

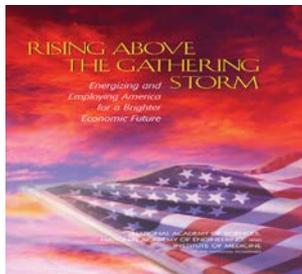
# **An Overview of the Advanced Research Projects Agency – Energy (ARPA-E)**

Ellen Williams, Director

**Bridging Renewable Electricity with Transportation  
Fuels Workshop**  
August 27-28, 2015

# ARPA-E's History

In 2007, The National Academies recommended Congress establish an Advanced Research Projects Agency within the U.S. Department of Energy



...“The new agency proposed herein [ARPA-E] is patterned after that model [of DARPA] and would sponsor creative, out-of-the-box, transformational, generic energy research in those areas where industry by itself cannot or will not undertake such sponsorship, where risks and potential payoffs are high, and where success could provide dramatic benefits for the nation.”...

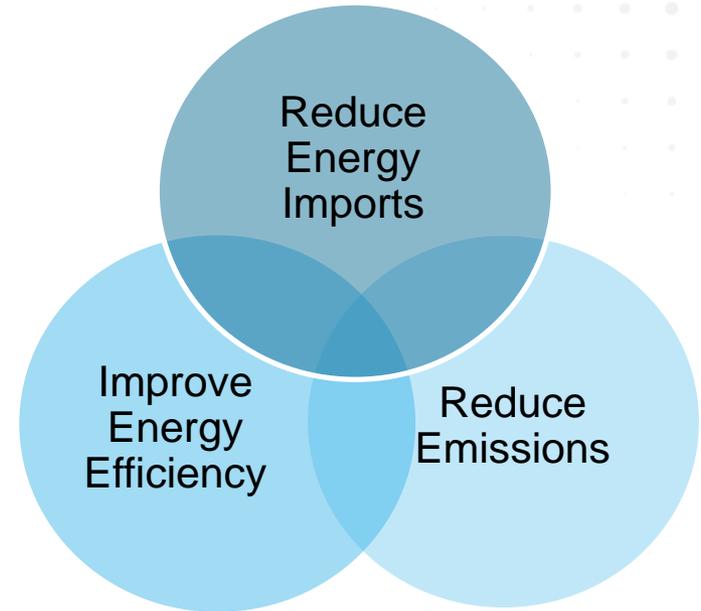


# ARPA-E Authorizing Legislation

**Mission:** To overcome long-term and high-risk technological barriers in the development of energy technologies

**Goals:** Ensure America's

- ▶ Economic Security
- ▶ Energy Security
- ▶ Technological Lead in Advanced Energy Technologies



**Means:**

- ▶ Identify and promote revolutionary advances in fundamental and applied sciences
- ▶ Translate scientific discoveries and cutting-edge inventions into technological innovations
- ▶ Accelerate transformational technological advances in areas that industry by itself is not likely to undertake because of technical and financial uncertainty

# Programs

**OPEN** programs support the development of potentially disruptive new technologies across the full spectrum of energy applications.

- Complement focused programs
- Support innovative “one off” projects
- Provide a “snapshot” of energy R&D



**Focused** programs prioritize R&D topics by their potential to make a significant difference in ARPA-E’s mission space.

