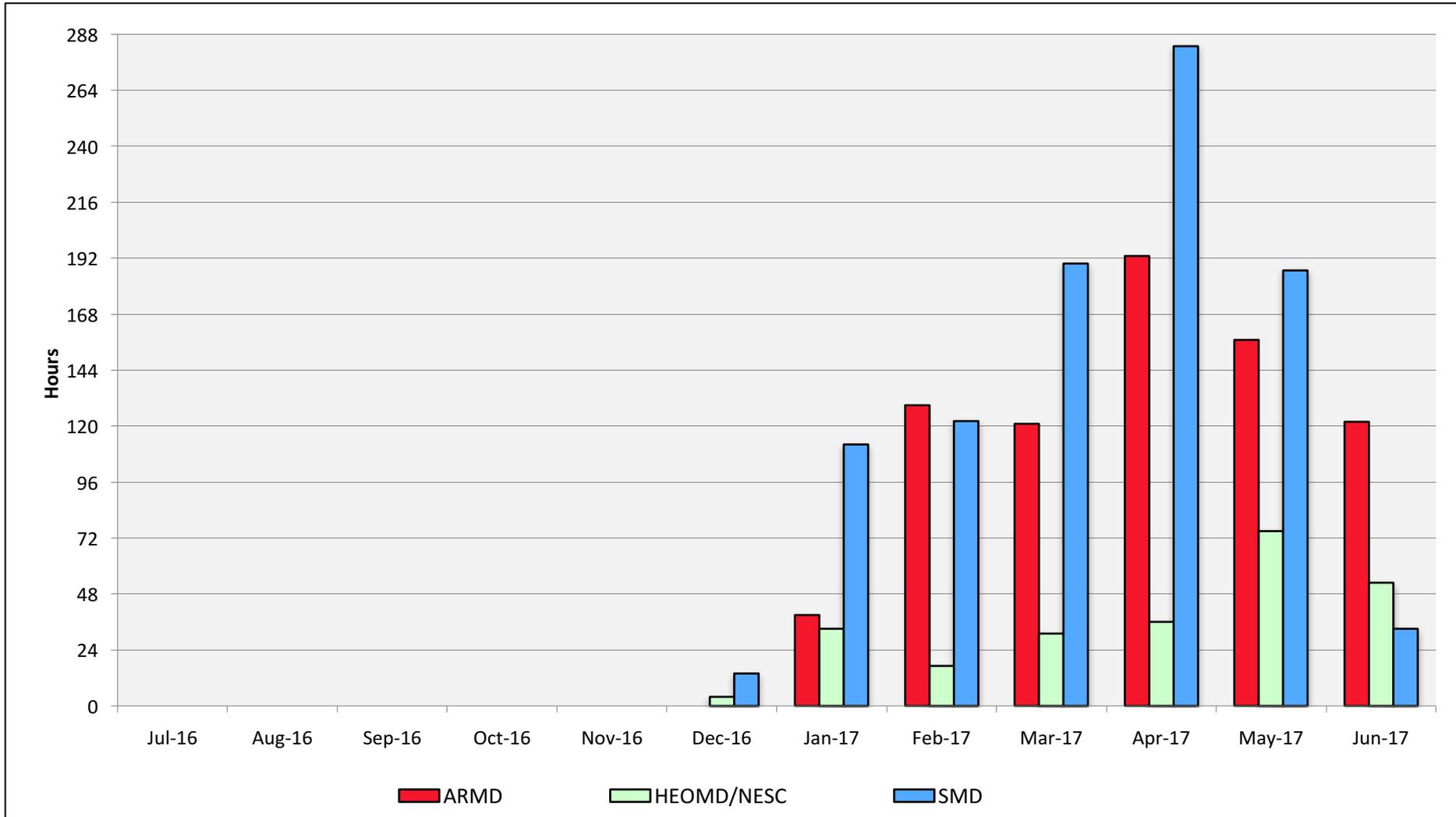
June 2017

# Electra: Monthly Utilization by Size and Length

