U.S. DEPARTMENT OF ENERGY | Office of Science

ASCR

July 11, 2011

Denver CO

SciDAC Futures

Daniel Hitchcock

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Advanced Scientific Computing Research

Looking Backward and Forward

Pat Dehmer's Talk

Centers for Enabling Technology

Institutes

Scientific Application Partnerships

SciDAC Conference

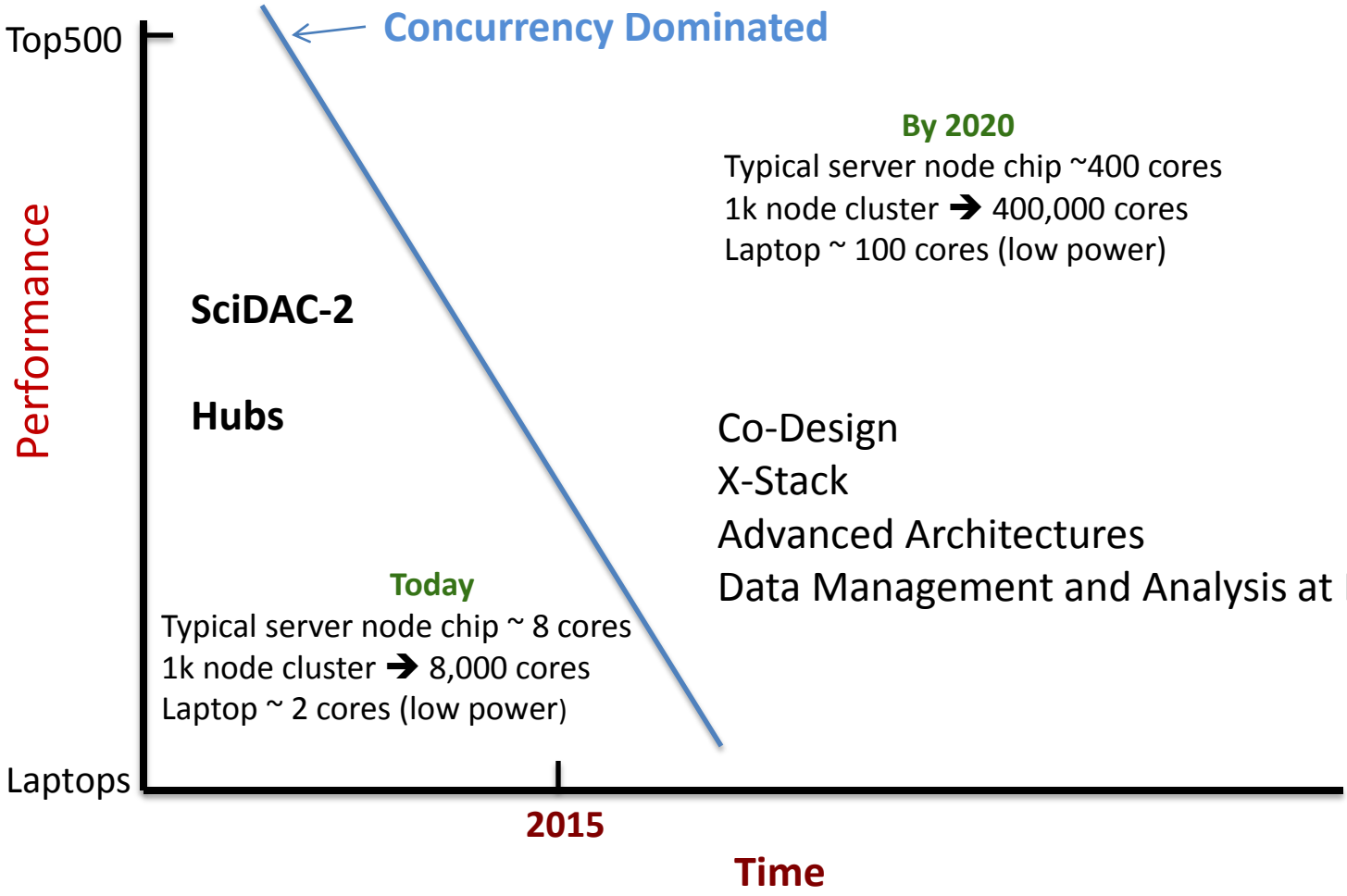
Institutes

Strategic ASCR – SC Office Partnerships

CoDesign

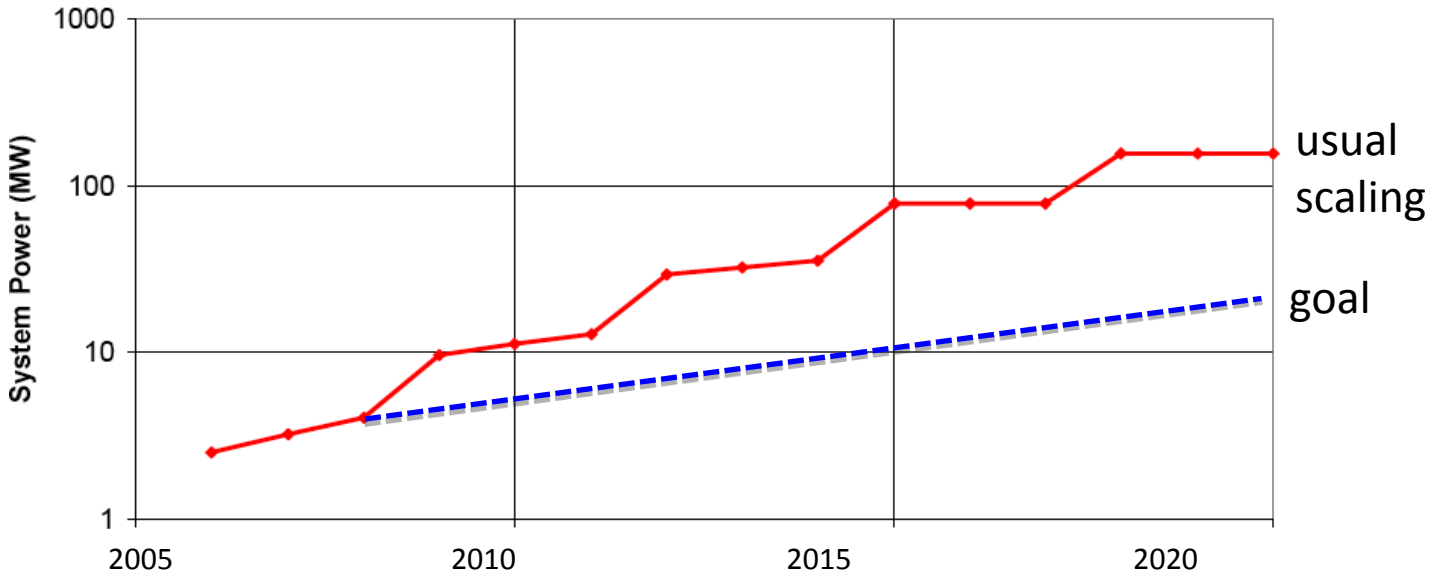
SciDAC PI Meetings

Why SciDAC is Changing

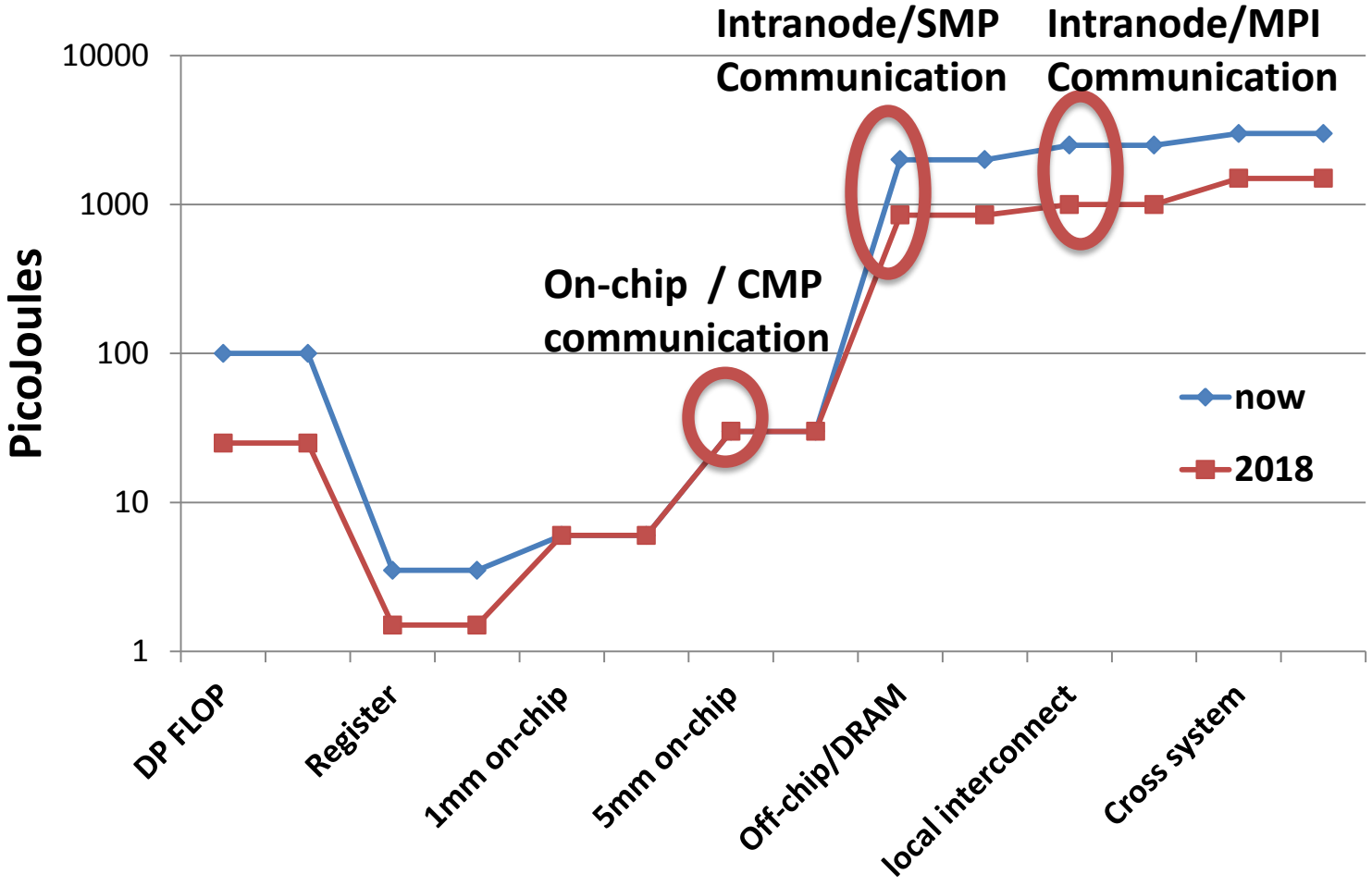


The Future is about Energy Efficient Computing

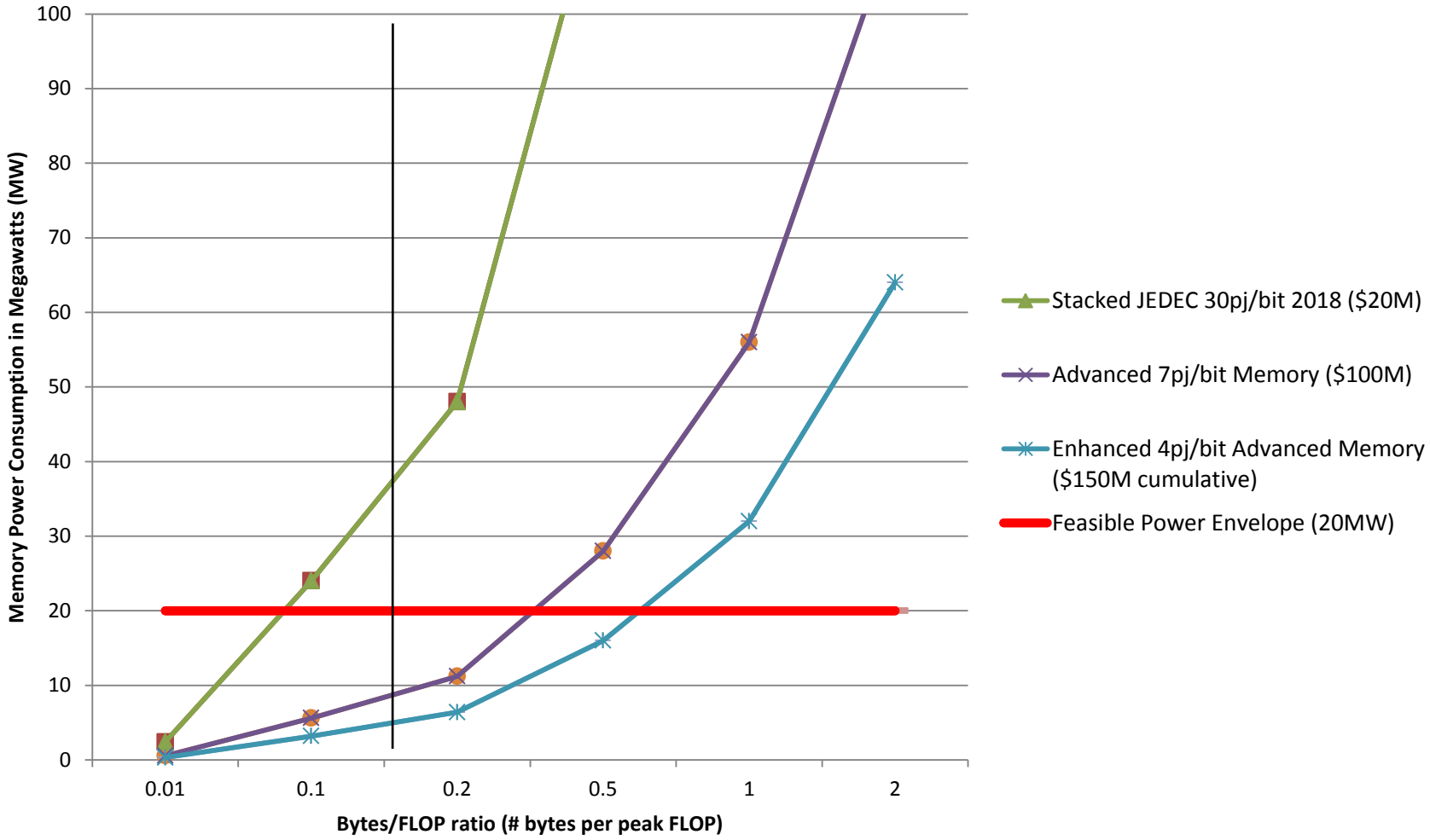
- **At $1M per MW, energy costs are substantial**
- **1 petaflop in 2010 will use 3 MW**
- **1 exaflop in 2018 at 200 MW with "usual" scaling**