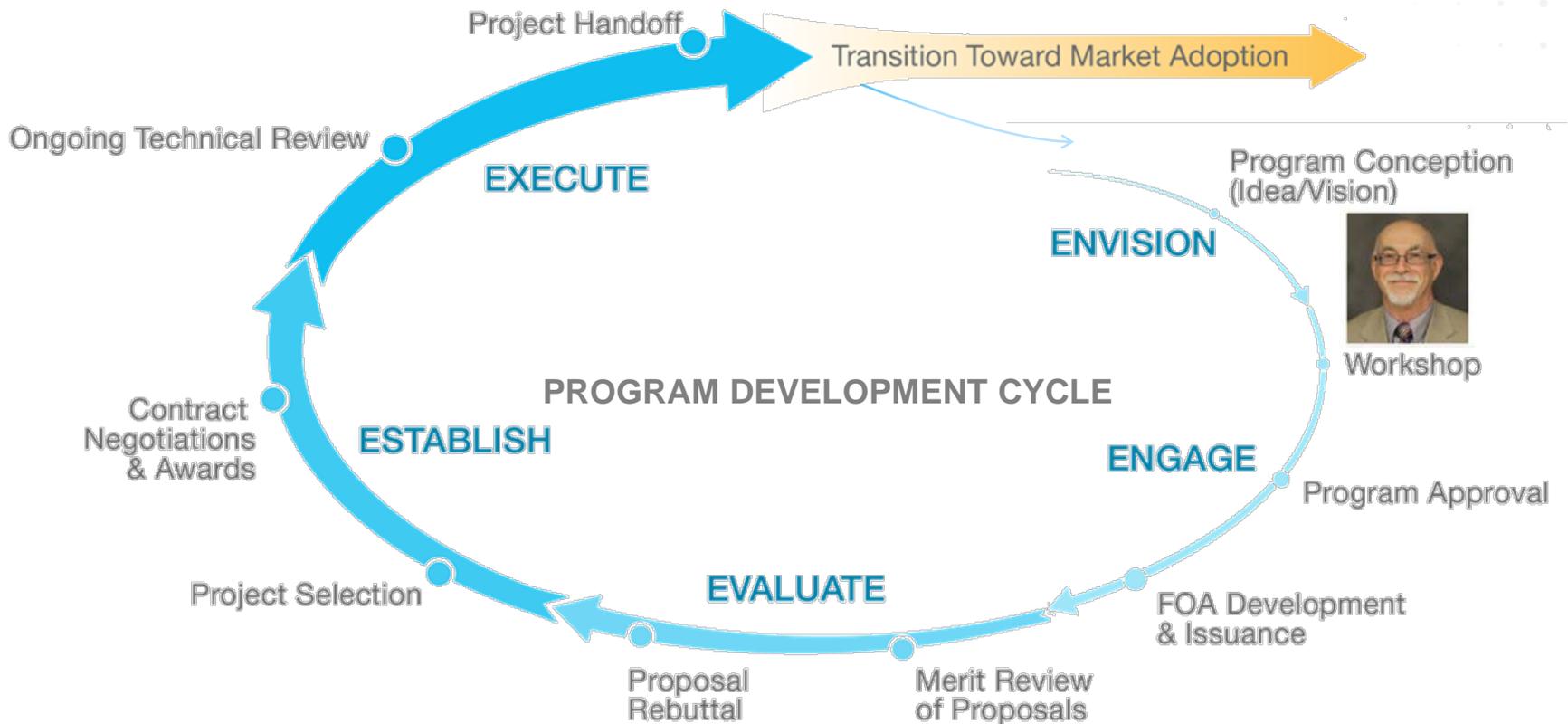
- Size of the potential impact
- Technical opportunities for transformation
- Portfolio of projects with different approaches



