



U.S. DEPARTMENT OF
ENERGY

Office of
Science

An Update from ASCR

July 19, 2019
NERSC User Group Meeting

Benjamin Brown, Ph.D.

ESnet Program Manager and Acting Facilities Division Director
Office of Advanced Scientific Computing Research

News of Note



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Dr. Chris Fall has been confirmed as the Director of the Office of Science



Dr. Fall's career background:

- Ph.D. in neuroscience
- Tenure-track professor at U. of Illinois at Chicago
- Science and Technology Policy Fellowship
- Chief Scientist at the Office of Naval Research
- Asst. Director for National Security at the White House Office of Science and Technology Policy
- Acting Director of ARPA-E
- Senior Advisor to the Under Secretary for Energy

ADVANCED SCIENTIFIC COMPUTING RESEARCH

Functional Organization Chart

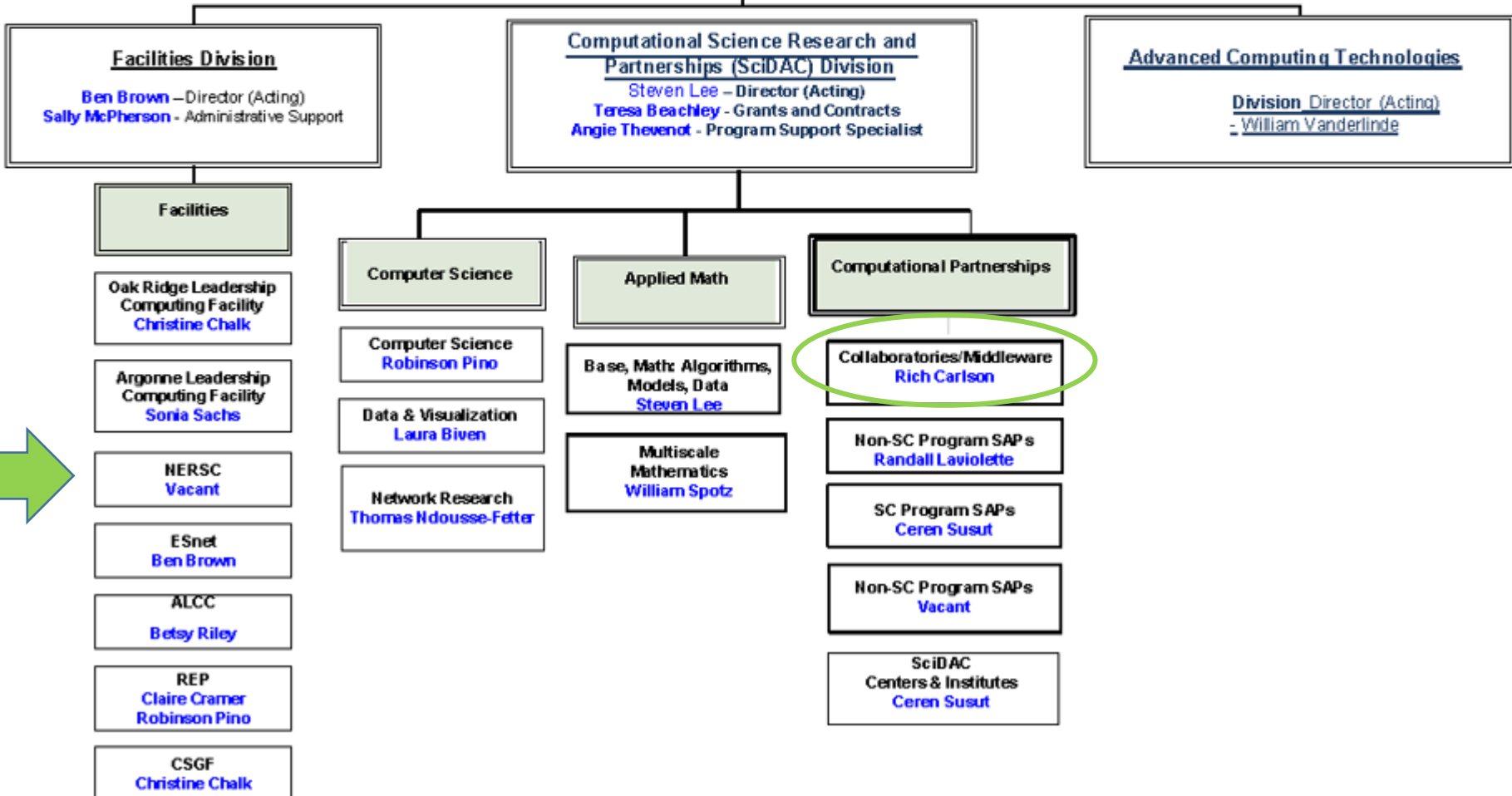
Unofficial version



The Office of
The Associate Director of Advanced Scientific Computing Research
Barbara Helland, Associate Director
Julie Stambaugh - Financial Analyst
Lori Jemigan - Program Support Specialist
Tameka Morgan (Contractor) - Administrative Assistant
 Christopher Miller - AAAS Fellow