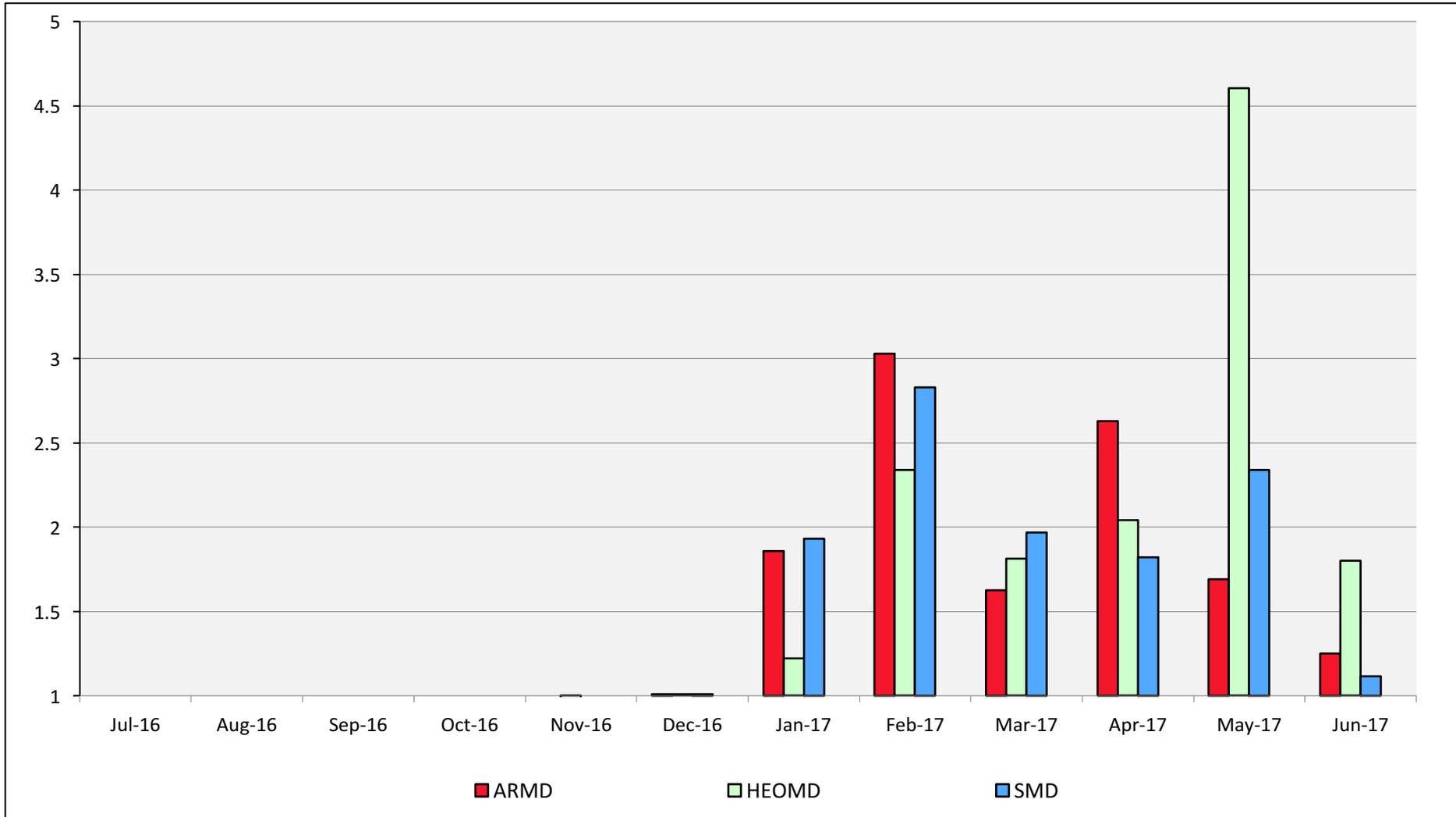


June 2017

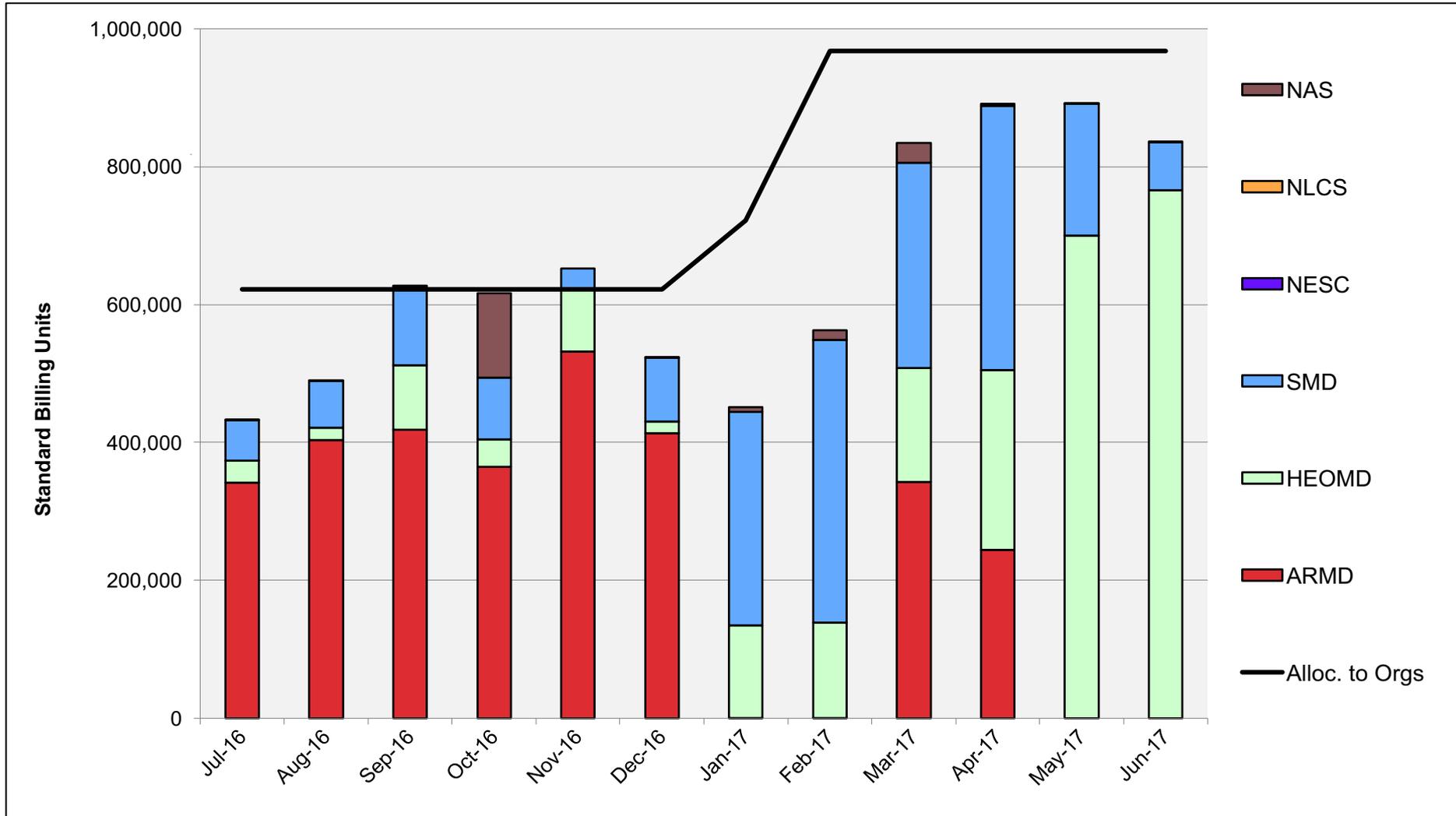
# Electra: Average Time to Clear All Jobs



