

Exascale Computing Project (ECP) Overview

Presented to

PathForward vendor information meeting

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EXASCALE COMPUTING PROJECT



U.S. DEPARTMENT OF
ENERGY

Office of
Science

ECP mission need

On July 29, 2015 the President established the National Strategic Computing Initiative (NSCI) to maximize the benefits of HPC for US economic competitiveness and scientific discovery.

DOE is a lead agency within NSCI with the responsibility that the DOE Office of Science and DOE National Nuclear Security Administration will execute a joint program focused on advanced simulation through a **capable** exascale computing program emphasizing sustained performance on relevant applications.

ECP Goals

- Develop a broad set of modeling and simulation applications that meet the requirements of the scientific, engineering, and nuclear security programs of the Department of Energy and the NNSA
- Develop a productive exascale capability in the US by 2023, including the required software and hardware technologies
- Prepare two or more DOE Office of Science and NNSA facilities to house this capability
- Maximize the benefits of HPC for US economic competitiveness and scientific discovery

Programmatic components of the ECP

- It is a partnership between SC and NNSA, addressing science and national security missions
 - Relies on investments by SC/ASCR and NNSA/ASC
 - NNSA/ASC Advanced Technology Development and Mitigation (ATDM) supports activities for the delivery of exascale applications, software, and technology
- ECP does not procure exascale systems
 - ECP includes only activities required for the delivery of the exascale computing capability (procurements of exascale systems will follow SC and NNSA processes and timelines)
 - Plus-up NRE)
 - incremental site preparation,
 - and plus-up facilities funding to be able to acquire capable exascale systems.

ECP Technical Approach

ECP will pursue a ten-year plan structured into four focus areas:

- **Application Development** deliver scalable science and mission performance on a suite of ECP applications that are ready for efficient execution on the ECP exascale systems.
- **Software Technology** enhance the software stack that DOE SC and NNSA applications rely on to meet the needs of exascale applications and evolve it to utilize efficiently exascale systems. Conduct R&D on tools and methods that enhance productivity and facilitate portability.
- **Hardware Technology** fund supercomputer vendors to do the research and development of hardware-architecture designs needed to build and support the exascale systems.
- **Exascale Systems** fund testbeds, advanced system engineering development (NRE) by the vendors, incremental site preparation, and cost of system expansion needed to acquire capable exascale systems.

ECP Laboratory Team

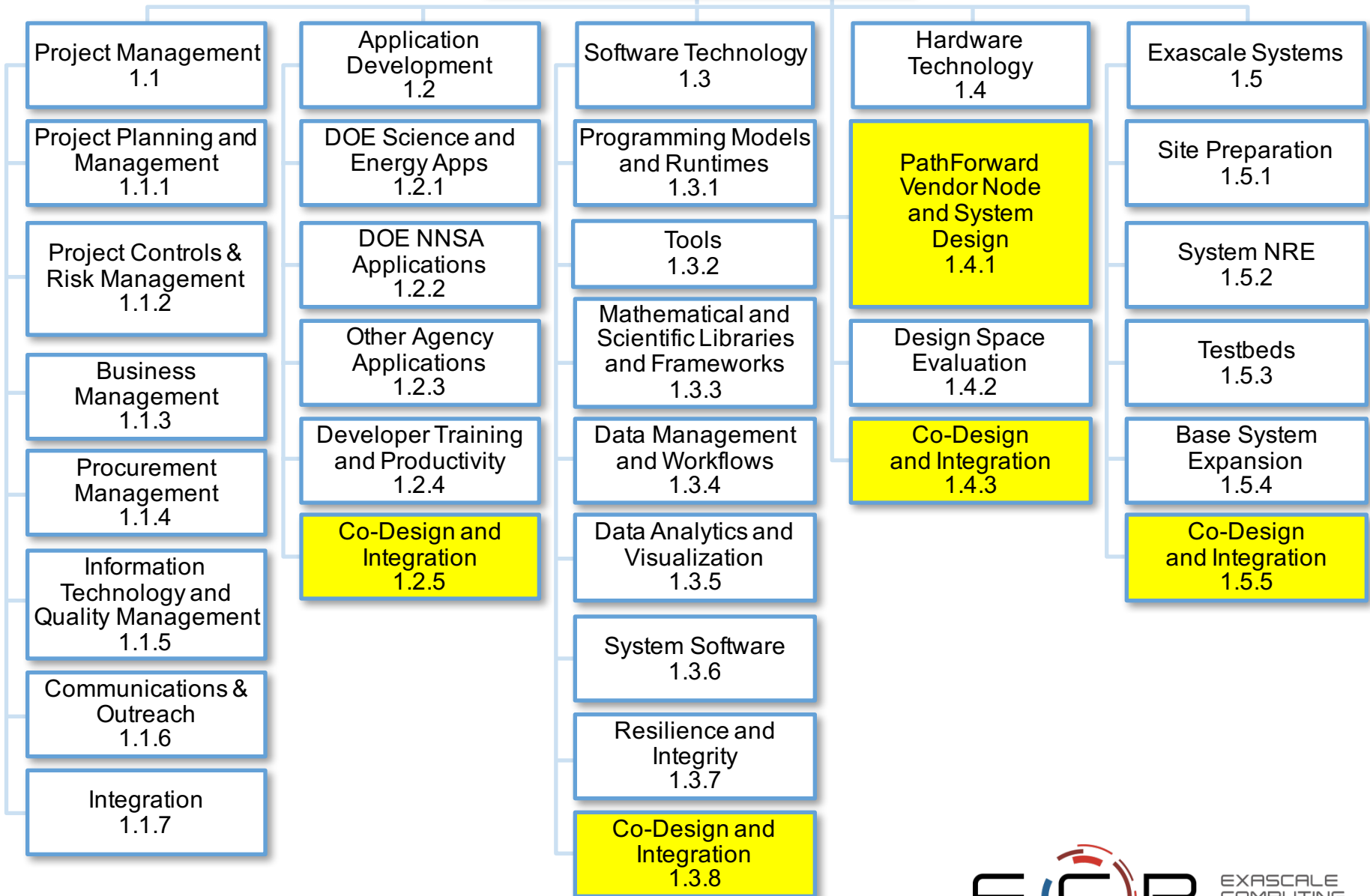
Project Director Deputy	Paul Messina, ANL Stephen Lee, LANL
Project Management Director	Kathlyn Boudwin, ORNL
Applications Development Director Deputy	Doug Kothe, ORNL Bert Still, LLNL
Software Technology Director Deputy	Rajeev Thakur, ANL Pat McCormick, LANL
Hardware Technology Director Deputy	Jim Ang, SNL John Shalf, LBNL
Exascale Systems Director Deputy	Terri Quinn, LLNL Susan Coghlan, ANL
CTO	Al Geist, ORNL
Integration Manager	Julia White, ORNL