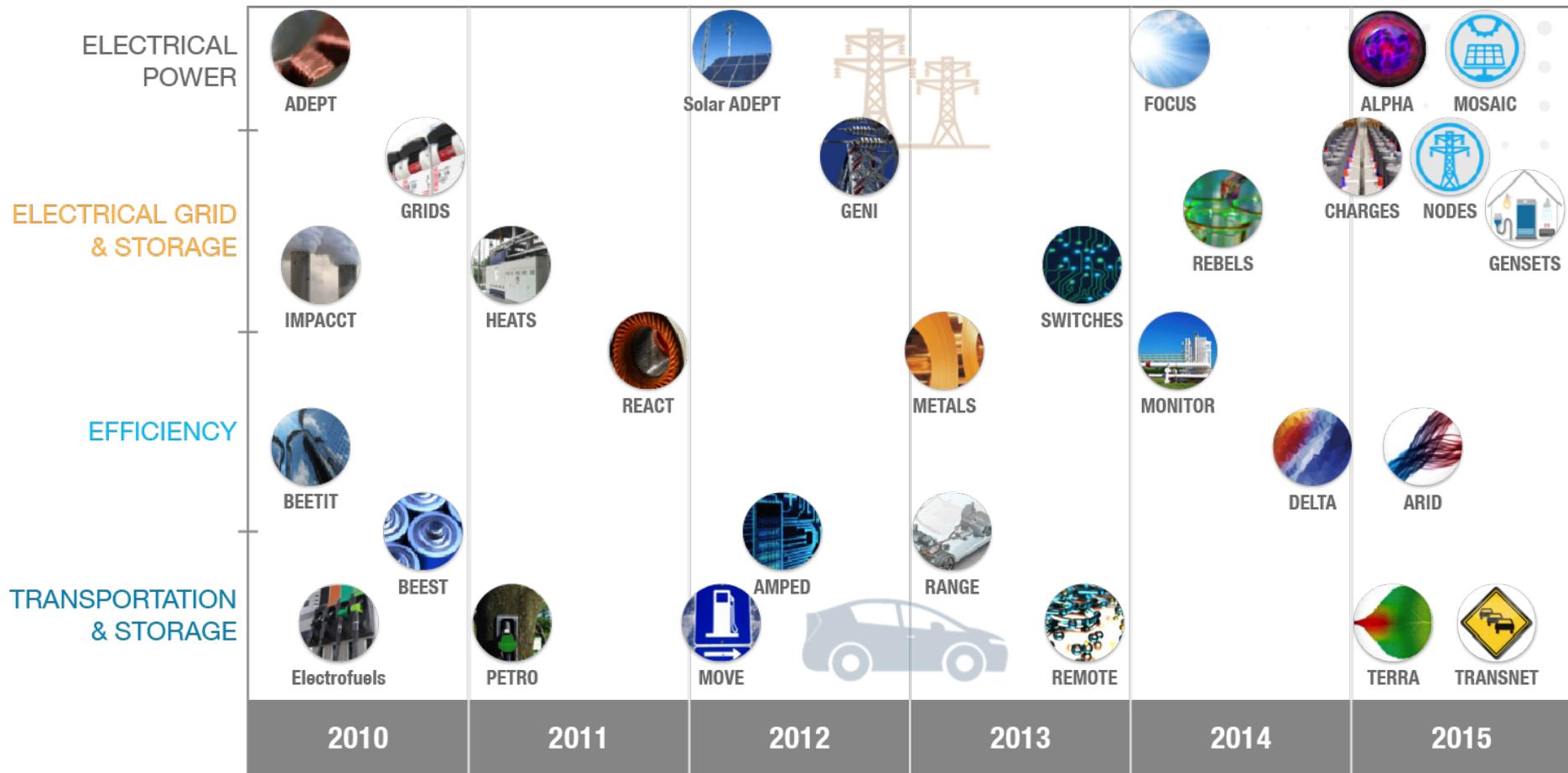
# Developing ARPA-E Focused Programs



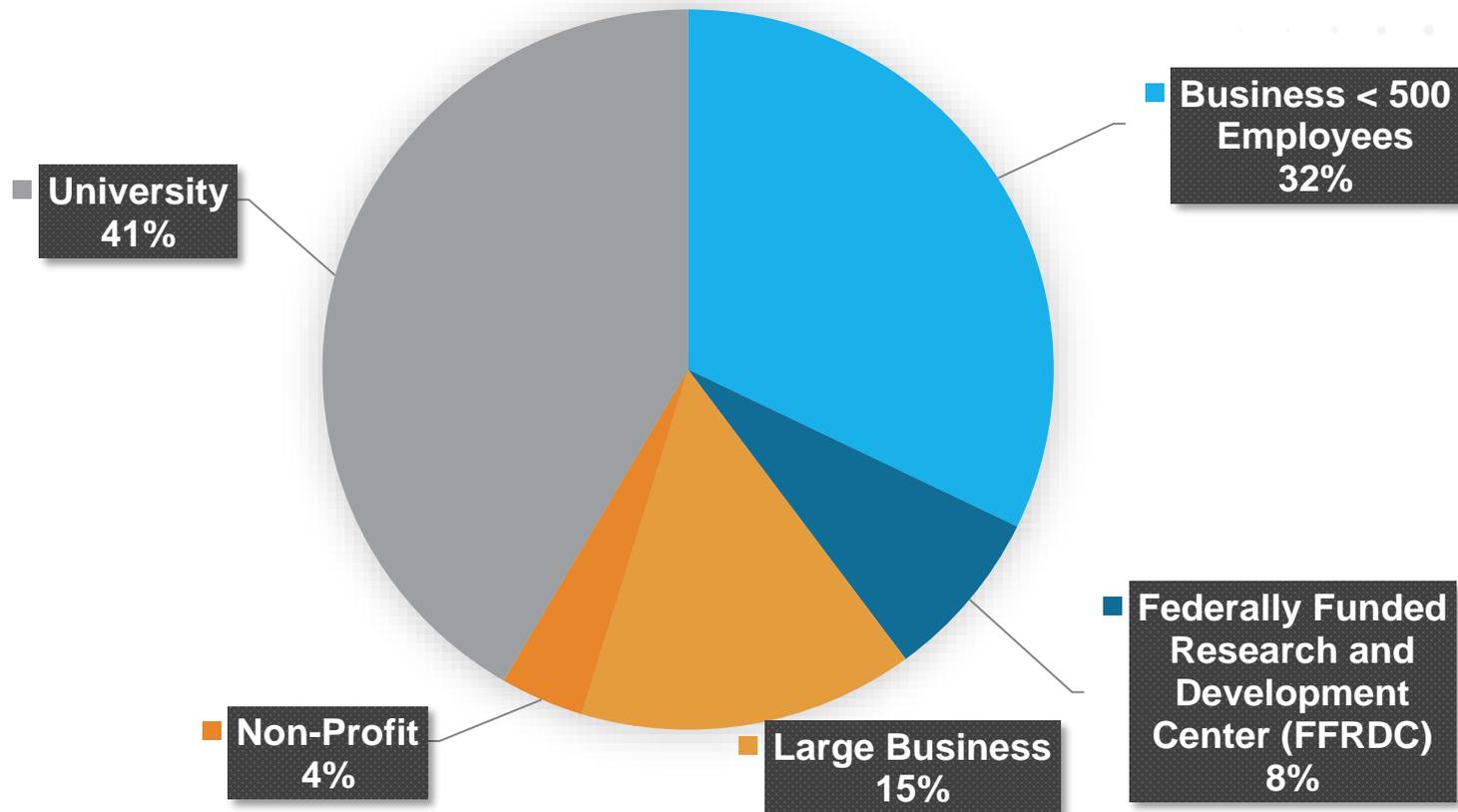
ARPA-E Program Directors



# Focused Program Portfolio



# ARPA-E Project Portfolio by Lead Organization



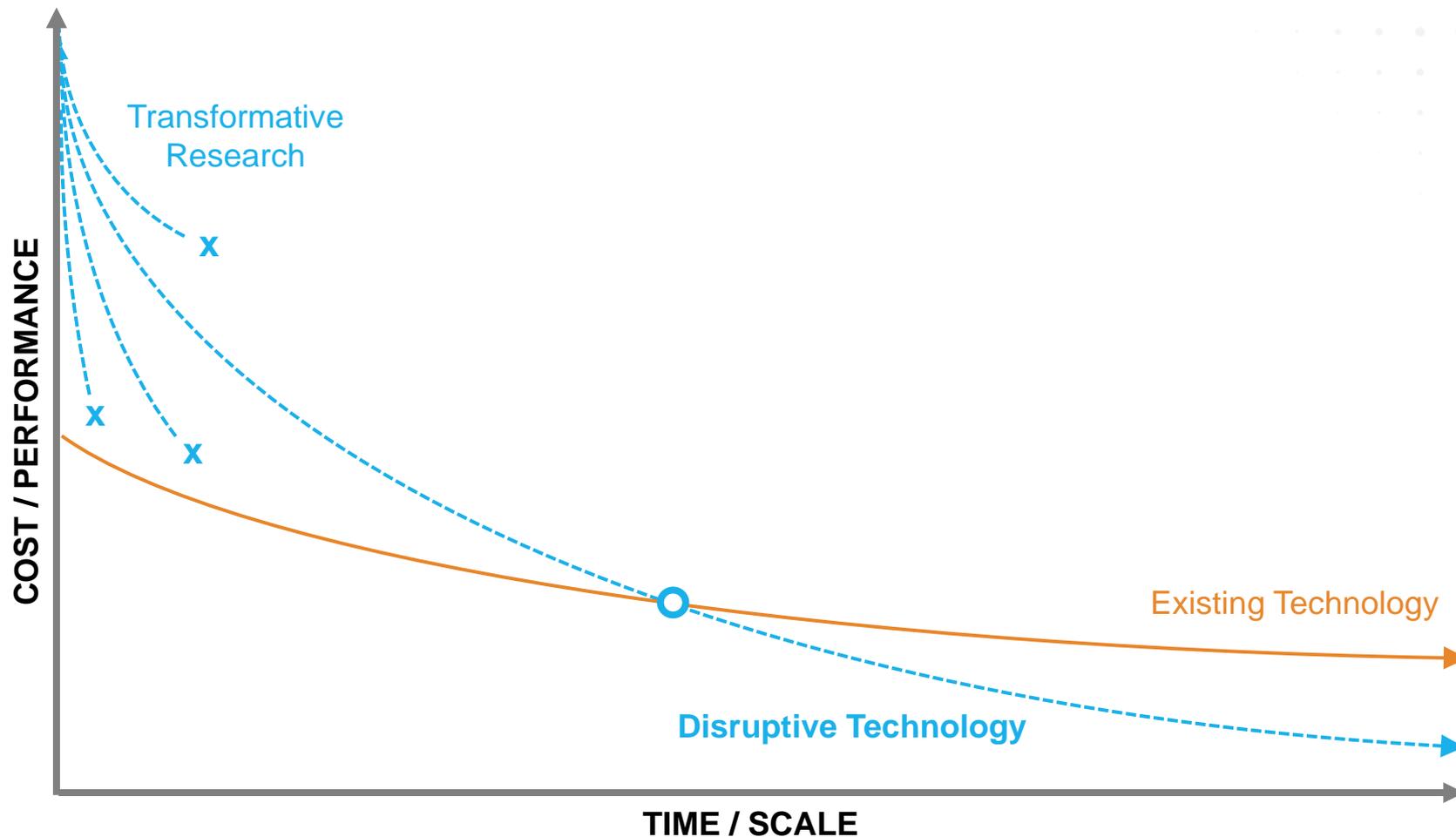
ARPA-E supports multi-institutional teams with substantial involvement from the private sector:  
74% of projects involve more than one institution  
79% of projects include the private sector, as leads or partners