- **1 exaflop in 2018 at 20 MW is target**



The Fundamental Issue: Where does the Energy (and Time) Go?



Memory Technology: Bandwidth costs power



SciDAC Institutes

Goals & Objectives

- Deliver tools and resources to lower barriers to effectively use state-of-the-art computational systems;
- Create mechanisms to address computational grand challenges across different science application areas;
- Incorporate basic research results from Applied Mathematics and Computer Science into computational science challenge areas and demonstrate that value
- Grow the Nation's computational science research community.

Awards- Up to $13M/year over 5 years available to support 1–5 Institutes

Eligible applicants- DOE National Laboratories, Universities, Industry and other organizations

Expected outcome- Institutes that cover a significant portion of DOE computational science needs on current and emerging computational systems.

Timeline

- Solicitations opened- February 23, 2011
- Letters of Intent- March 30, 2011
- Solicitations closed- May 2, 2011
- First awards- end of FY2011

Answers to Inquiries- http://science.doe.gov/ascr/research/scidac/SciDAC3InstitutesFAQ.html

Strategic ASCR – SC Office Partnerships

Goals & Objectives

- **Partner with SC Programs to Combine the best math, CS, and networking with SC program expertise to enable *strategic* advances in program missions**

Awards- FOA's in development with other SC Offices

Eligible applicants- DOE National Laboratories, Universities, Industry and other organizations

Expected outcome- New Science.

Timeline

- **Solicitations opened- August 2011**
- **First awards- mid FY2012**

Co-Design

Goals & Objectives

- **Understand how to allocate complexity between hardware, systems software, libraries, and applications;**
- **Modify application designs at all levels;**
- **Understand reformulating as well as reimplementing tradeoffs;**
- **Explore uncertainty quantification, in line data analysis, and resilience in applications;**
- **Co-adapt applications to new programming models and perhaps languages;**
- **Impact of massive multithreaded nodes and new ultra-lightweight operating systems.**

Awards- June 2011

Expected outcome- Understanding, Guidance for Future Applications, Application Readiness

Three Exascale Co-Design Centers Awarded

Exascale Co-Design Center for Materials in Extreme Environments (ExMatEx)

Director: Timothy Germann (LANL)

