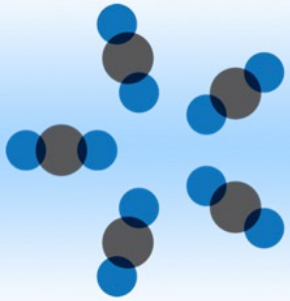
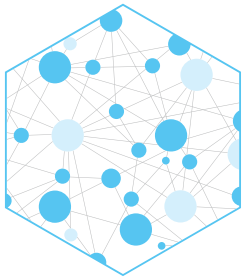


CCSI^2

Carbon Capture Simulation for Industry Impact



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PROMMIS

Process Optimization and Modeling for Minerals Sustainability

The PSE+/IDAES Software Ecosystem

Keith Beattie, Ludovico Bianchi

NATIONAL ENERGY TECHNOLOGY LABORATORY

BERKELEY LAB

Sandia National Laboratories

Carnegie Mellon University

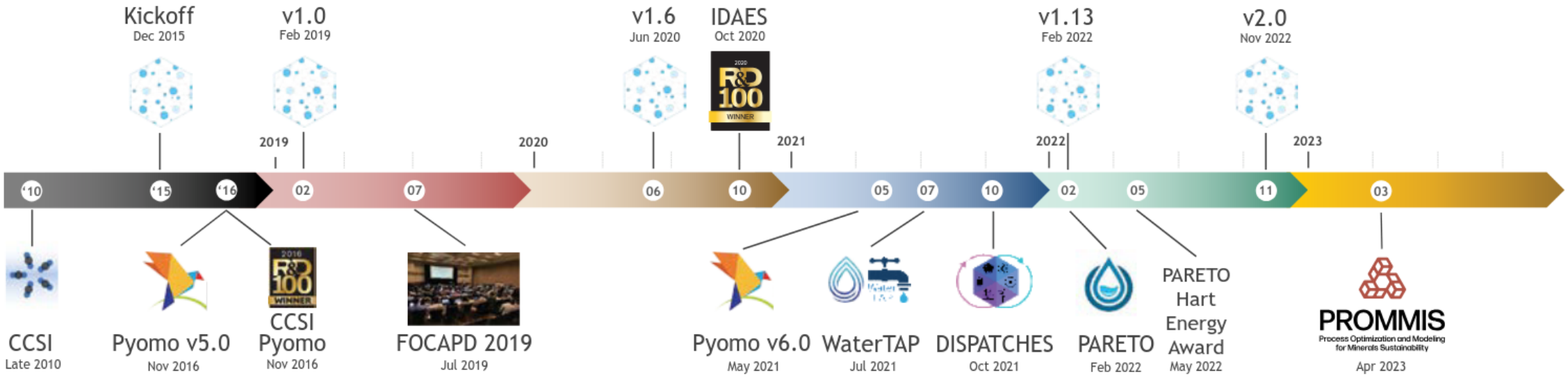
WestVirginiaUniversity.

UNIVERSITY OF NOTRE DAME

Georgia Tech

U.S. DEPARTMENT OF ENERGY

The PSE+ Software Ecosystem History



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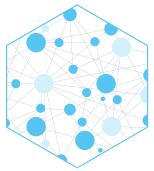
Multiple Software Development Projects



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H_2 with Capture
FECM

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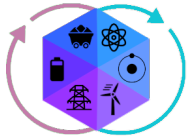
CCSI²
Carbon Capture Simulation for Industry Impact

Post-Combustion Carbon Capture/CDR
FECM

NATIONAL ENERGY TECHNOLOGY LABORATORY · BERKELEY LAB · Lawrence Livermore National Laboratory · Los Alamos NATIONAL LABORATORY · Pacific Northwest NATIONAL LABORATORY · OAK RIDGE National Laboratory · WestVirginiaUniversity · UNIVERSITY OF NOTRE DAME · THE UNIVERSITY OF TEXAS AT AUSTIN · UT · Carnegie Mellon



DISPATCHES
Design Integration and Synthesis Platform to Advance Tightly Coupled Hybrid Energy Systems

Hybrid Energy Systems
FECM, NE, EERE via GMLC

NATIONAL ENERGY TECHNOLOGY LABORATORY · Sandia National Laboratories · BERKELEY LAB · INL Idaho National Laboratory · NREL Transforming ENERGY · UNIVERSITY OF NOTRE DAME