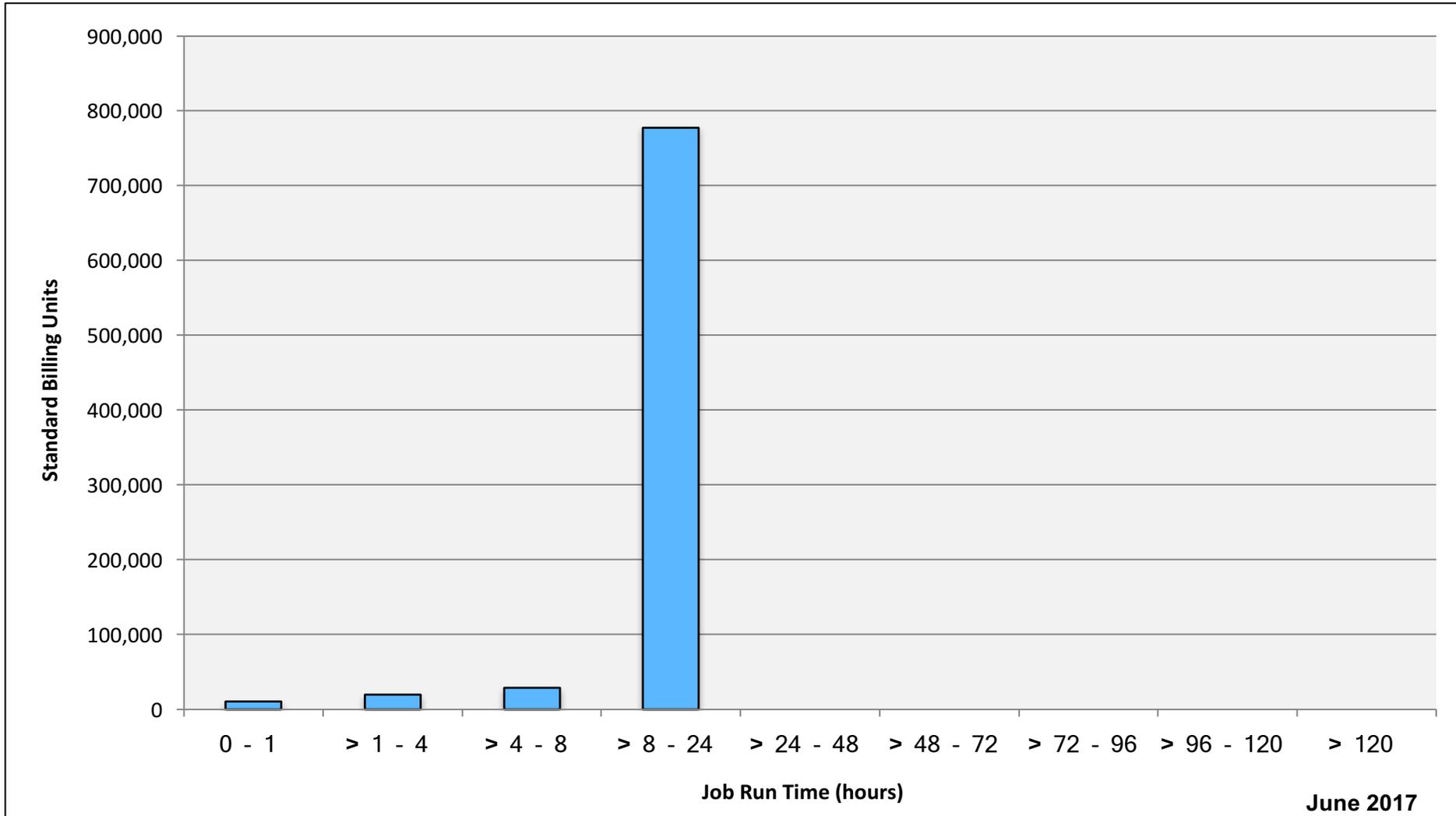
# Electra: Average Expansion Factor



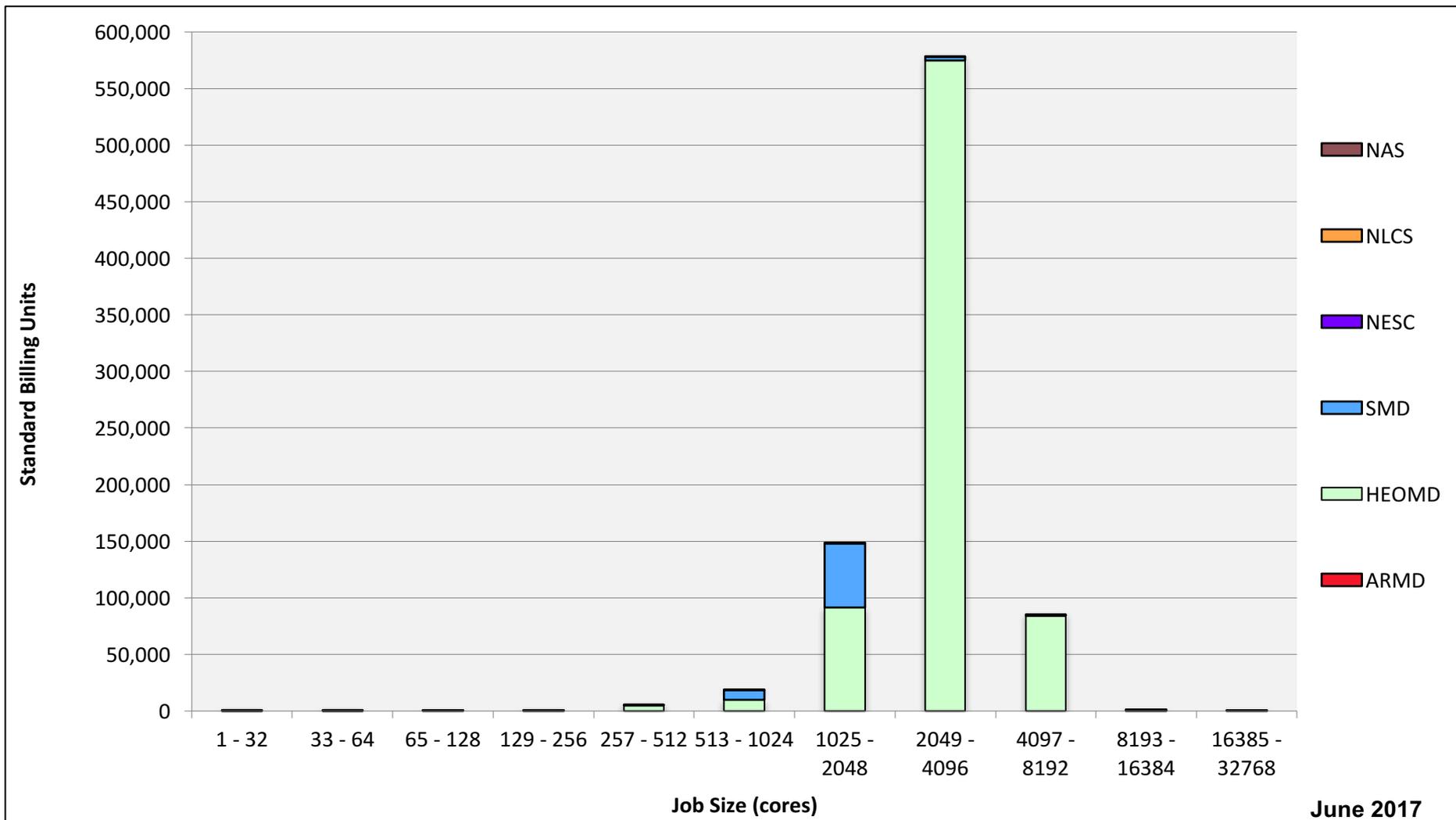
# Merope: SBU's Reported, Normalized to 30-Day Month