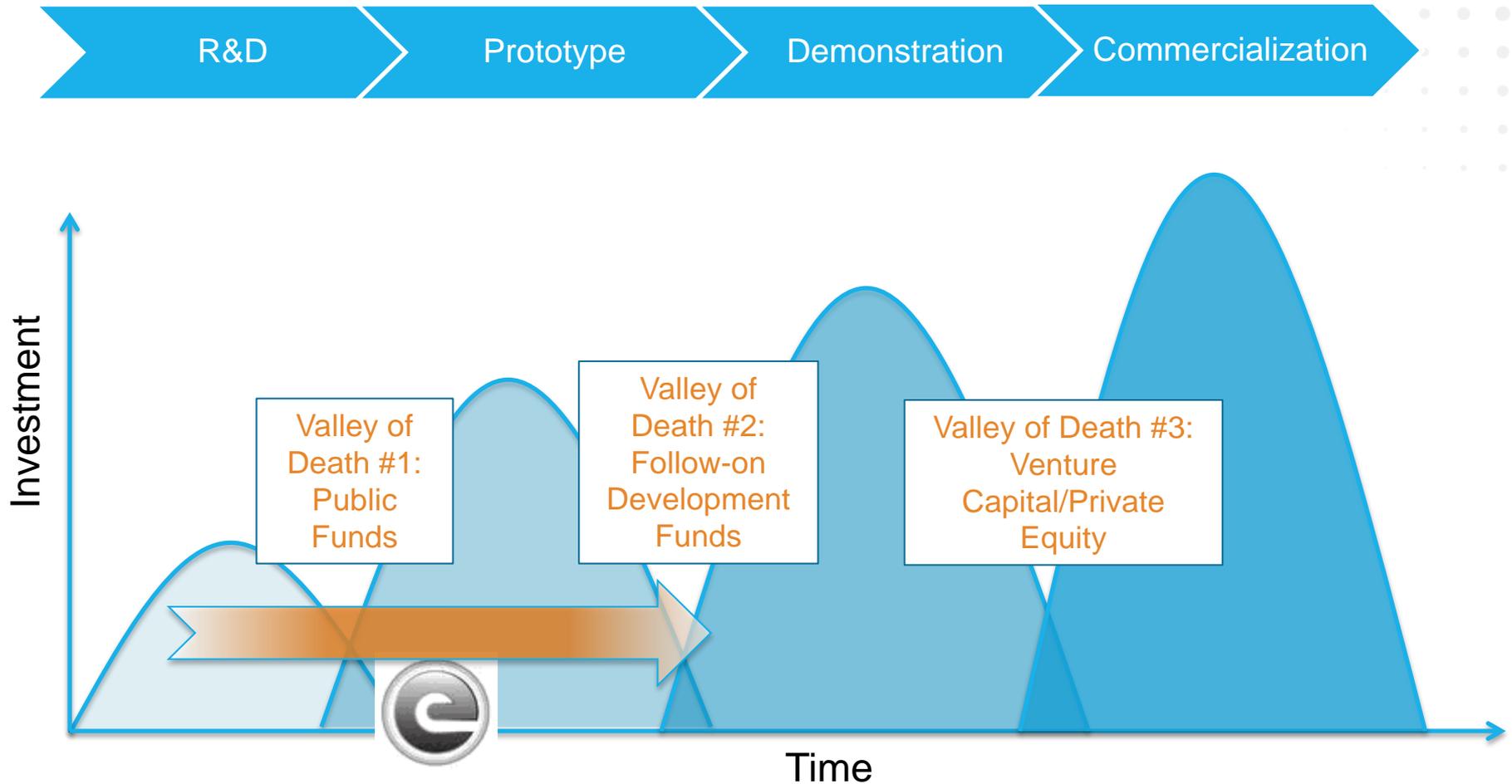
If it works...