ASCAC
 Christine Chalk - DFO
 Lori Jemigan - Program Support Specialist

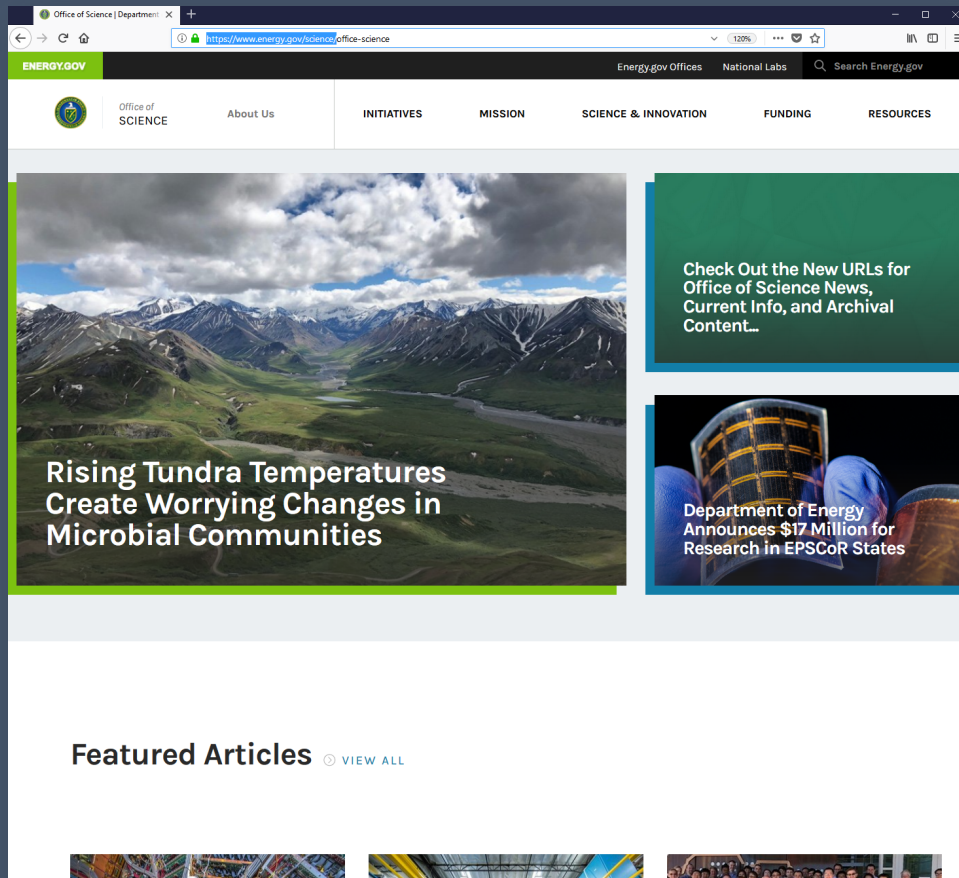
Thank you to **Carolyn Lauzon!**
 Carolyn has started a detail in the DOE Office of AI and Technology.



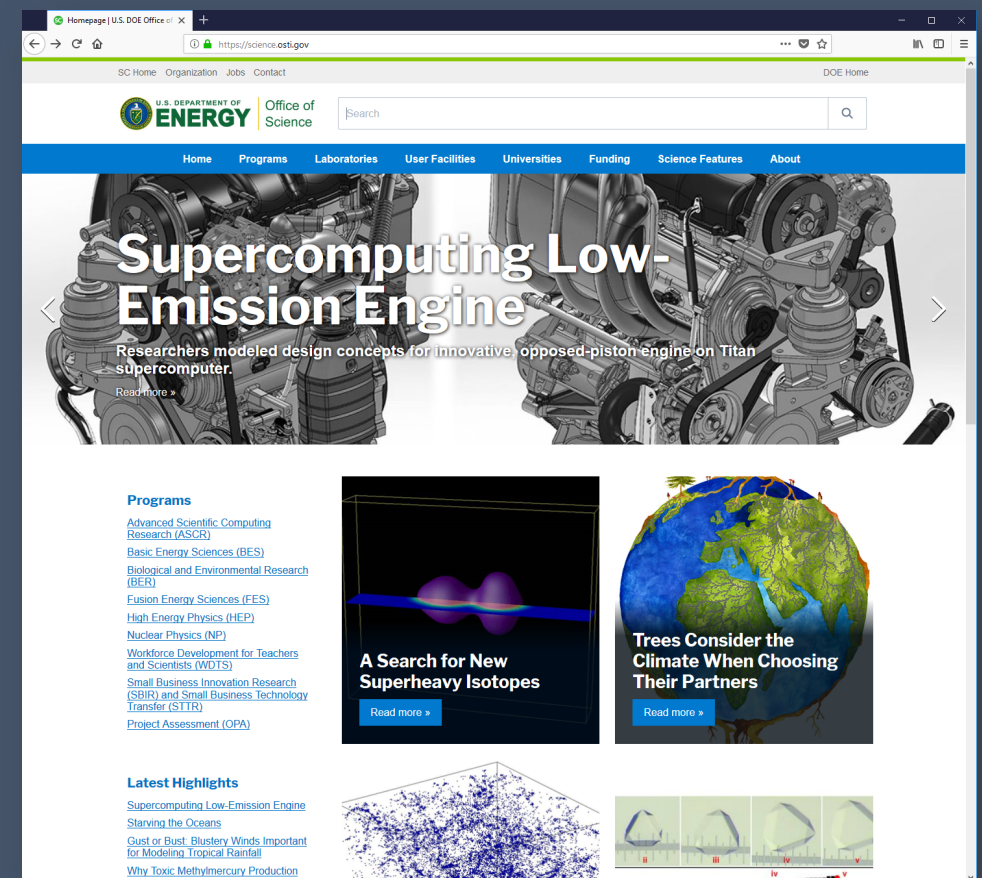
Thank you to **Rich Carlson**, who is the Acting NERSC PM!