# Merope: Monthly Utilization by Job Length

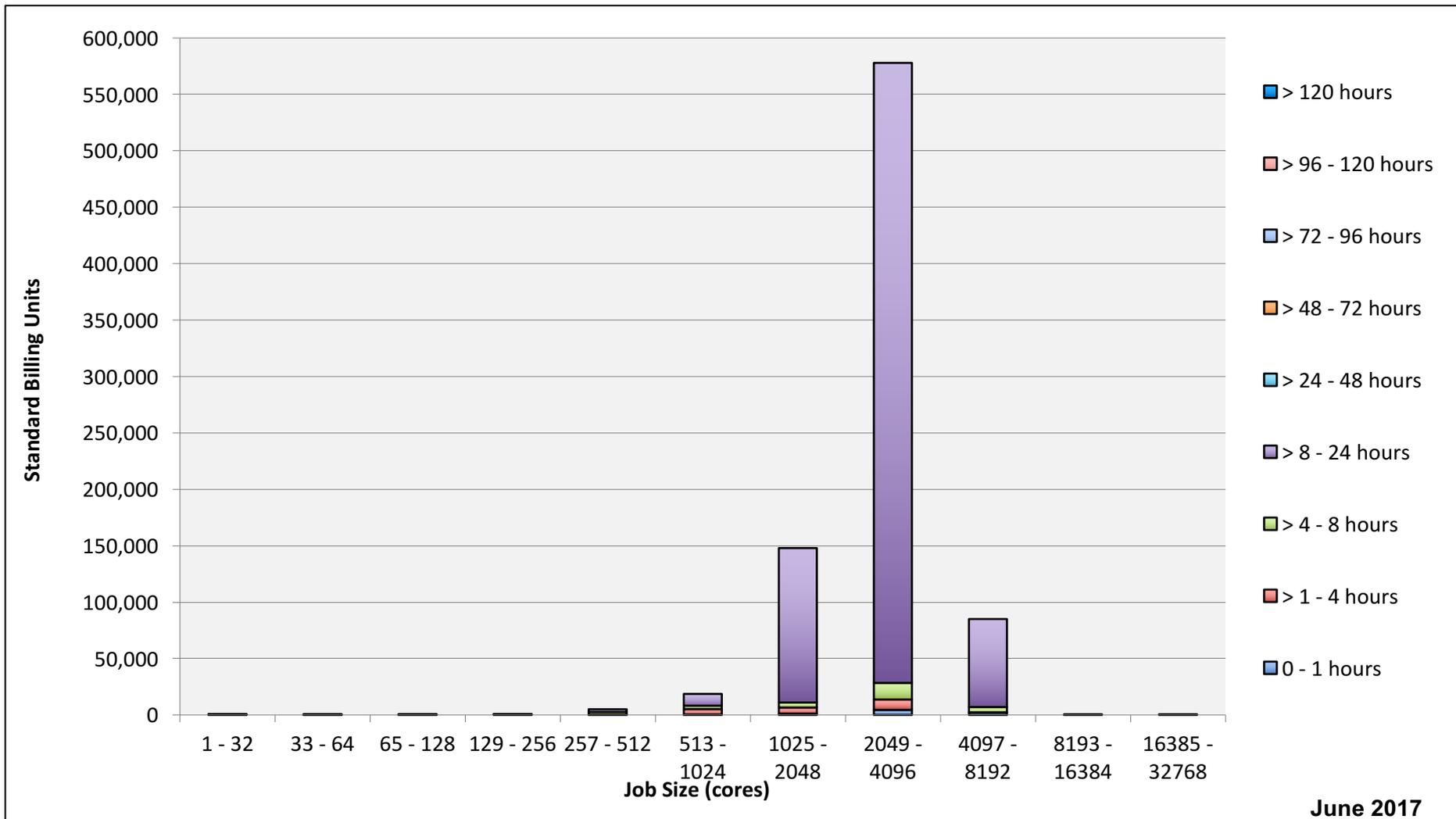


# Merope: Monthly Utilization by Size and Mission

