Accelerating energy technology innovation at Cyclotron Road

Overview for EERE Advance Manufacturing Office

AMO Program Review

May 28-29, 2015

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Critical Need

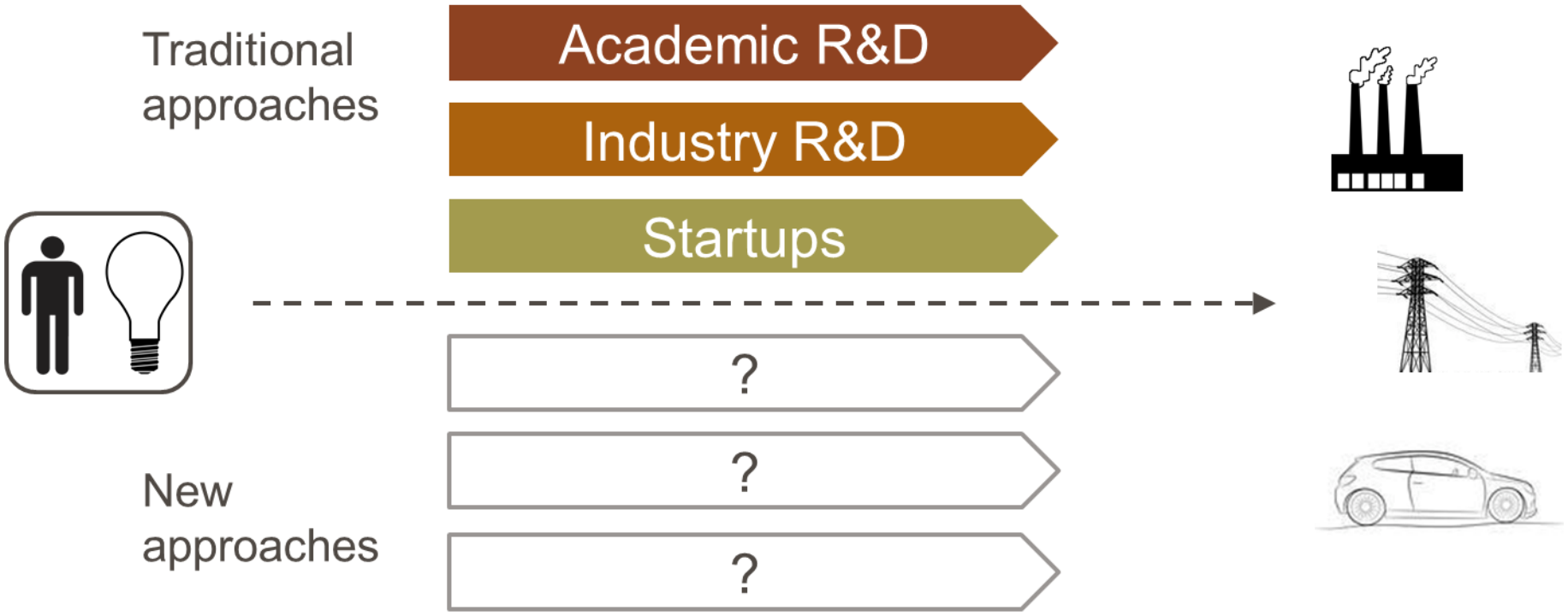
How do we get more “shots on goal” for breakthrough energy technology?

Bridging the lab-to-market gap for clean energy technologies based on breakthrough materials and manufacturing innovation will be critical to addressing climate change

“Innovation has nothing to do with how many R&D dollars you have. When Apple came up with the Mac, IBM was spending at least 100 times more on R&D. It’s not about the money. It’s about the people you have, how you’re led, and how much you get it.”