There is a new Office of Science website

<https://www.energy.gov/science/>



<https://science.osti.gov/>



Free roadside assistance for network performance issues: The Engagement and Performance Operations Center (EPOC)

NEW!



<https://epoc.global/>

- **Roadside Assistance** via a coordinated Operations Center to resolve network performance problems with end-to-end data transfers reactively;
- **Application Deep Dives** to understand full workflows for diverse research teams in order to evaluate bottlenecks and potential capacity issues;
- **Network Analysis** to proactively discover and resolve performance issues;
- **Provision of managed data services** via support through the IU GlobalNOC and our Regional Network Partners;
- **Coordinated Training** to ensure effective use of network tools and science support.



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Budget and Priorities

a perspective from the ASCR Facilities Division

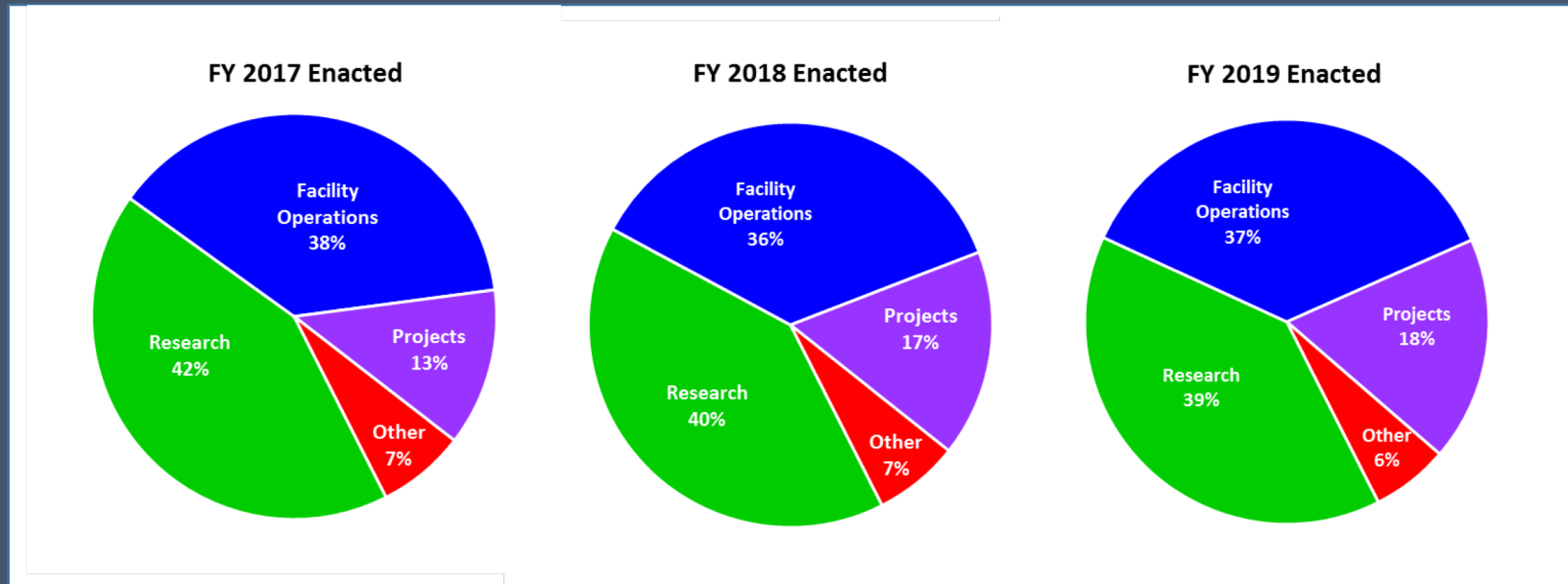


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Office of Science Appropriations

	FY 2017		FY 2018		FY 2019			
	Enacted	% of Total	Enacted	% of Total	Enacted	% of Total	FY 2018 Enacted	
							\$ Change	% Change
Research	2,286,552	42.4%	2,525,663	40.3%	2,591,403	39.4%	304,851	13.3%
Facility Operations	2,047,930	38.0%	2,272,148	36.3%	2,404,985	36.5%	357,055	17.4%
Projects	677,213	12.6%	1,034,150	16.5%	1,181,956	17.9%	504,743	74.5%
Other	379,277	7.0%	427,942	6.8%	406,656	6.2%	27,379	7.2%
Total	5,390,972	100.0%	6,259,903	100.0%	6,585,000	100.0%	1,194,028	22.1%
*Other includes GPP/GPE, WDTS, S&S, and PD.								