PROMMIS
Process Optimization and Modeling for Minerals Sustainability

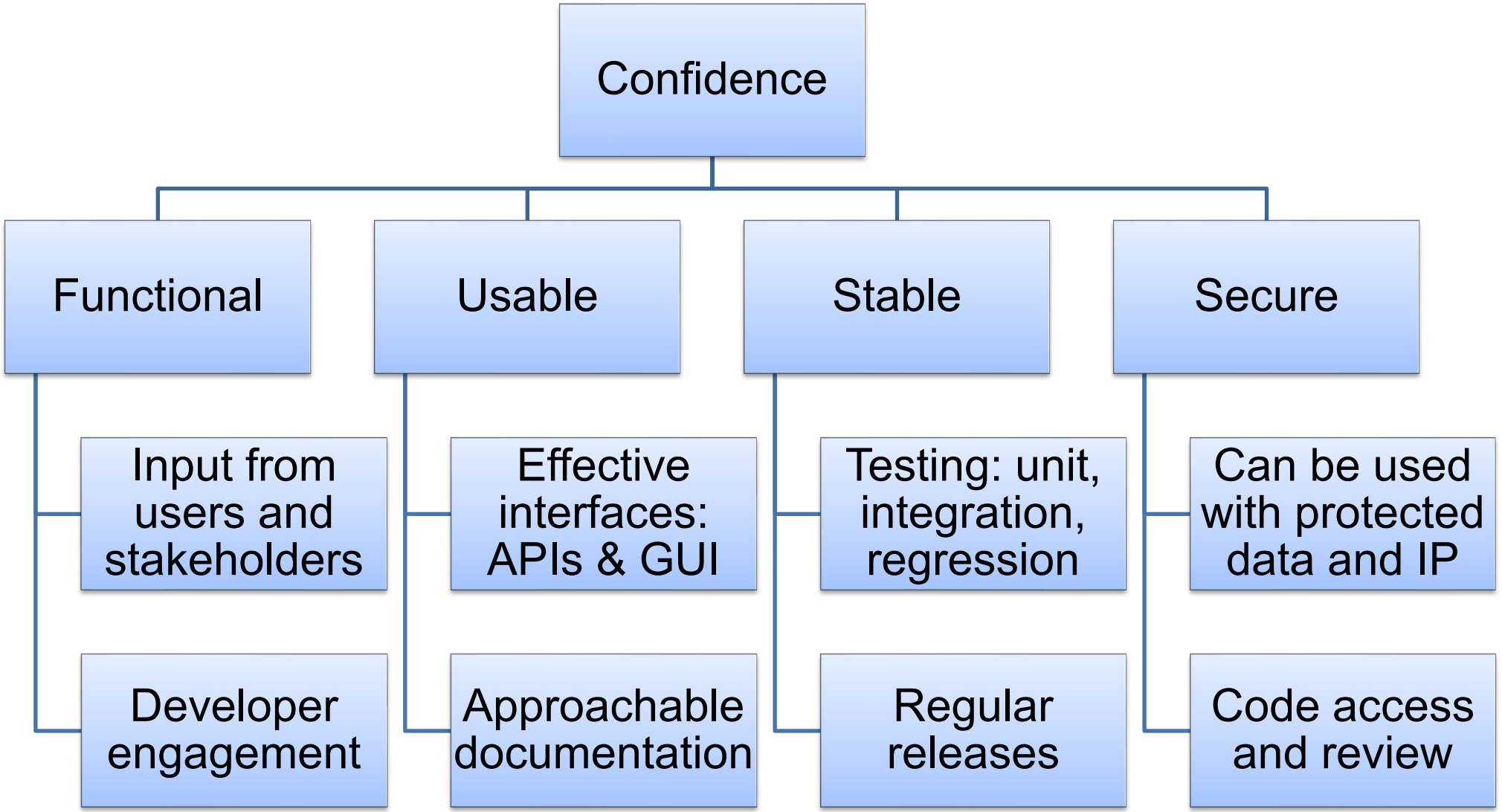
Rare Earth Element & Critical Mineral Recovery
BIL via FE-30