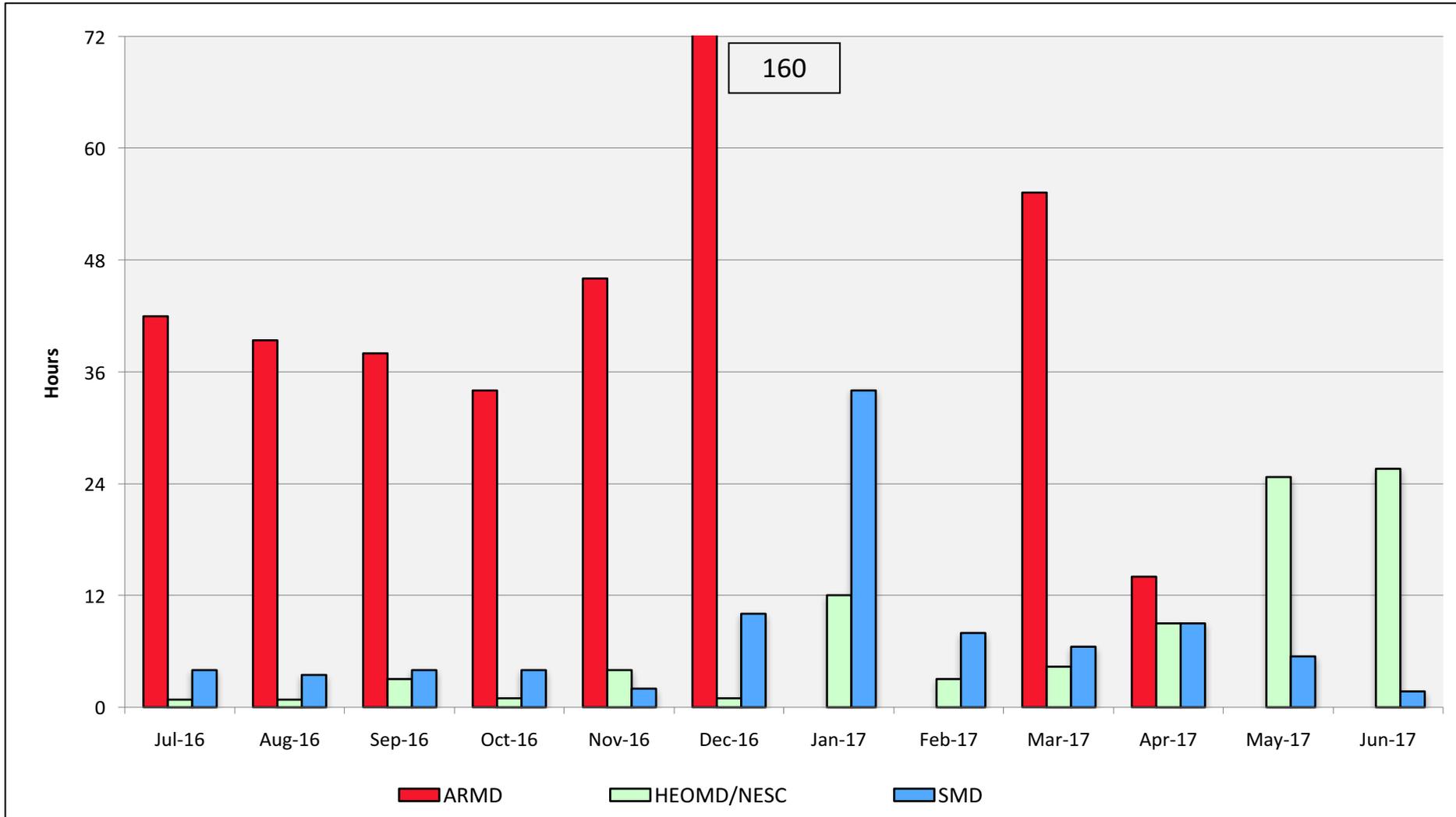


June 2017

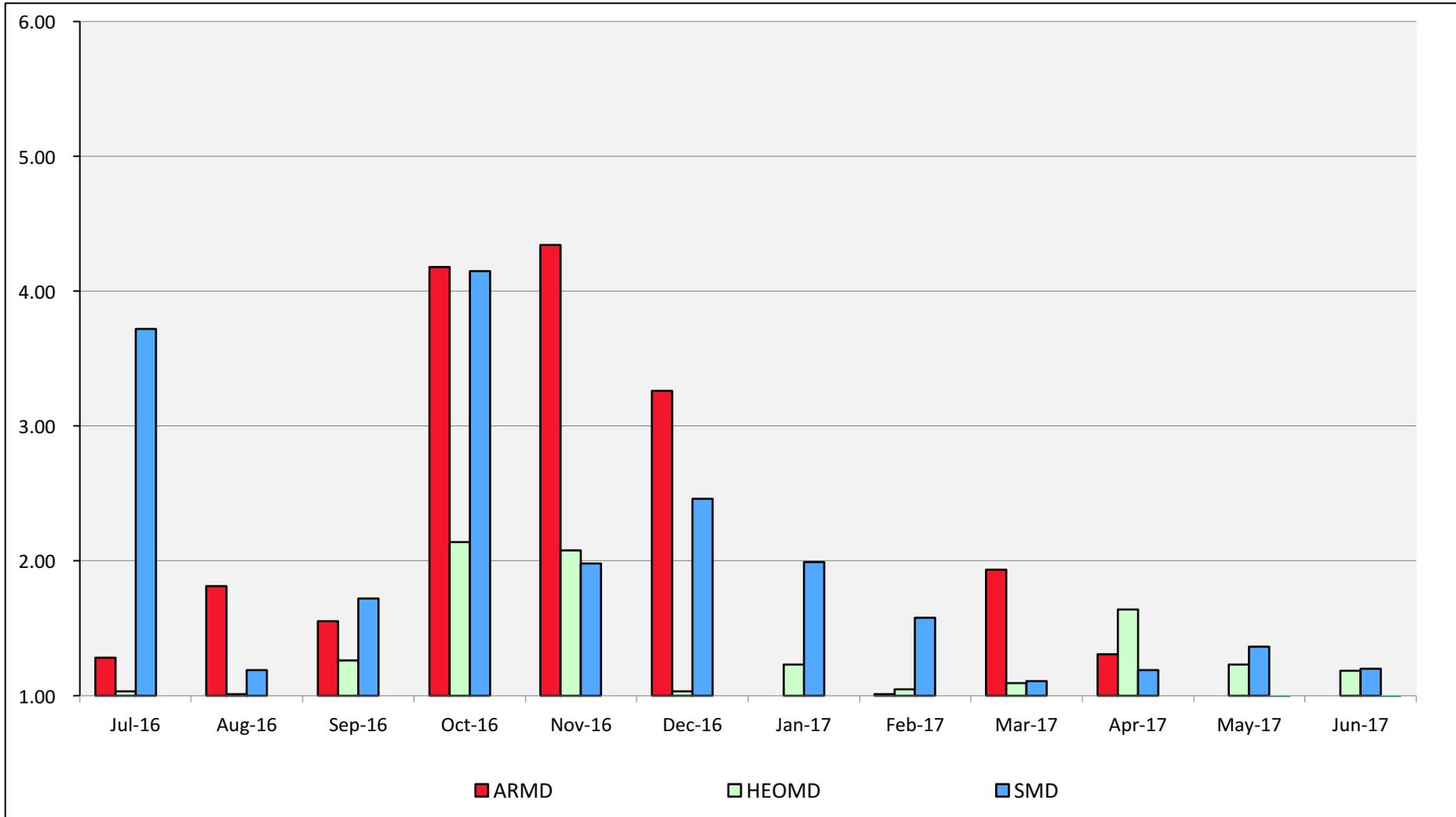
# Merope: Monthly Utilization by Size and Length