Energy and Water Development Appropriations



Current USG/DOE S&T Priorities with a major ASCR contribution

- Exascale Computing Project
- Artificial Intelligence / Machine Learning
- Quantum Information Science

Recent ASCR Research Workshops

Extreme Heterogeneity in Computing Systems (Jan. 2018)

Scientific Machine Learning (Jan. 2018)

Storage Systems and Input/Output (Sept. 2018)

Quantum Networks for Open Science (Sept. 2018)

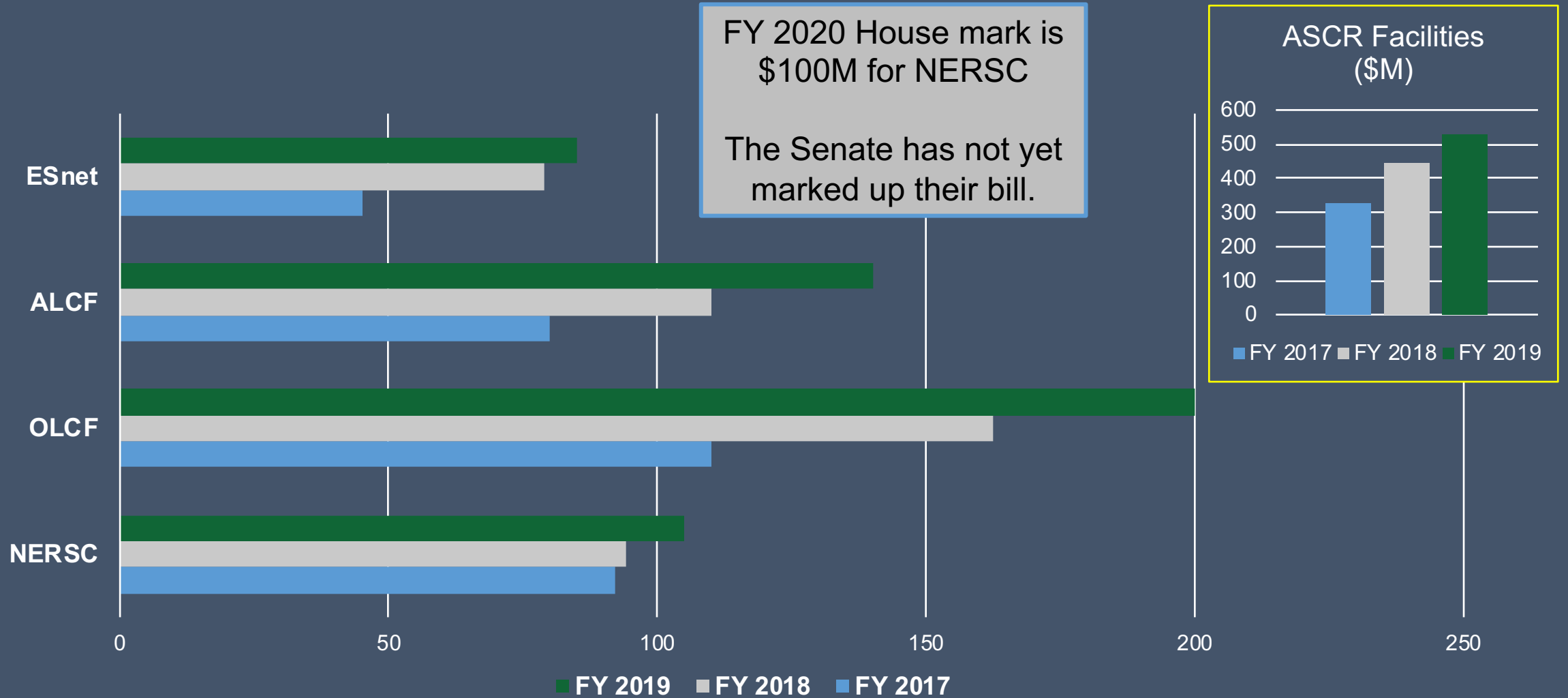
In Situ Data Management (Jan. 2019)

Data for AI Roundtable (Jun. 2019)



<https://science.osti.gov/ascr/>

ASCR Facilities Appropriations, FY 2017 to 2019 (\$M)



The Exascale Computing Project is on track

7
YEARS
\$1.7B

A seven-year, \$1.7 B R&D effort that launched in 2016

6
CORE DOE
LABS

Six core DOE National Laboratories: Argonne, Los Alamos
Lawrence Berkeley, Lawrence Livermore, Oak Ridge, Sandia