***will it matter?***

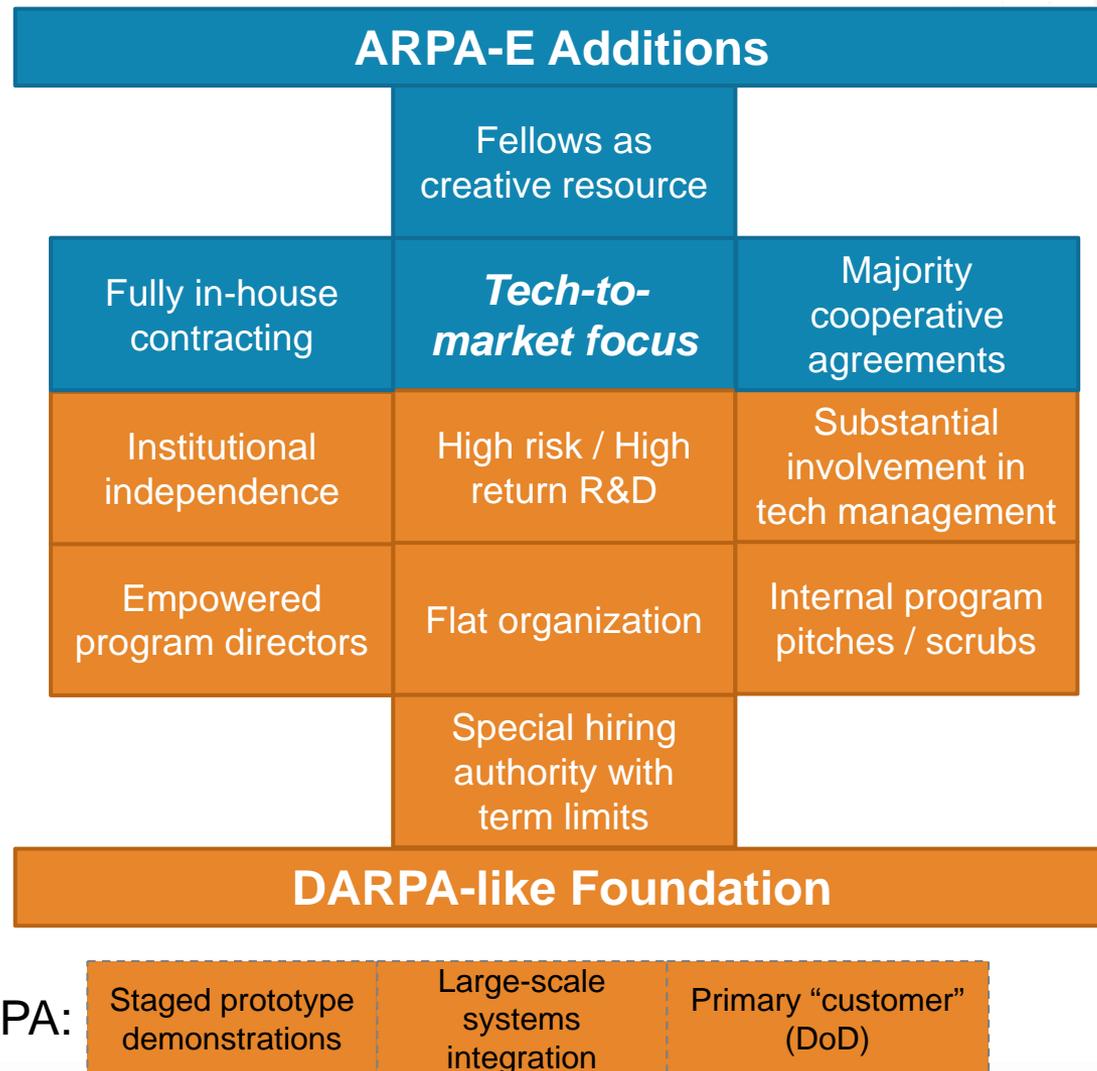
# Funding Disruptive Approaches to Innovation



# Transitions Toward Market Adoption



# Built on DARPA foundation, and still evolving...



# Technology to Market Advisors

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- ▶ **Manage:** the Commercialization progress of project technologies
  - Manage project teams' T2M efforts through T2M Plans and jointly developed milestones
- ▶ **Advise:** support project teams with skills and knowledge to align technology with market needs
  - IP and competitor management
  - Value Chain and Market analysis
  - Product hypothesis
  - Economic analysis
  - Partner discovery and engagement
- ▶ **Finance:** engage third party financiers to support continuity of technology development towards the market

*ARPA-E is continually recruiting new Tech-to-Market advisors, who serve 3-year terms*

# Program Directors – Central to ARPA-E

*ARPA-E is continually recruiting new Program Directors, who serve 3-year terms*

## ROLES & RESPONSIBILITIES

### Program development

- ▶ Perform technical deep dive soliciting input from multiple stakeholders in the R&D community
- ▶ Present & defend program concept in climate of constructive criticism

### Active project management

- ▶ Actively manage portfolio projects from merit reviews through project completion
- ▶ Extensive “hands-on” work with awardees

### Thought leadership

- ▶ Represent ARPA-E as a thought leader in the program area

## ATTRIBUTES

- ▶ R&D experience; intellectual integrity, flexibility, and courage; technical breadth; commitment to energy; communication skills; leadership; and team management
- ▶ *A passion to change our energy future*

# Fellows – Unique to ARPA-E

*ARPA-E also hires Fellows, who serve 2-year terms*

## ROLES & RESPONSIBILITIES

### Identification of high-impact energy technologies

- ▶ Perform technical and economic analyses to identify high-impact energy technologies
- ▶ Publish original research papers and reviews

### Program director support

- ▶ Help develop future programs through technical analysis, discussions, and workshops
- ▶ Assist with management of current projects, including site visits