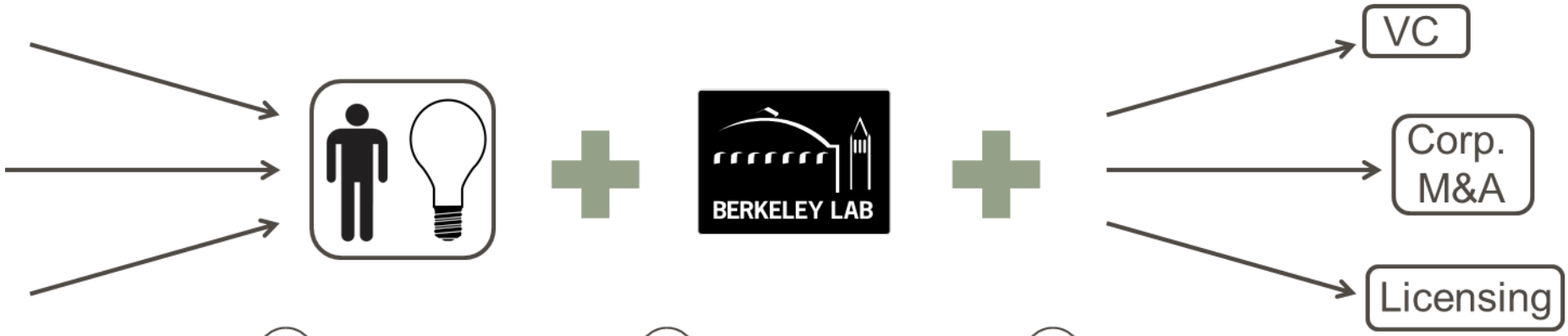
–Steve Jobs, former Apple CEO

We need more pathways to translate materials and manufacturing technology



Our approach

Cyclotron Road: a new model for “hard” energy technology innovation



1. **Recruit** the world’s best energy technology innovators
2. **Leverage** collaborations with national lab experts and facilities
3. **Deploy** people, IP, and tech to the marketplace

Progress so far

The Cyclotron Road pilot

Overview

- Launched July 2014 at Berkeley Lab as “M37”
- Open worldwide call for applicants
- Two-year commitment of seed project funding, five year term
- 6 projects selected in first cohort

Pilot goal: validate fundamentals of the Cyclotron Road model

A different kind of startup for hard tech

Runway to get started

- $500,000 seed funding over two years
- Lab space
- Support obtaining additional funds

BERKELEY LAB

Berkeley Lab's world-class R&D

- $820 million annual budget
- 13 Nobel laureates
- ~100 National Academy members