Staff from most of the 17 DOE national laboratories take part
in the project

3
FOCUS
AREAS

Three focus areas: Hardware and Integration, Software Technology,
Application Development

100
R&D TEAMS
1000
RESEARCHERS

More than 100 top-notch R&D teams

Hundreds of consequential milestones delivered on
schedule and within budget since project inception

**The ultimate success of ECP will be determined by the technical achievements
of the applications as well as community acceptance of the ECP software stack**

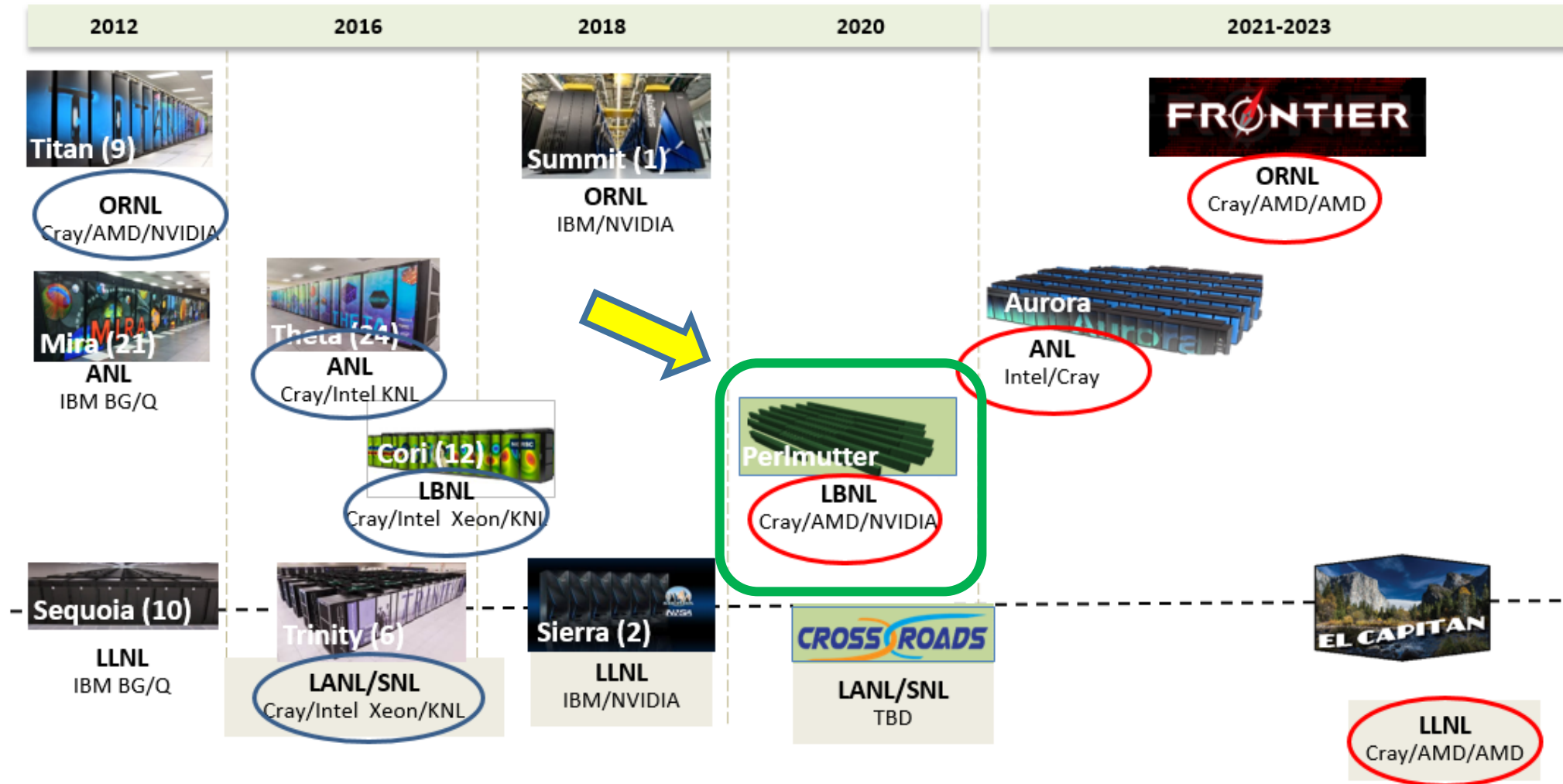


Department of Energy (DOE) Roadmap to Exascale Systems

An impressive, productive lineup of *accelerated node* systems supporting DOE's mission

Pre-Exascale Systems [Aggregate Linpack (Rmax) = 323 PF!]