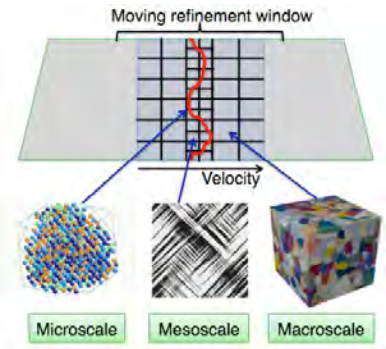
Center for Exascale Simulation of Advanced Reactors (CESAR)

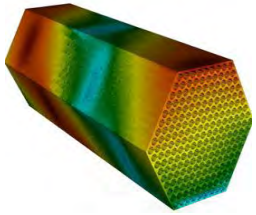
Director: Robert Rosner (ANL)

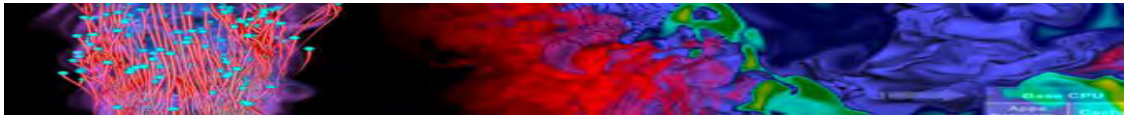
Combustion Exascale Co-Design Center (CECDC)

Director: Jacqueline Chen (SNL)

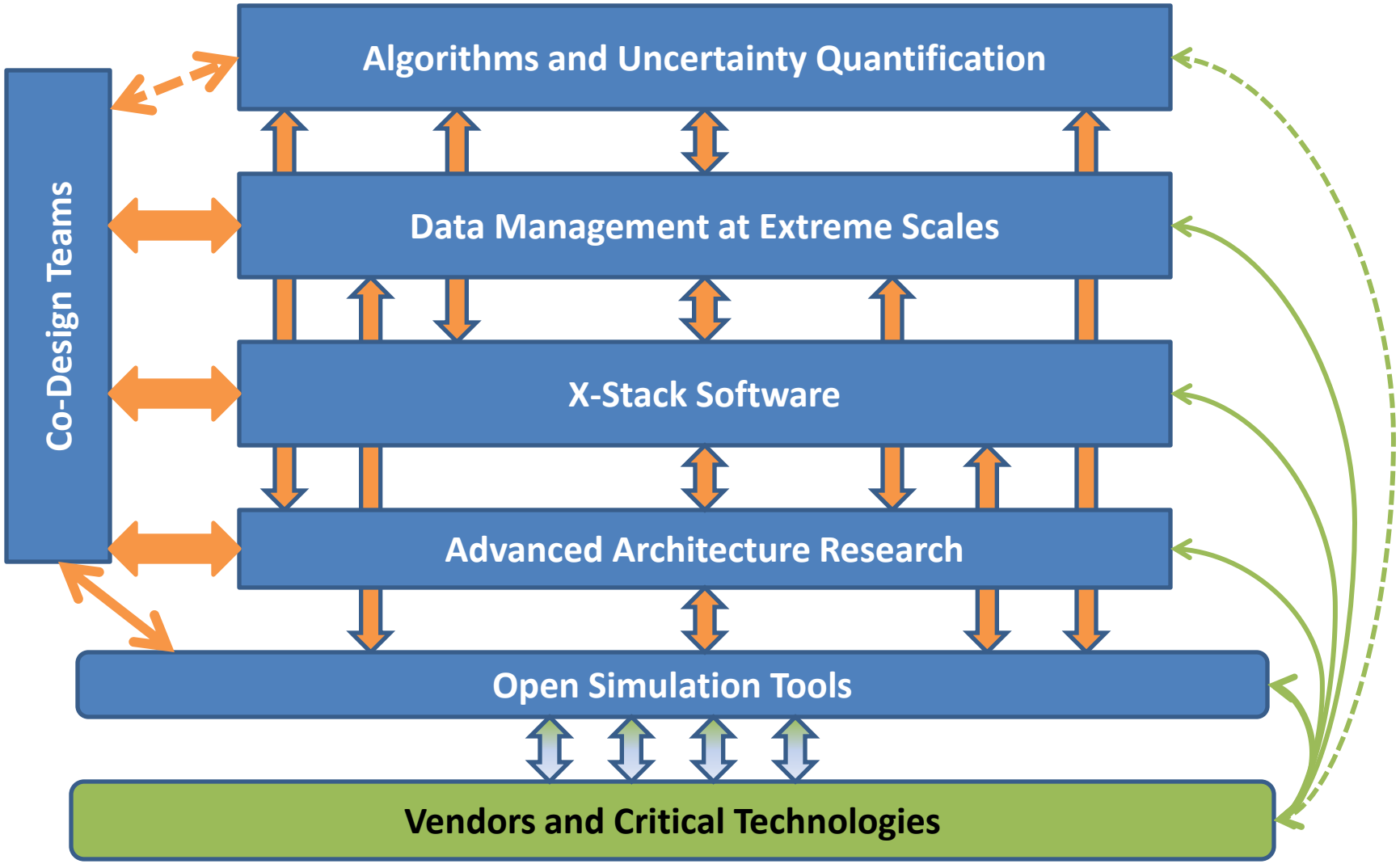
	ExMatEx (Germann)	CESAR (Rosner)	CECDC (Chen)
National Labs	LANL	ANL	SNL
	LLNL	PNNL	LBNL
	SNL	LANL	LANL
	ORNL	ORNL	ORNL
		LLNL	LLNL
			NREL
University & Industry Partners	Stanford	Studsvik	Stanford
	CalTech	TAMU	GA Tech
		Rice	Rutgers
		U Chicago	UT Austin
		IBM	Utah
		TerraPower	
		General Atomic	
		Areva	