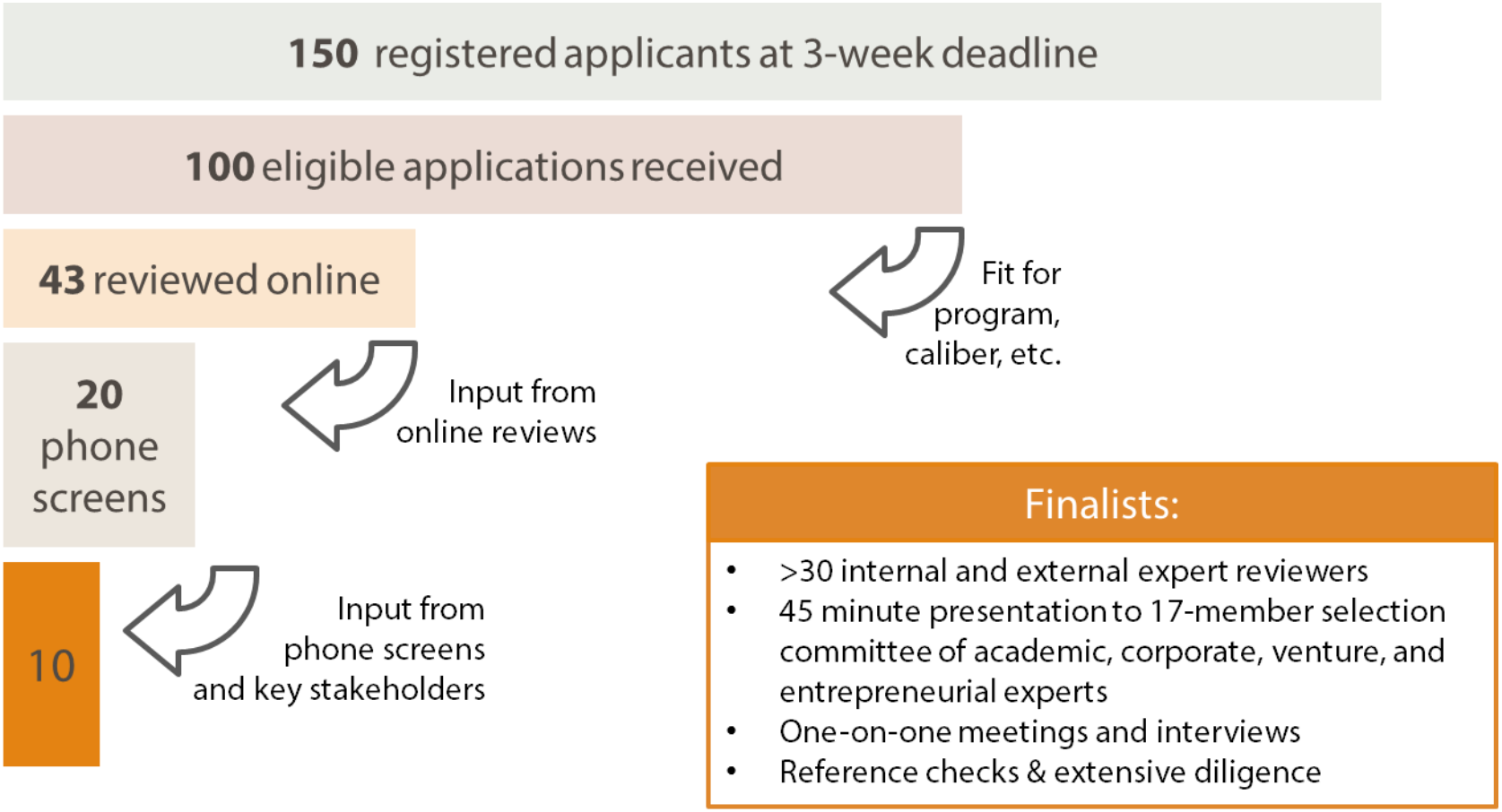
Mentorship, network, and culture

- Business and project coaching
- Engagement with potential partners
- Community of like-minded entrepreneurs

Early response suggested large demand

Google analytics:
Three weeks from standstill launch…

Selection process



Accelerating projects with program support

Program activities

- Bi-weekly project reviews
- Industry mentorship
- Events and conferences
- Entrepreneurship workshops
- Funding strategy and contacts
- Thought-leader “Roadshows”
- Cohort community

Meet the first cohort

Dan Riley and Jared Schwede

Steven Kaye

Raymond Weitekamp

Marcus Lehmann

Kendra Kuhl, Etosha Cave

Deepak Dugar

Pilot metrics

Validation of the fundamental model

CR can successfully attract top innovators

Validation:

- Strong reaction from innovator community
- Success in recruiting high quality first cohort
- Compelling “but for” anecdotes from applications/interviews

Key learning:

- **Longer application window to attract broader applicant pool**

“Win-win” collaborations are feasible

Validation:

- Several successful collaboration established
- Innovators seeing expected value: equipment, expertise, credibility

Key learning:

- **Project leads are seen as adding value to lab**
- **Critical effort around building collaborations through face-to-face interactions**

Innovators can attract additional funding

Early indicators:

- ~$1.5M in follow-on funding in first 6 months
- Promising opportunities for bigger funding on the radar

Innovator application snapshots

Why Cyclotron Road?

"Critically, […] I believe Cyclotron Road will **reduce start-up costs** and enable **lower risk development paths** for energy and materials technologies while ensuring that these technologies are put into real-world use. "

"**Collaboration opportunities** at LBNL and Berkeley will be considerably easier through the Cyclotron Road program compared to a startup or large company…"

"Compared to a VC-backed startup environment, we expect that the opportunity for **a full spectrum of possible exits and strategic partners** will be instrumental for the ultimate success of [our technology]"

The closest alternative routes in private research […] emphasize patents and licensing […] and discourage employees from leaving to start spinoffs … **I want to grow a company from scratch, make something useful and impactful to the world, and do it fast.**

Cyclotron Road is the program of our dreams: a nexus of top researchers, state of the art equipment, and a culture dedicated to developing technology at a rapid pace.

Collaboration snapshot

Andreas Schmid + Jared/Dan

Andreas Schmid, LBL (NCEM)

Dan Riley and Jared Schwede, Cyclotron Road

"Most of my work is focused on the beauty of physics. ***It's exciting to have the chance to do something that can make a big applied impact*** *with Jared and Dan"*

"After our conversations, ***we are excited to work with Dr. Schmid****, and believe that his system* ***may open up radical new capabilities*** *in understanding thermionic conversion."*