First U.S. Exascale Systems

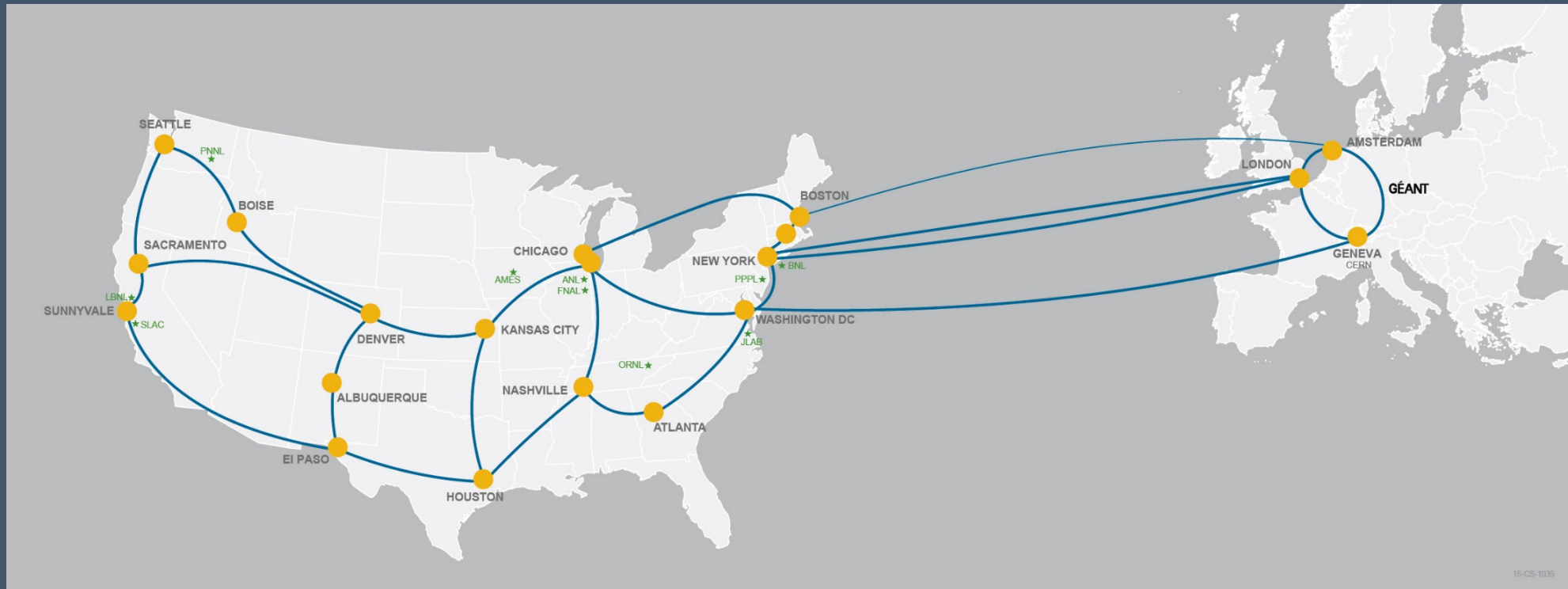


NERSC-9:



- Cray Shasta System providing 3-4x capability of Cori system
- First NERSC system designed to meet needs of both large scale simulation and data analysis from experimental facilities
- Robust readiness program for simulation, data and learning applications and complex workflows

ESnet6: The next generation of DOE's high performance network user facility



ESnet is *not* an Internet Service Provider.

- The network is tailored to handle science's enormous data flows.
- ESnet provides a range of services that enable scientific data acquisition, transport, placement, and sharing.
- Research workflows of growing complexity require automation and programmability of network services; ESnet6 is designed to meet this need.

A shameless plug for the ESnet team



The Big Picture

a personal commentary



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We live in interesting times

The end of Moore's Law.

The explosion of data sources and volumes.

The advent of cloud and edge compute.