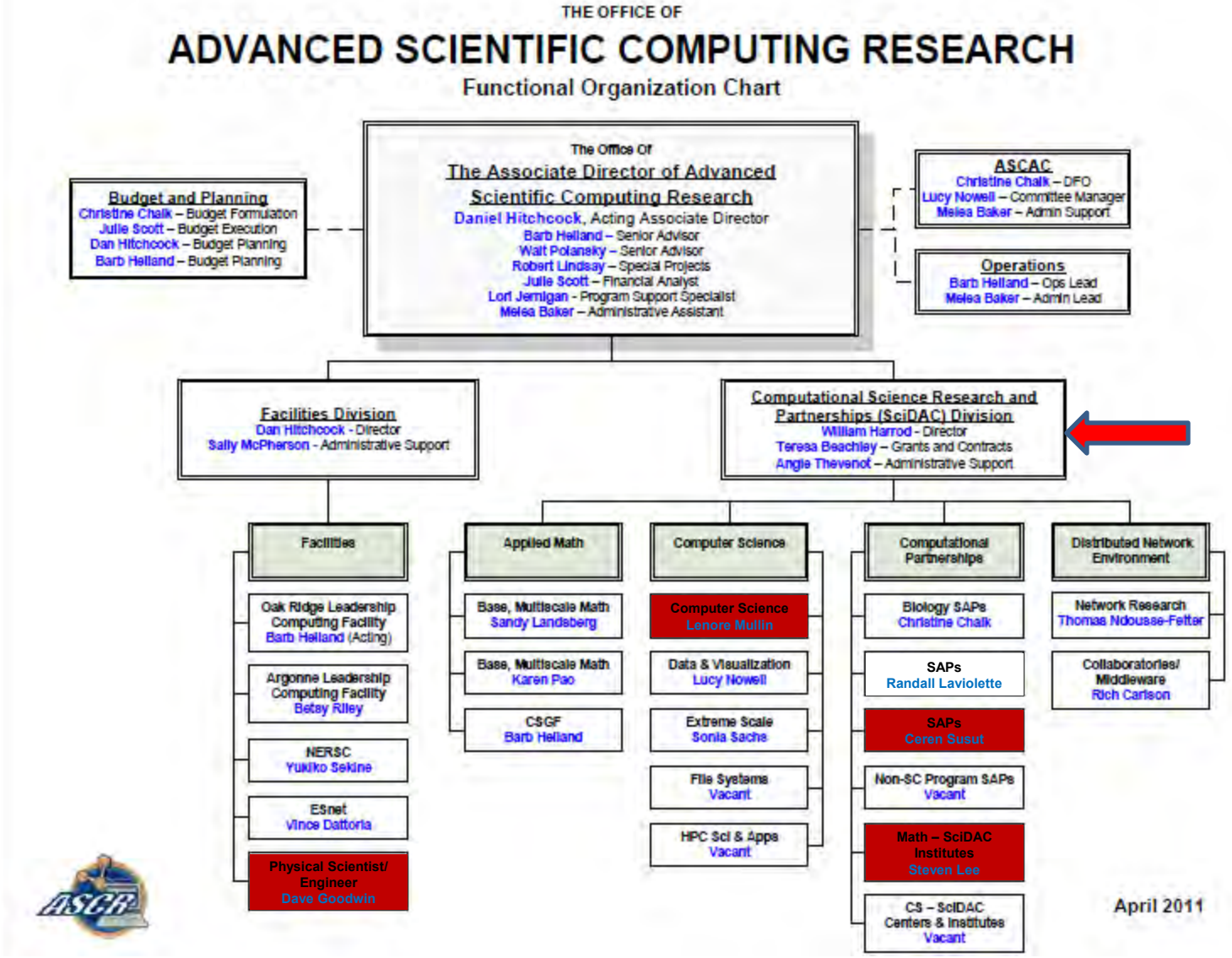




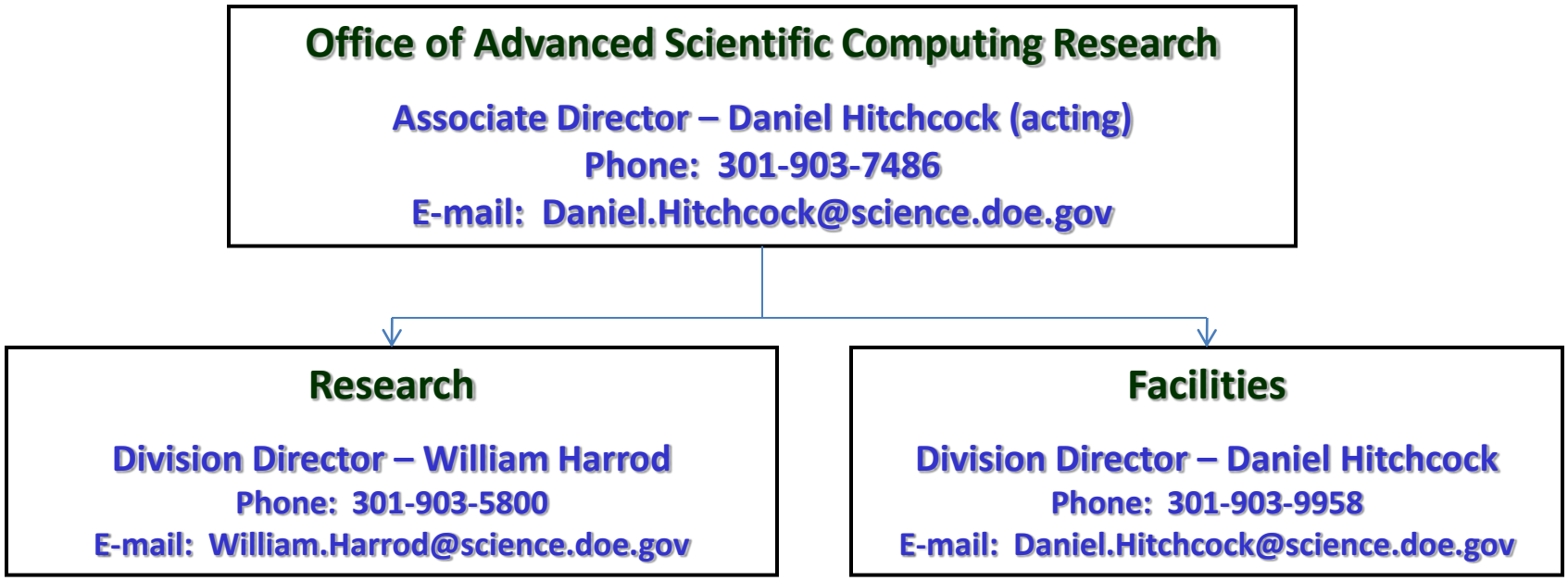
Co-Design in Exascale



ASCR Org Chart – New in Red



ASCR at a Glance



Relevant Websites

ASCR: science.energy.gov/ascr/
ASCR Workshops and Conferences:
science.energy.gov/ascr/news-and-resources/workshops-and-conferences/
SciDAC: www.scidac.gov
INCITE: science.energy.gov/ascr/facilities/incite/
Exascale Software: www.exascale.org
DOE Grants and Contracts info: science.doe.gov/grants/