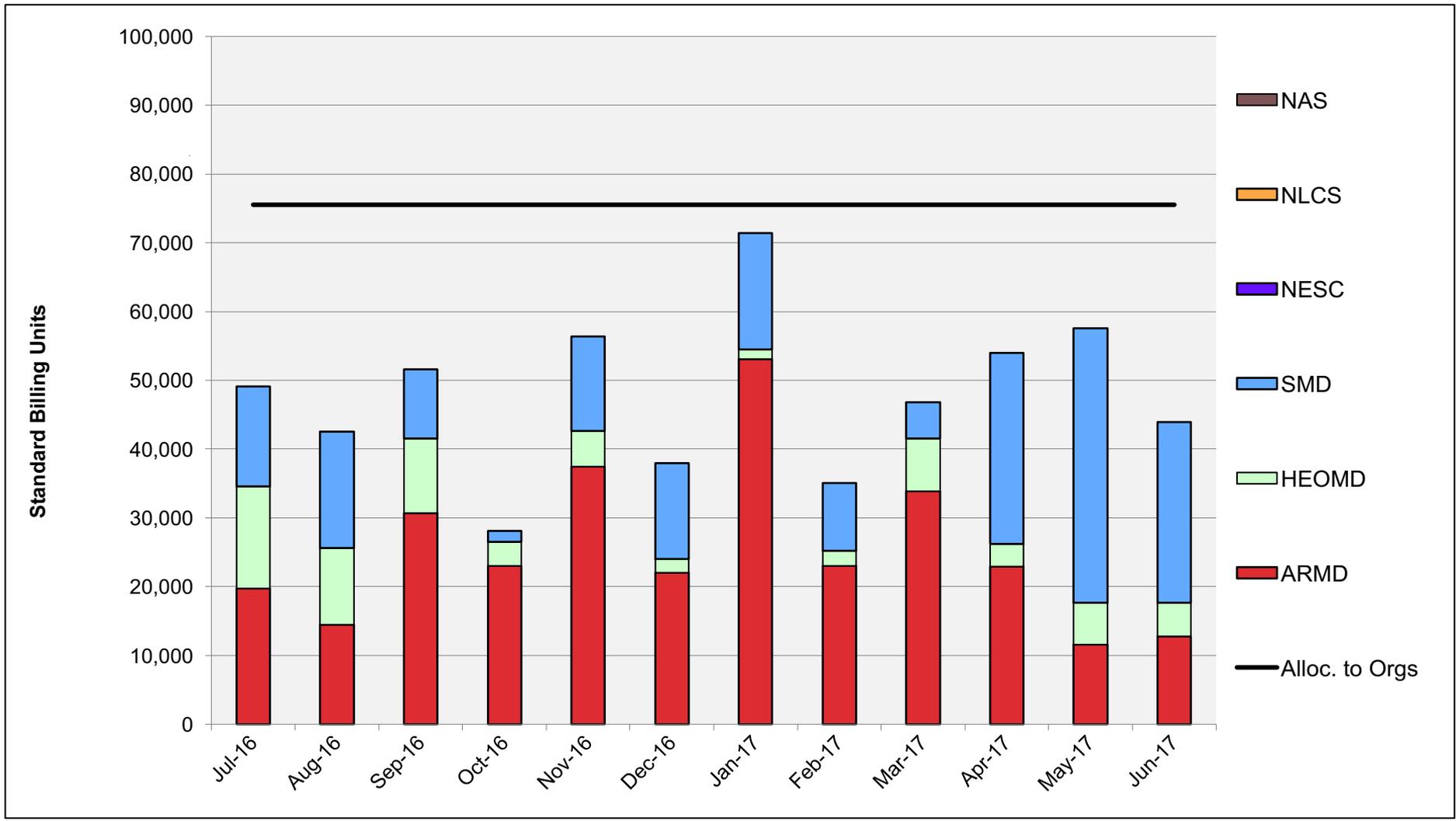
# Merope: Average Time to Clear All Jobs