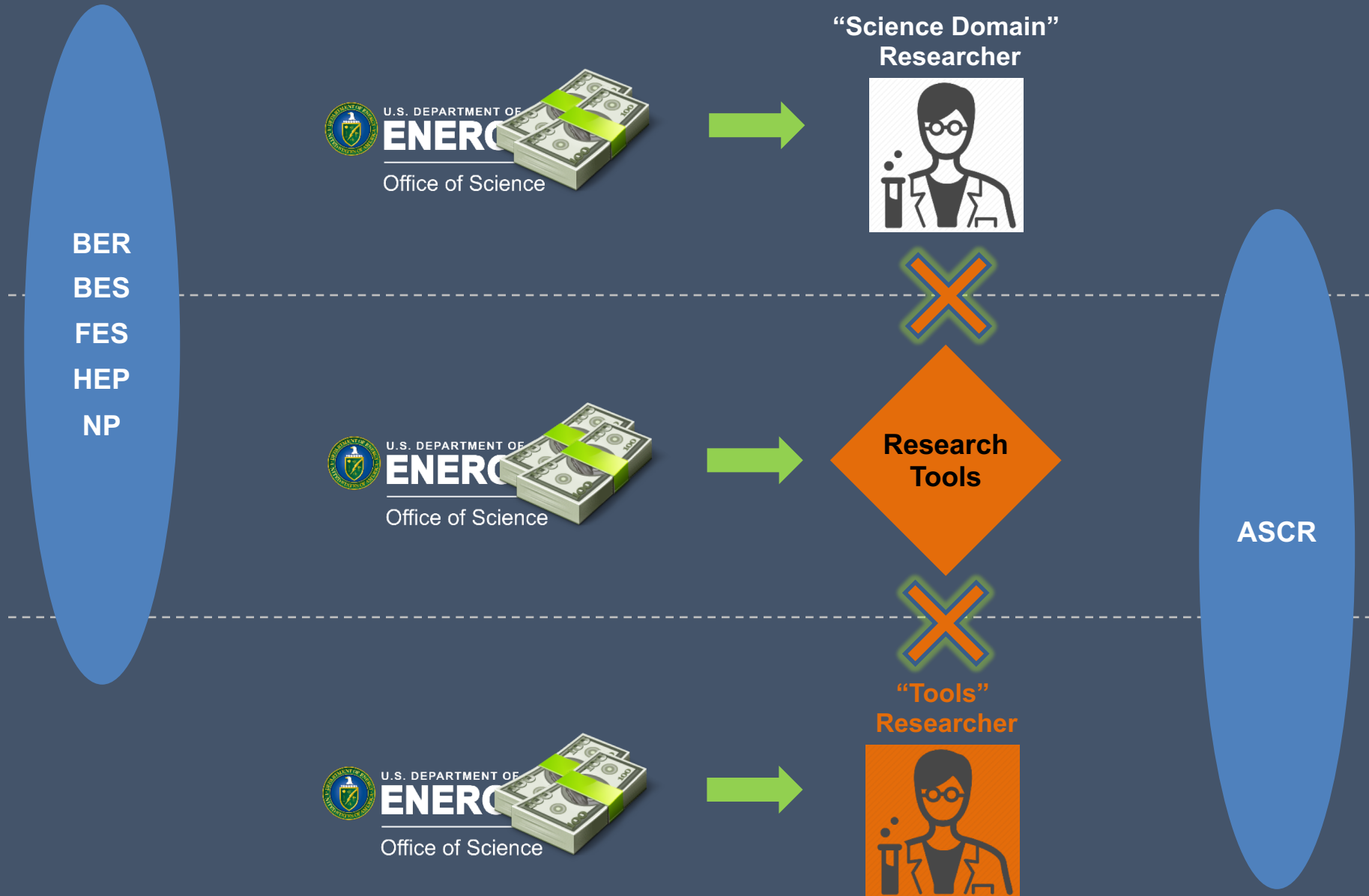




“The purpose of a science funding agency is to be catalytic, to stimulate communities to express their imagination in its fullest form.”

-- Prof. Sir Mark Walport, CEO of UKRI

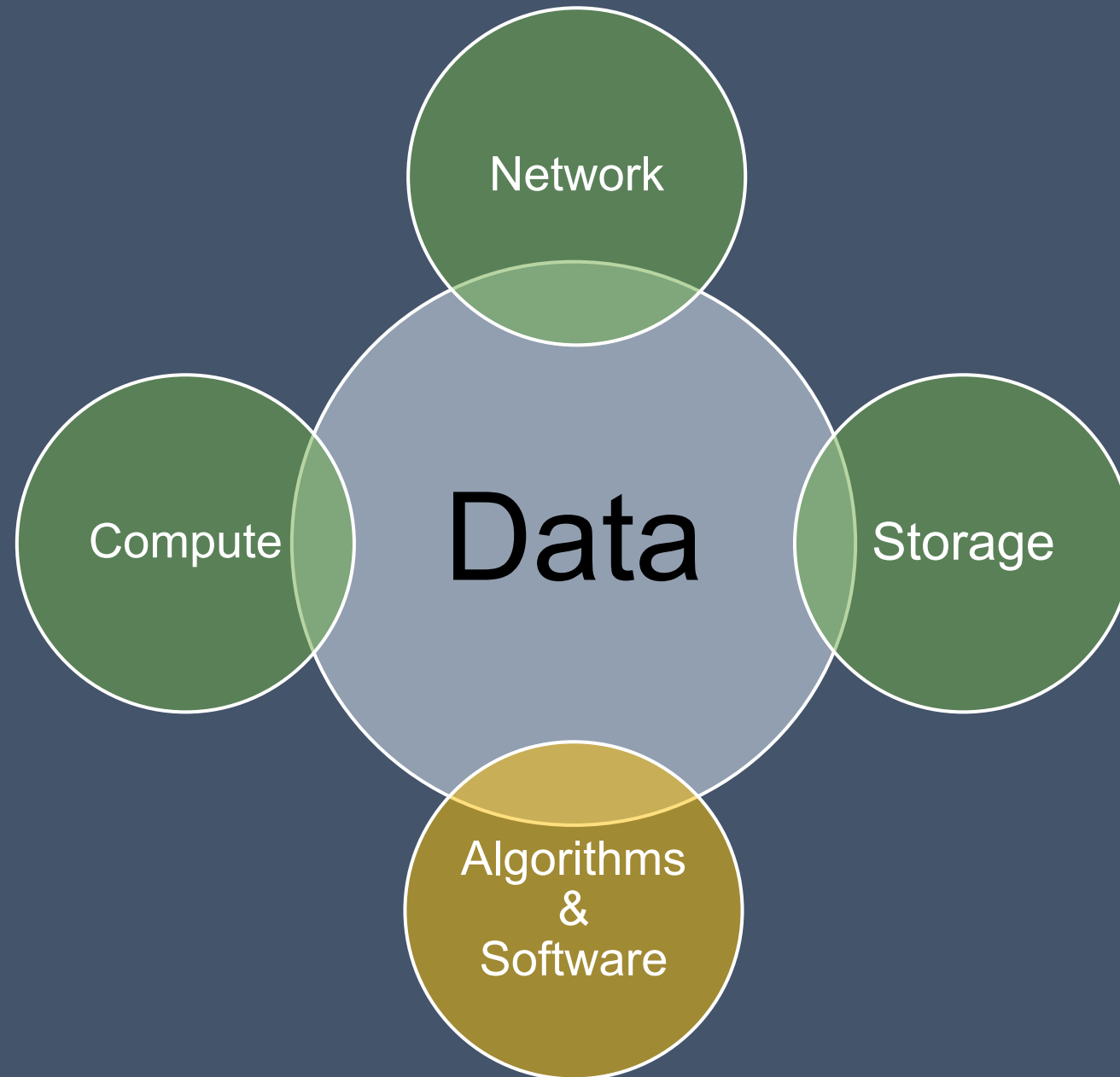
A gross generalization of the Office of Science Programs' mission modes