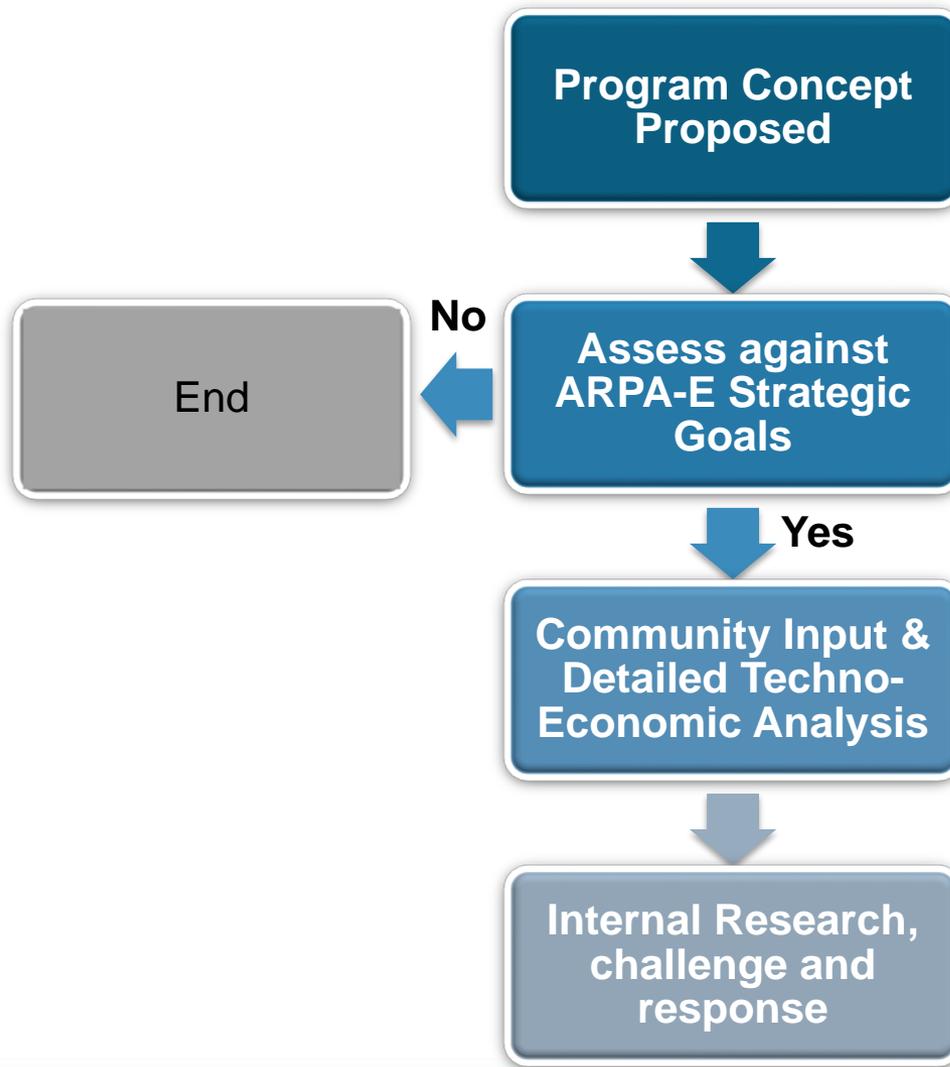
### Organizational support

- ▶ Review proposals for funding opportunities
- ▶ Contribute to the strategic direction and vision of the agency

## ATTRIBUTES

- ▶ Ph.D. in science or engineering; strong analytical and communication skills; ability to work independently and across disciplines; leadership
- ▶ *A passion to change our energy future*