ECP Scope is based on Mission Needs and Requirements

- Scope was determined based on
 - Breadth of the mission-critical DOE and NNSA applications
 - Historical and current software requirements of DOE and NNSA applications
 - Input on future needs from 133 DOE and NNSA lab responses to the applications RFI
 - Reports of DOE and NNSA workshops on application and software needs for exascale
 - Reports of workshops and analyses of hardware requirements
 - Analyses of computing technology trends
 - Identifying gaps in vendor product plans for DOE mission applications
 - Experiences from the NNSA ASCI program

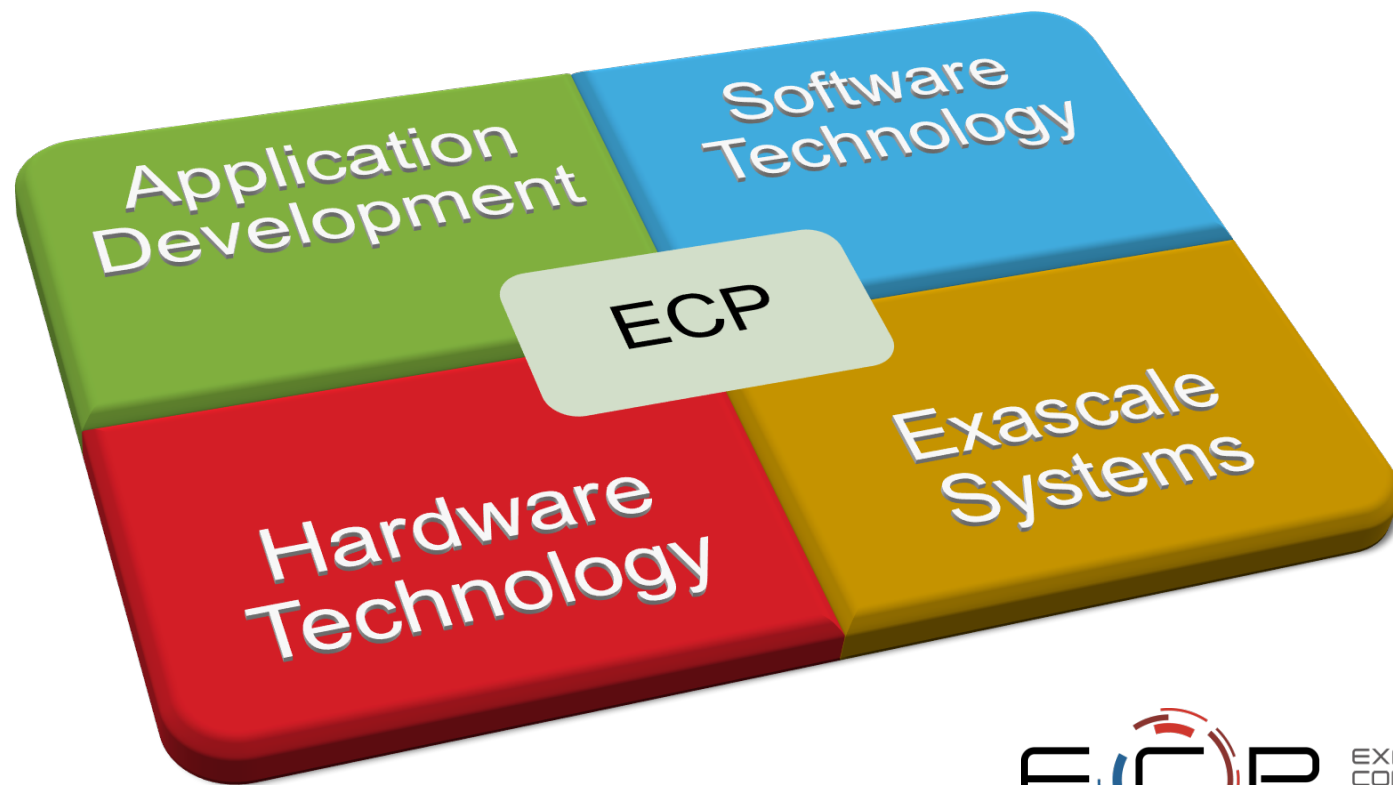
ECP WBS

Exascale Computing Project 1.



ECP Holistic Structure

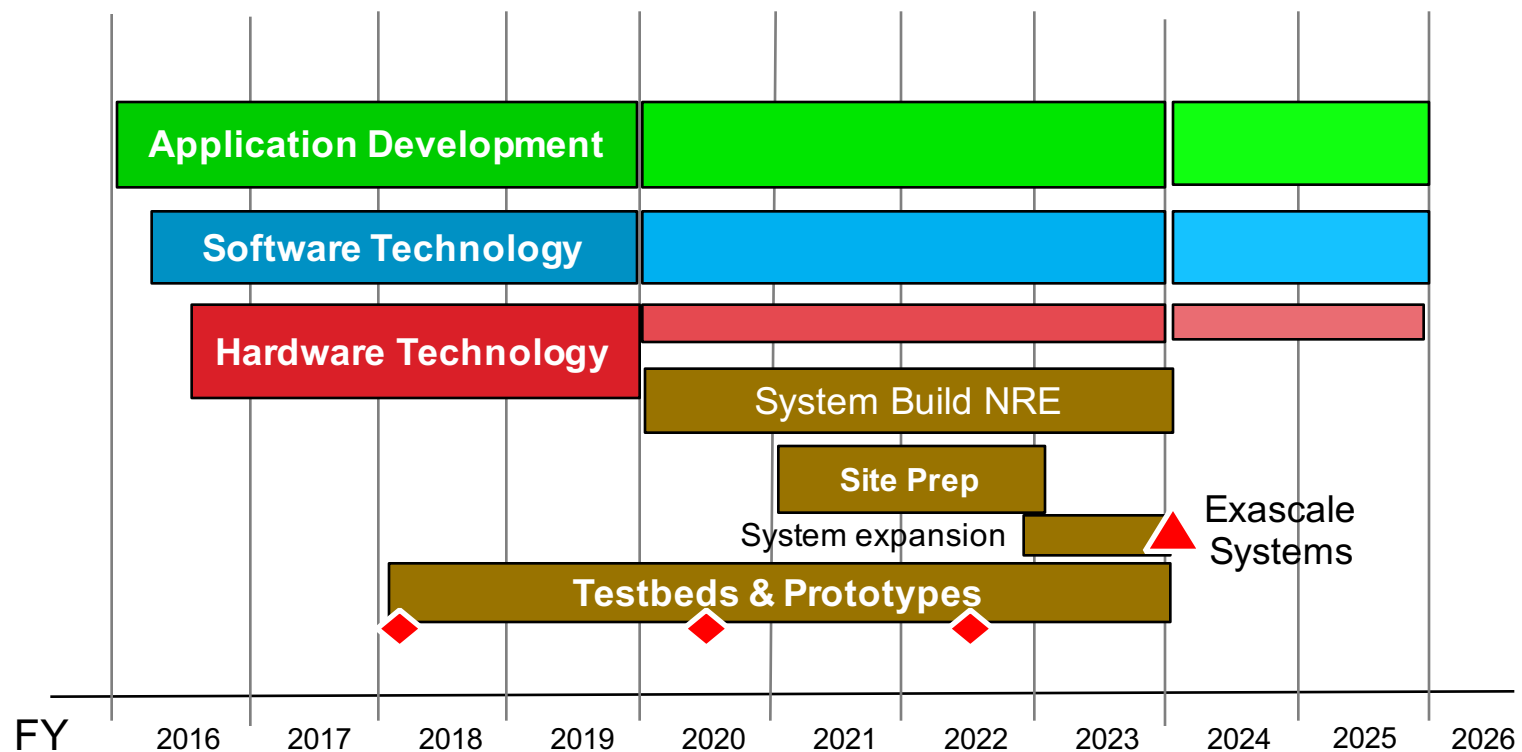
Capable exascale computing requires close coupling and coordination of key development and technology R&D areas.



ECP Timeline

The Project has three phases:

- Phase 1 – R&D before DOE facilities exascale systems RFP in 2019
- Phase 2 – Exascale architectures and NRE are known. Targeted development
- Phase 3 – Exascale systems delivered. Meet Mission Challenges



Questions?



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