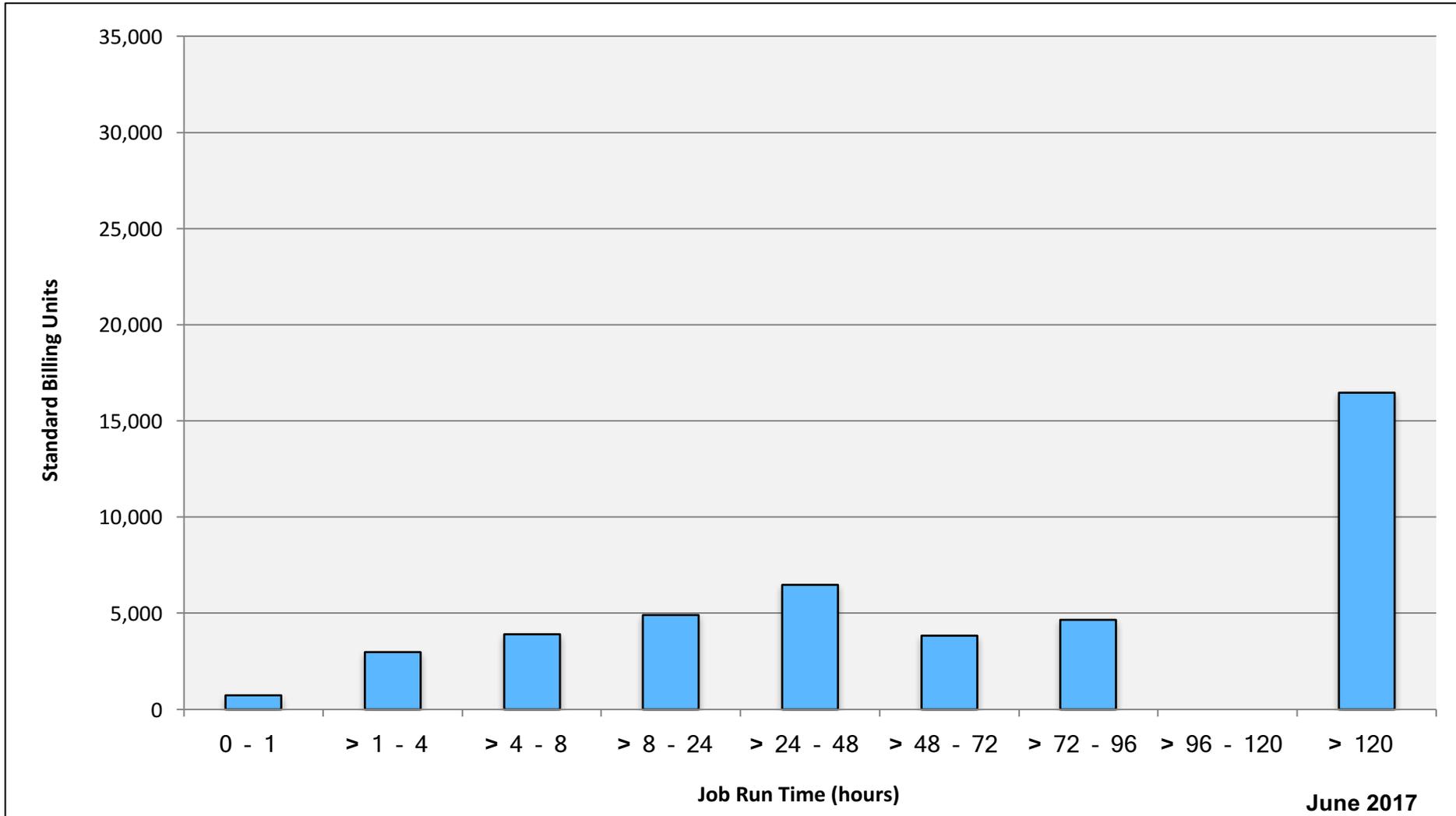
# Merope: Average Expansion Factor



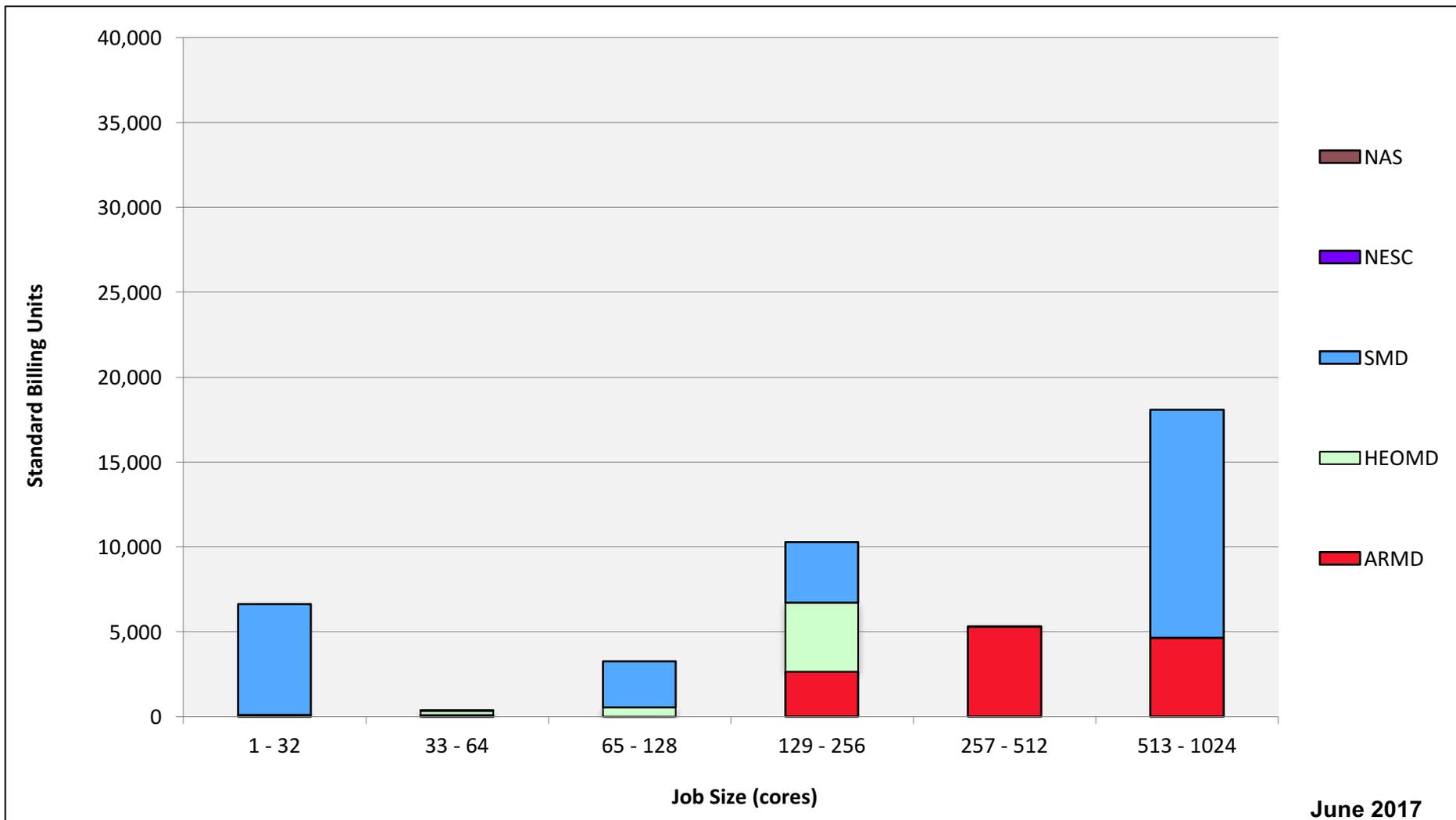
# Endeavour: SBUs Reported, Normalized to 30-Day Month