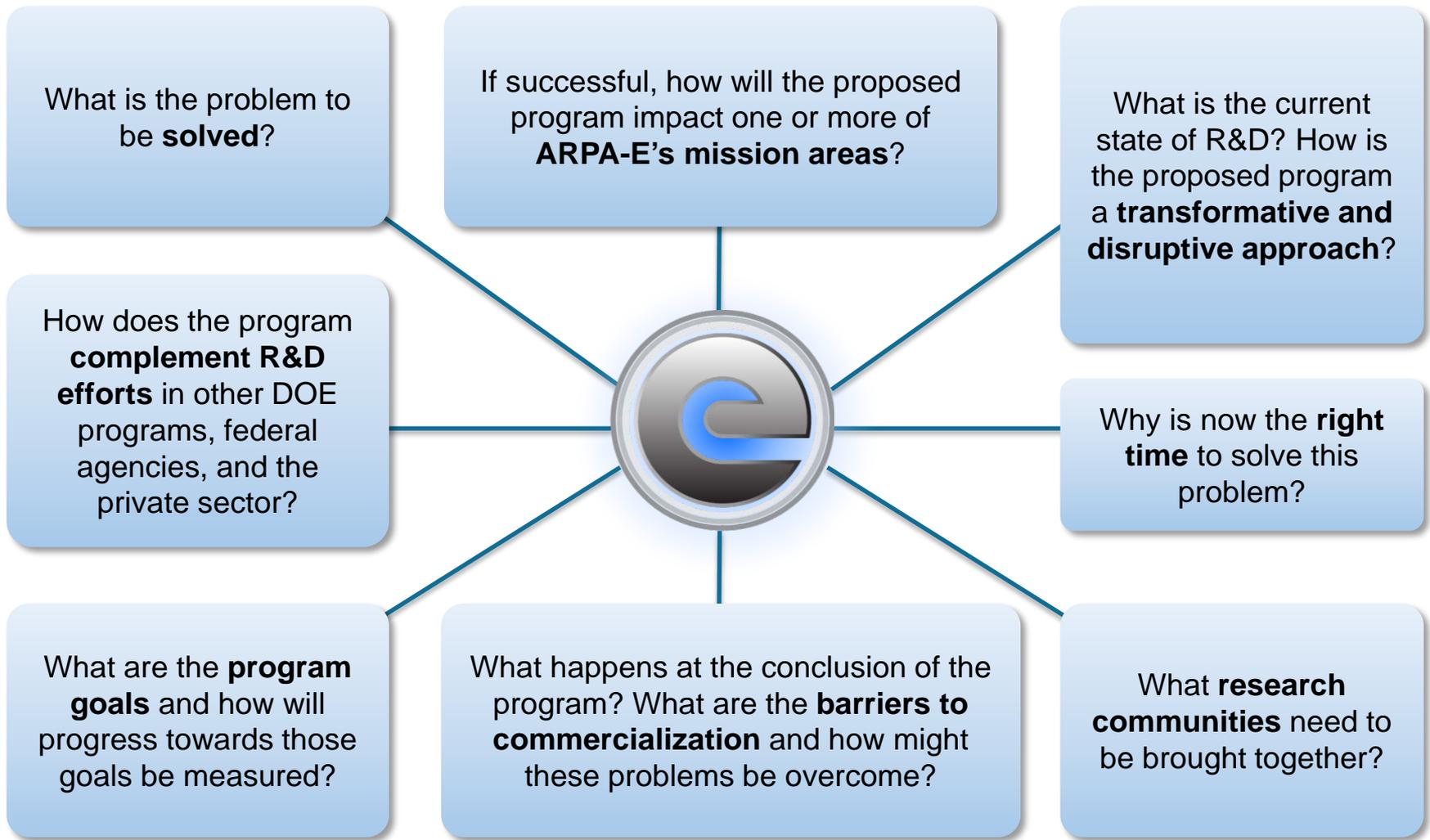
# Program Development: Concept to FOA



## PD-Led External Engagement (representative examples):

- ▶ Discussions with other DOE offices or other agencies
- ▶ Site visits (academia, industry)
- ▶ Attendance at conferences
- ▶ Webinars
- ▶ Workshop (mandatory)
- ▶ Funded external study (ARID, NODES)
- ▶ Requests for Information (RFIs)

# ARPA-E Program Framing Questions





U.S. DEPARTMENT OF  
**ENERGY**

Sign up for our newsletter at

[www.arpa-e.energy.gov](http://www.arpa-e.energy.gov)

Join us at our 2016 Summit

February 29–March 2, 2016

Gaylord National Convention Center  
just outside Washington, DC.

# What Makes an ARPA-E Project?



## IMPACT

- ▶ High impact on ARPA-E mission areas
- ▶ Credible path to market
- ▶ Large commercial application



## TRANSFORM

- ▶ Challenges what is possible
- ▶ Disrupts existing learning curves
- ▶ Leaps beyond today's technologies



## BRIDGE

- ▶ Translates science into breakthrough technology
- ▶ Not researched or funded elsewhere
- ▶ Catalyzes new interest and investment



## TEAM

- ▶ Comprised of best-in-class people
- ▶ Cross-disciplinary skill sets
- ▶ Translation oriented

# Early Measures of ARPA-E Success

## MOVING TECHNOLOGY TOWARD MARKET



- ▶ More than 37 partnerships with other government agencies
- ▶ More than 30 new companies formed
- ▶ 34 Projects have attracted more than \$850 million in private-sector follow-on funding after ARPA-E's investment of \$135 million
- ▶ Established company relationships and developed new communities
- ▶ Several technologies now in products in the marketplace



## BREAKTHROUGH ACHIEVEMENTS

- ▶ Technology breakthroughs
- ▶ Patents
- ▶ Publications



## OPERATIONAL EXCELLENCE

- ▶ Expedited program development and project selection
- ▶ Aggressive performance metrics

# ARPA-E Impact

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**INNOVATION OPPORTUNITIES**



**PATH TO COMMERCIALIZATION**



**EVOLVING PORTFOLIO**



**OPTIONS FOR THE FUTURE**