NATIONAL ENERGY TECHNOLOGY LABORATORY · BERKELEY LAB · Sandia National Laboratories · Carnegie Mellon · WestVirginiaUniversity · UNIVERSITY OF NOTRE DAME · Georgia Tech

Water Purification
EERE via NAWI & IEDO

NATIONAL ENERGY TECHNOLOGY LABORATORY · BERKELEY LAB · NREL Transforming ENERGY · OAK RIDGE National Laboratory

Software Engineering Goal

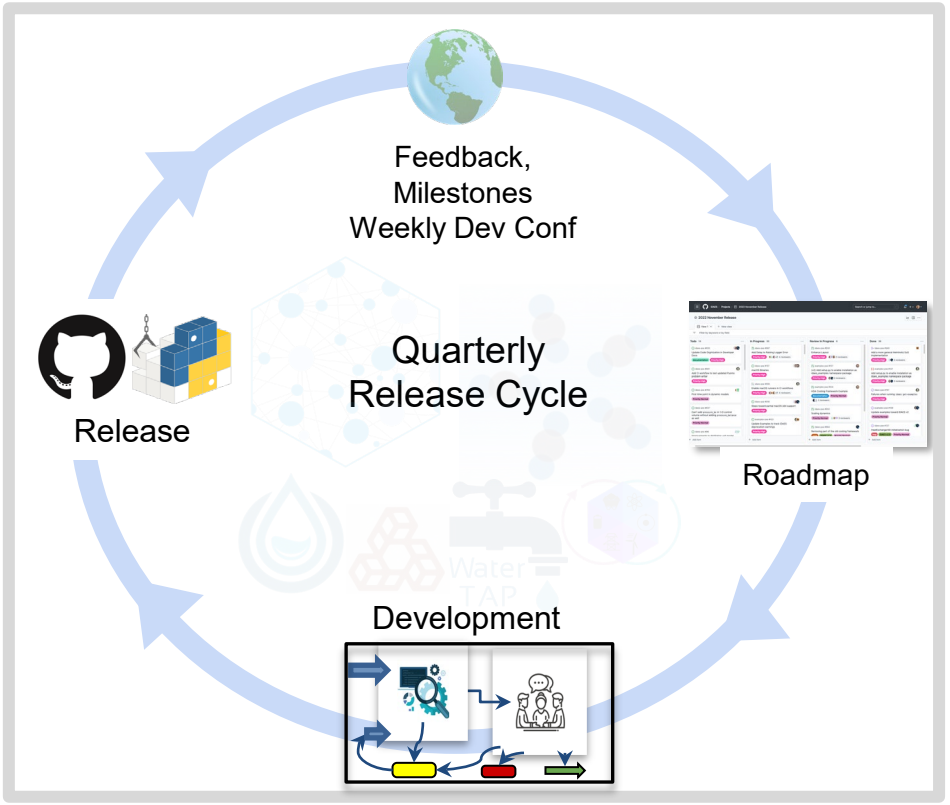


Open Source, Engagement and Support

- Open Source
  - BSD-style license
  - Insight, Influence and Access
  - Supports multi-institution teams
  - Potential for surviving beyond single vendor/funder
- We have processes for working with protected data and IP under NDAs
- Your engagement drives our roadmap
- Your engagement drives our support