# Endeavour: Monthly Utilization by Job Length

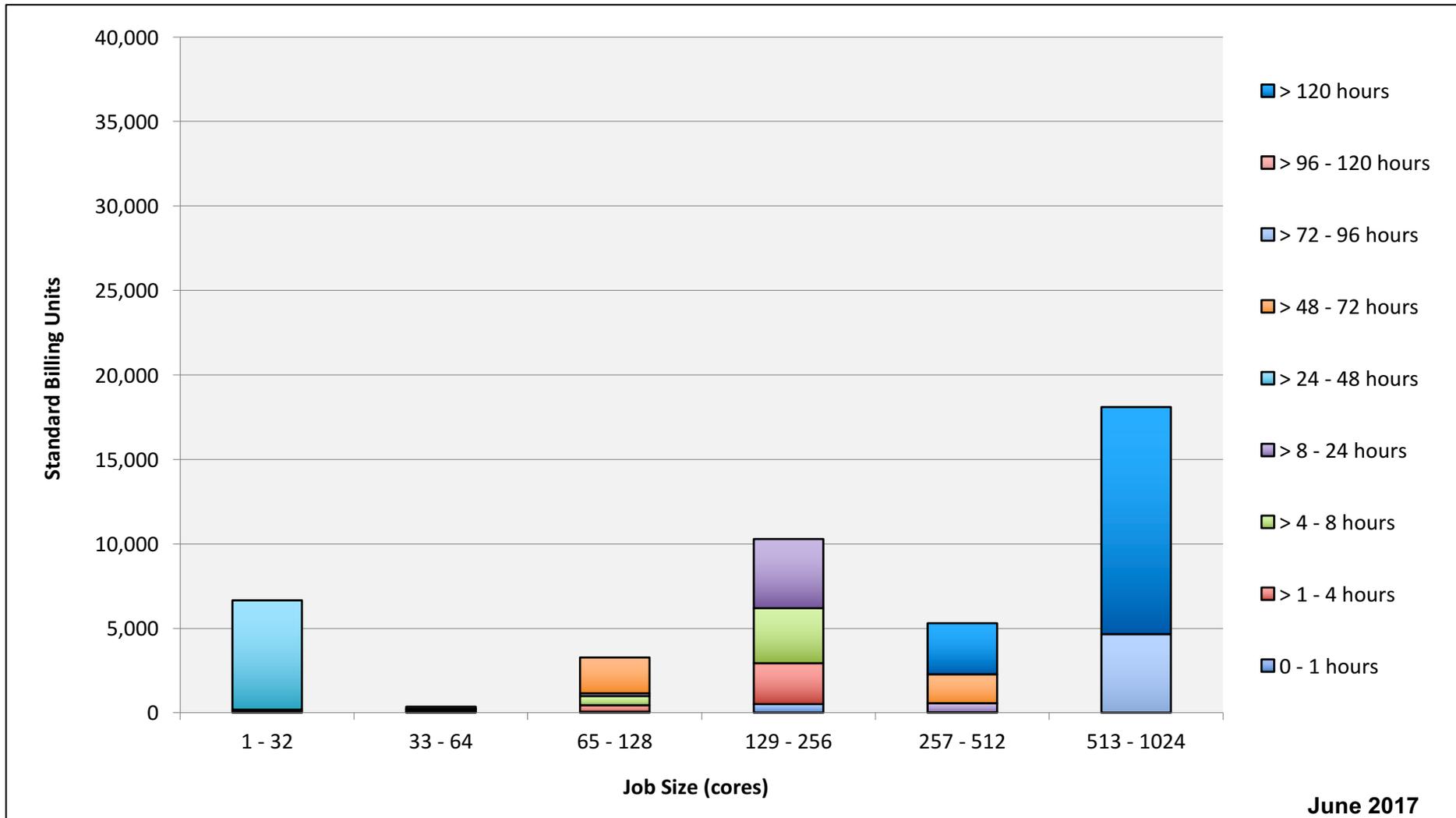


# Endeavour: Monthly Utilization by Size and Mission



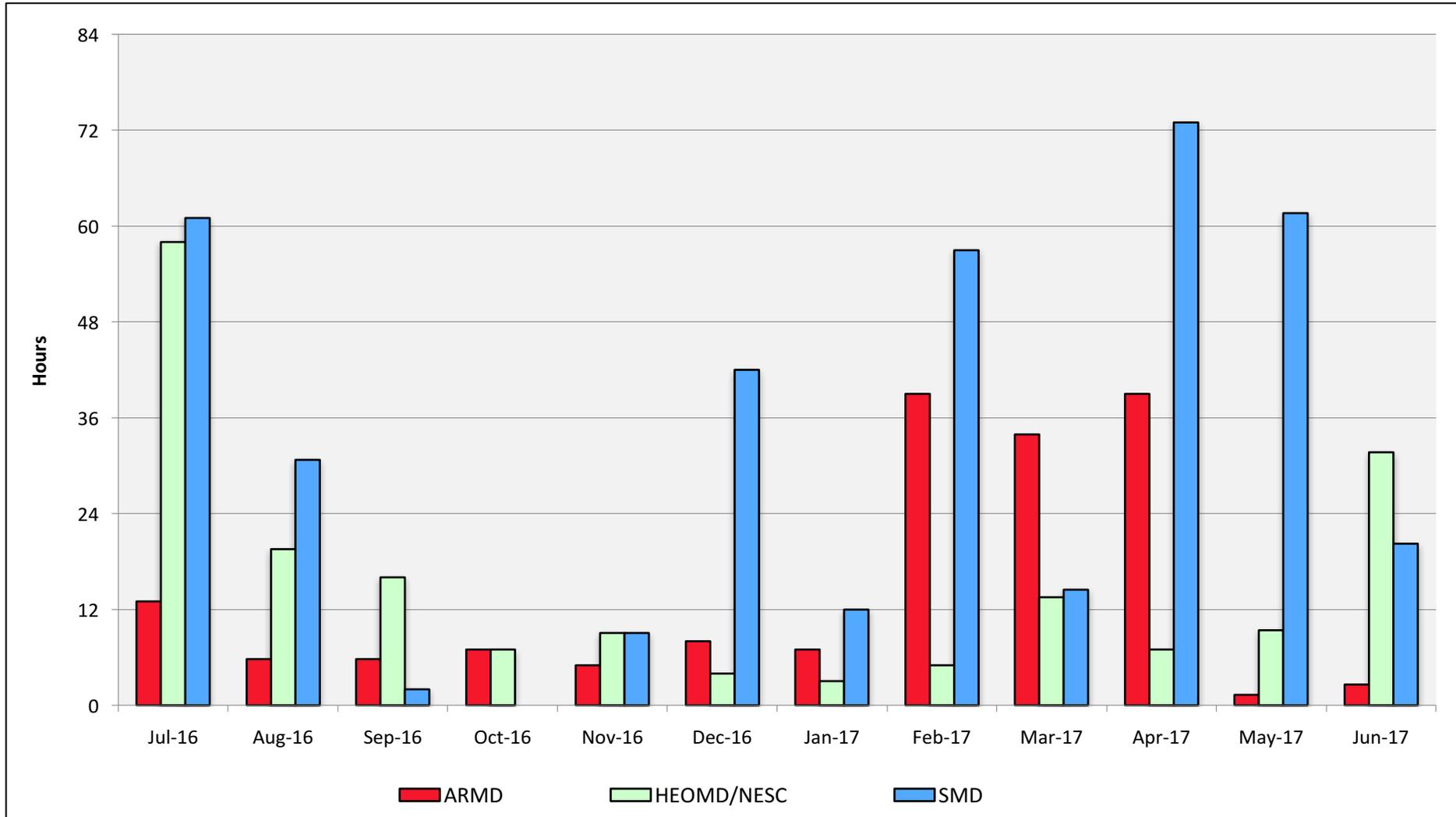
June 2017

# Endeavour: Monthly Utilization by Size and Length



June 2017

# Endeavour: Average Time to Clear All Jobs



# Endeavour: Average Expansion Factor