Funding snapshot

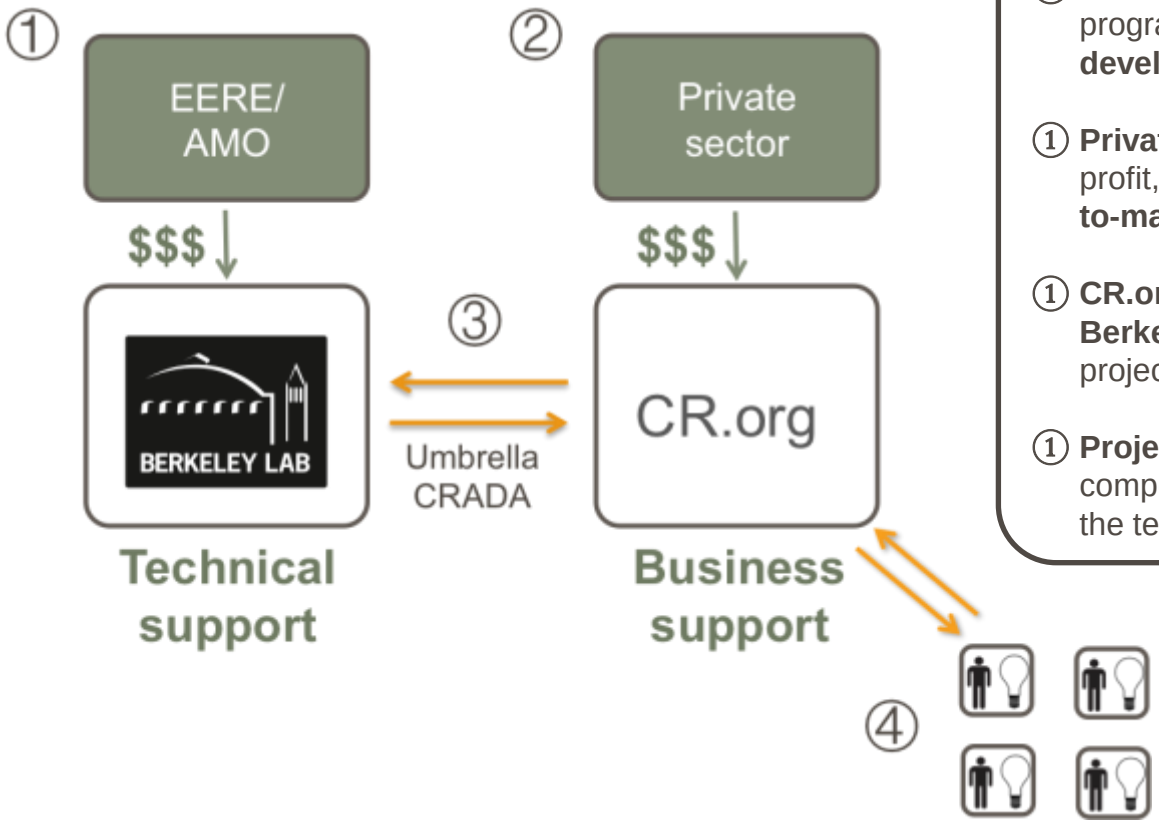
Aligning projects with appropriate funding agencies

32+ Proposals on the radar	> $50M in total funding
10+ Submitted to date	> $30M in total funding

Proposals to EERE, ARPA-E, CEC, DARPA, USDA, and others

~$1.5M in competitive funds awarded in first 6 months

The Cyclotron Road Partnership



① **EERE AMO funding** to Berkeley Lab to support program staff and infrastructure for **technology development** activities

① **Private sector funding** to CR.org, a 501c3 non-profit, to support staff and infrastructure for **tech-to-market** activities

① **CR.org** will execute an **umbrella CRADA with Berkeley Lab** to enable collaborations between project teams and laboratory scientists and staff.

① **Project teams**, selected through a fair and open competition, collaborate with Berkeley Lab under the terms of the CR.org umbrella CRADA.

Expected outcomes and metrics for success

Outcome 1: Validation of the Cyclotron Road innovation model

Metrics: Enhanced project viability through follow on funding; early yield on flexible commercial outcomes; sustained “win-win” collaborations with Berkeley Lab

Outcome 2: Demonstrated private-sector appetite to participate in the PPP

Metrics: Commitments of financial sponsorship; CTO participation in Leadership Council

Outcome 3: Formalized operating model for organization and program support structures

Metrics: Formalized mentorship and educational activities, streamlined R&D operations across organization, value-added expertise on board (e.g. technoeconomics, design-for-manufacturing)

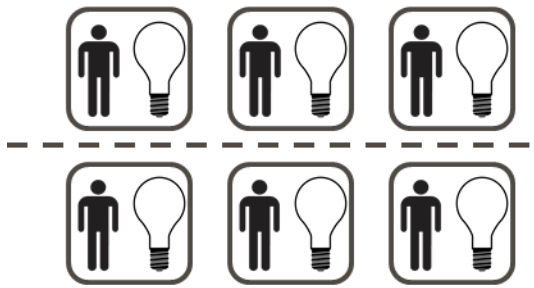
Outcome 4: Explore additional avenues for public-sector participation in PPP

Metrics: State government participation, engagement with other federal funding agencies (EERE program offices, DARPA, etc.)