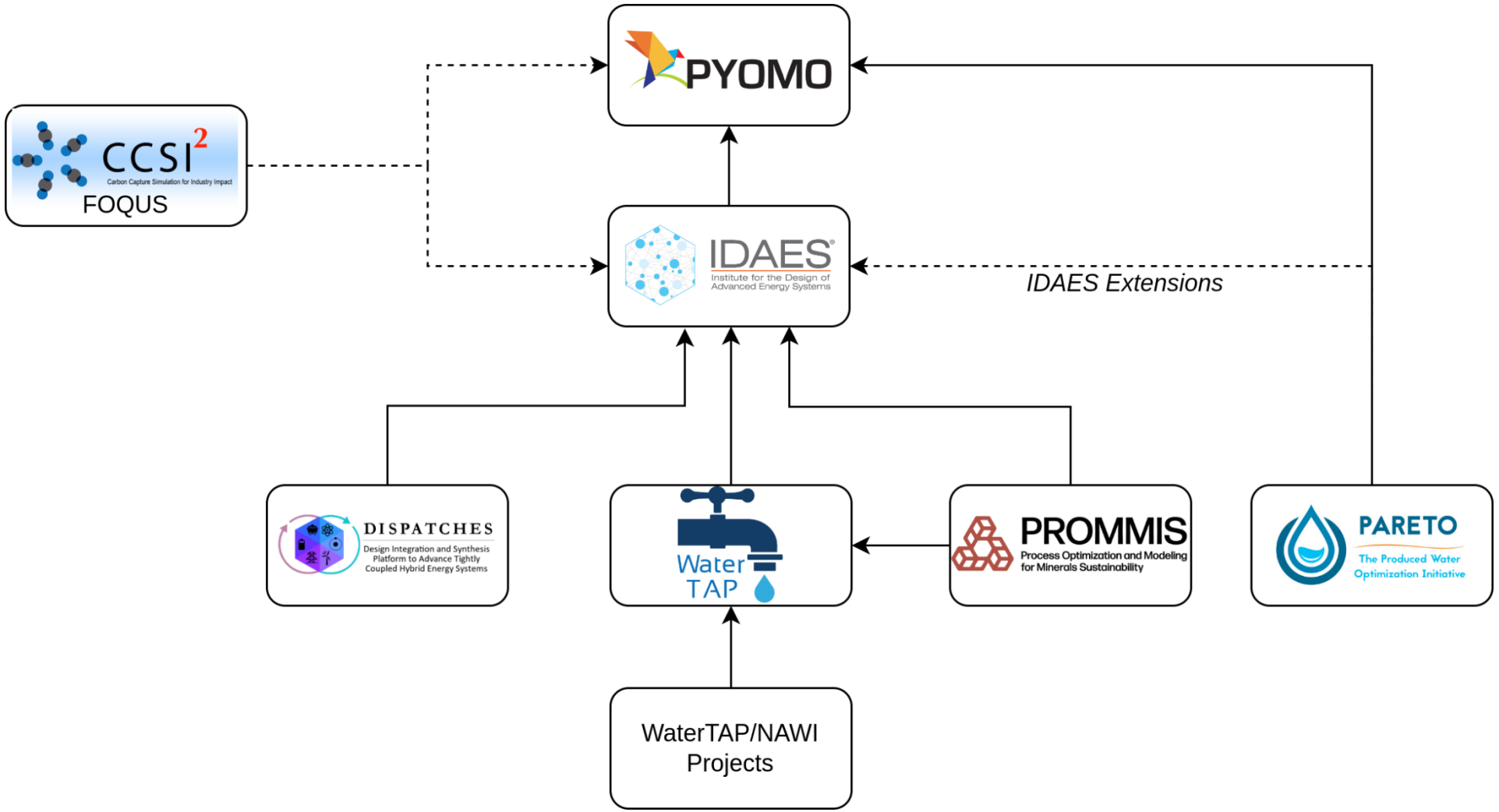
Common Software Dev Process and Tools Across all PSE+ projects

- GitHub:
  - Version Control (git)
  - Issue Tracking
  - Discussion Forums
  - CI: Automated Testing, Coverage, Static Analysis
  - Pull Request / Code Review
  - Project Boards for release and roadmap tracking
- Regular (weekly) Developer Conferences & Office hours
- Date-driven (quarterly) Releases
- Roadmap / Milestones identification:
  - Users & Developers
  - Stakeholders
  - FWP, SOW, etc.



An evolving "agile" software engineering process arrived at over years of experimentation on what is effective given our specific scientific, research funded & collaborative structure.