ASCR mission

unofficial simplified version

Advance state-of-the-art capabilities that
enable scientific discovery through computation.



ASCR “AI for Science” town hall meetings

<https://www.anl.gov/AITownHall2019>

- Four town hall meetings will gather community input for ASCR near and long term planning:
 - July 22-23 at Argonne National Laboratory
 - August 20-21 at Oak Ridge National Laboratory
 - September 11-12 at Lawrence Berkeley National Laboratory
 - October 22-23 in Washington DC
- Academia + all 17 DOE National Labs are participating.
- ANL, LBNL, and ORNL will serve as hosts for all four meetings.

Lead Organizers



Rick Stevens
ANL



Kathy Yelick
LBNL



Jeff Nichols
ORNL

An ASCR grand challenge/opportunity

The digital frontier is in a state of rapid and disruptive evolution.

Scientific computing is diversifying, both in tools and users.

What investments will enable the [greatest scientific impact] x [broadest swath] of the Office of Science research community?



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Dirksen Senate
Office Building

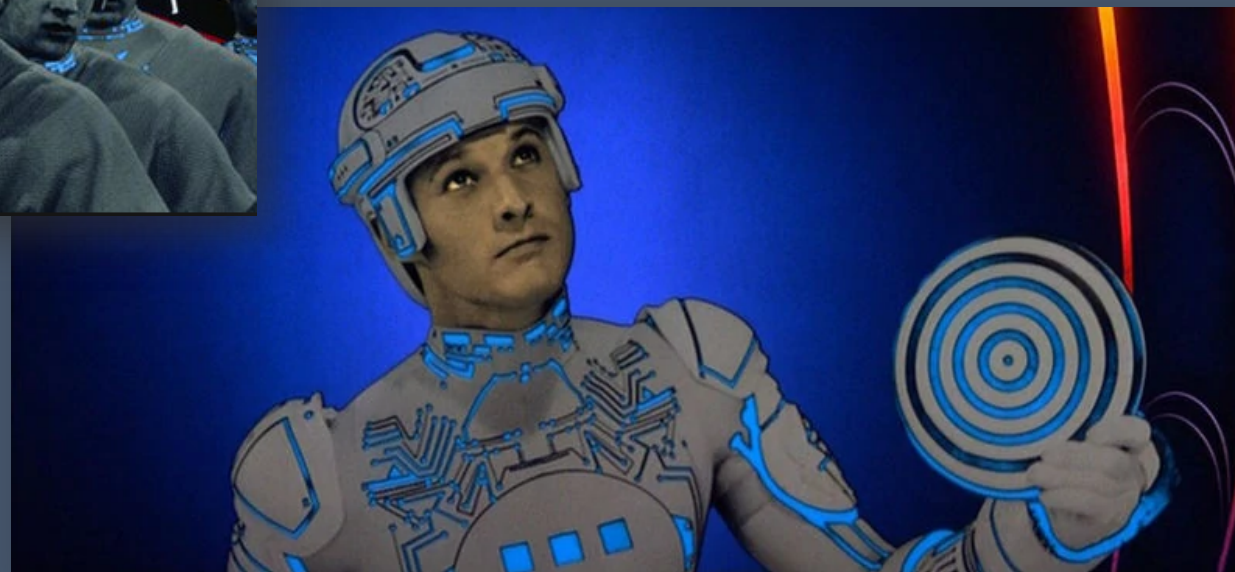


User power!



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Thank you for engaging in the NERSC community!