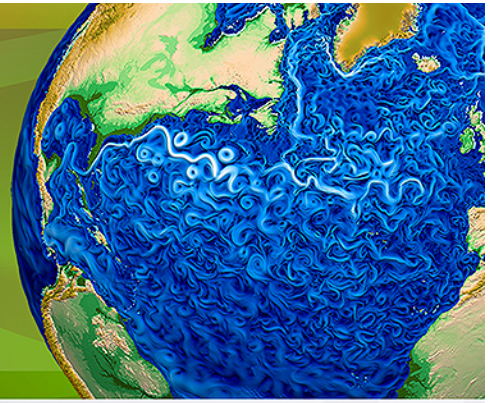
ACME
Accelerated Climate Modeling for Energy



ACME Status and Plan Overview

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ACME Council Chair
June 8, 2016

U.S. DEPARTMENT OF ENERGY

Why ACME?

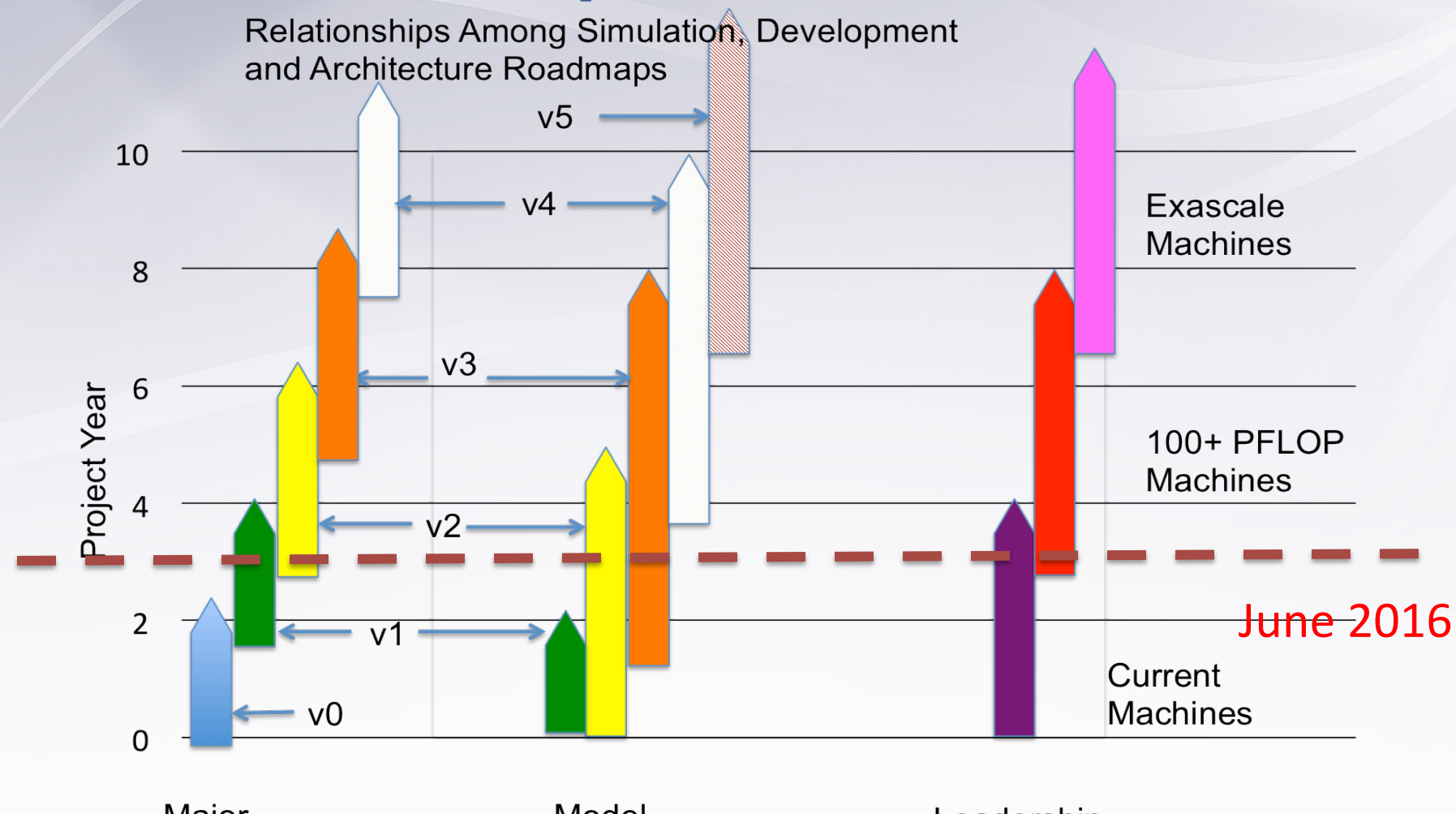
The Accelerated Climate Modeling for Energy Project is an ongoing, state-of-the-science Earth system modeling, simulation, and prediction project that optimizes the use of DOE laboratory resources to meet the science needs of the nation and the mission needs of DOE.