PSE+ Dependencies

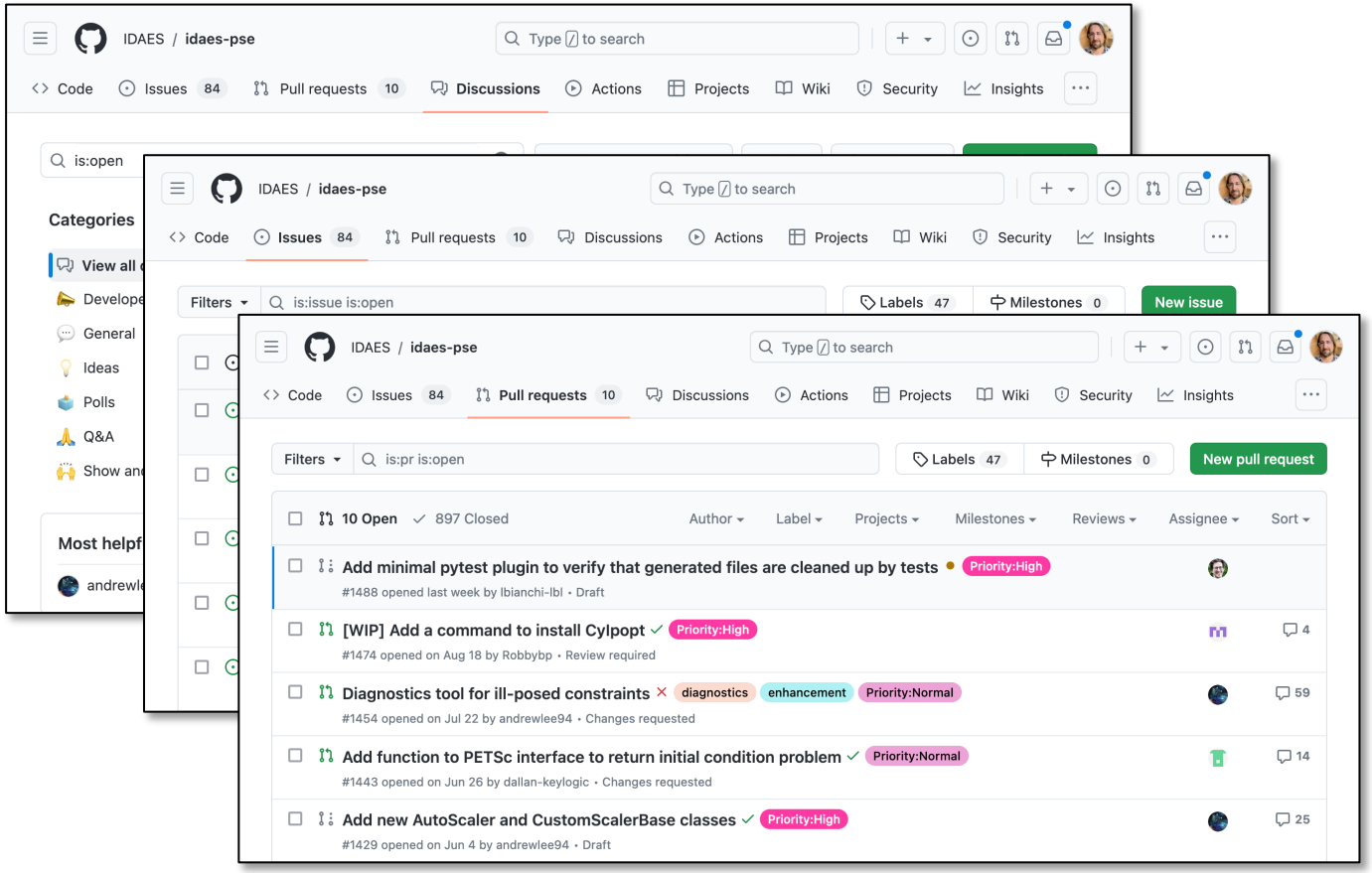


Software Investment

- PSE+: software-centric, multi-institution, interdisciplinary projects with incredibly diverse set of contributors, domains, user base
- Writing software is like cooking: starts as code written by a single developer running on one machine; software engineering is everything that lets us scale beyond that
- Resources dedicated to Software Engineering and Release Management are a force multiplier for the project
  - Make development workflow more efficient for contributors
  - Establish a rigorous process for applying changes and fixing bugs
  - Provide training and support for developers at all levels of experience using industry-standard tools and processes
  - Develop and maintain infrastructure for testing and deployment
  - Maximize chances that software is usable and useful to users

How to Engage

- **GitHub**
  - Discussion boards
  - Open Issues
  - Pull requests
- **Mailing lists**
- **Virtual Office hours**
- **Stakeholder calls**
- **These summit meetings**



Your engagement informs and supports our development

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2024 Joint IDAES/CCSI$_2$/PrOMMiS Technical Team Meeting
Lawrence Berkeley National Lab

Register as Stakeholder or User:

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