What does a win look like?

Department of Energy:
A replicable model to support the best innovators and get higher yield of mission-aligned commercial outcomes

Private Sector
A pipeline of top talent and technologies that will constitute the industry's next breakthroughs and leaders



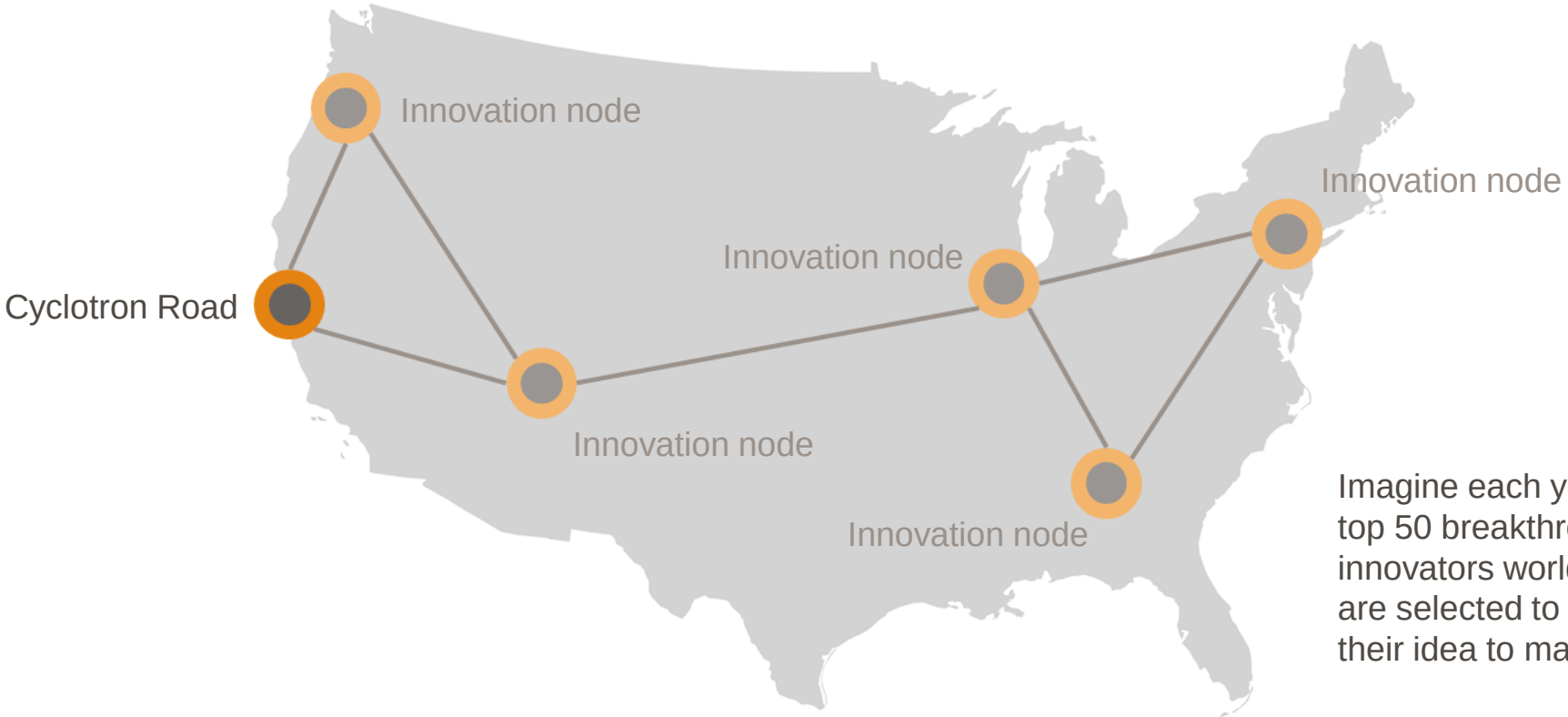
cyclotronroad

Innovators
A custom-built home to pursue their applied R&D dreams with mentored support and a higher chance of success in commercializing breakthrough energy technologies

Berkeley Lab
A new mode to drive impact, expose Lab scientists to industry needs and an entrepreneurial culture, and create an all-star alumni network in the private sector

Our vision

A network of open innovation nodes driving impact in energy technology



Imagine each year, the top 50 breakthrough innovators worldwide are selected to drive their idea to market


www.cyclotronroad.org