Over the next 10 years, the ACME project will assert and maintain an international scientific leadership position in the development of Earth system and climate models at the leading edge of scientific knowledge and computational capabilities. With its collaborators, it will demonstrate its leadership by using these models to achieve the goal of designing, executing, and analyzing climate and Earth system simulations that address the most critical scientific questions for the nation and DOE.

ACME Project Elements

- a series of **prediction and simulation experiments** addressing scientific questions and mission needs;
- a well documented and tested, continuously advancing, evolving, and improving **system of model codes that comprise the ACME Earth system model**;
- the ability to use effectively **leading (and "bleeding") edge computational facilities** soon after their deployment at DOE national laboratories; and
- **an infrastructure** to support code development, hypothesis testing, simulation execution, and analysis of results.

ACME Roadmap



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Organizational Paradigm

- Challenges
  - Fragmentation of staff in DOE National Laboratory business model
  - Staff spread across eight labs and five partners
- Solution
  - Project guided by roadmap
    - 3 month, 6 month, 1 year, 3 year, 5 year milestones
    - Work structured into tasks of duration 3 months or less with well-defined deliverables
  - Flat and flexible organization
  - Accountability and transparency
  - Empower the many task leaders

ACME-V1.0 Timeline

01 Sep 2015 Code Review Process Phase1 Step 1 (Design Document) for each component, check Code Review Process ✔

01 Nov 2015 New feature freeze, Code Review Process Phase 1 Step 3: Pull Request (PR) for all new features issued✔

01 Nov 2015 - 31 Dec 2015 SE integration of new features, Code Review Process Phase 1 Step 3: Integration, Only PR for bug fixes or BFB are allowed at that point✔ (***01 March 2016***)

31 Dec 2015 ACME v1.0-alpha (end of Q6=Y2Q2) - all component-level functionality ready for coupled system testing and tuning, coupled tests and validation from this point on🡐

31 Mar 2016 ACME v1.0-beta (end of Q7=Y2Q3) - one configuration decided upon, feature switches decided for all 3 experiments, tuning only from this point on

30 Jun 2016 ACME v1.0 frozen

Deliverables for First 3 Years

01 Jul 2016 Start major experiments with ACME v1.0 code base:

01 Jul 2016 - start Water cycle experiment

01 Jul 2016 - start Cryosphere experiment

01 Jul 2016 - start BGC experiment

30 Jun 2017 All major 3 year experiments completed

Addition to Current Road Map – Standard Practice Experiments

- CMIP DECK
- i. AMIP simulation (~1979-2014)
- ii. Pre-industrial control simulation
- iii. 1%/yr CO2 increase
- iv. Abrupt 4xCO2 run

- v. CMIP6 - Historical simulation using CMIP6 forcings (1850-2014)
- vi - CORE-II IAF Ocean/Ice simulation

Five Years

v2 is production model on 100 PFLOP Machines executing v2 Experiments

- Defining computational abstraction now for v2 and v3
- Incorporate ECP, SciDAC and CMDV

v3 and v4 in development for Exascale Machines

Meeting Outcomes –

- ***Critical Path Items***
  - Action Plan to Complete v1 Beta
  - New Schedule for v1 Simulations

- Plans to Complete Code Review and Documentation of v1 components
- Plans to Harden Software Infrastructure, Testing, Data Management and Workflows for v1 Simulations
- Publication plans for groups updated
- Preliminary Road Maps for v2 and v3