U.S. Department of Energy
Advanced Research Projects Agency – Energy

Request for Information (RFI)
DE-FOA-0001695
on
Understanding the Commercialization of Transformational Energy Technologies Through Private Capital

Overview and Purpose:

ARPA-E is focused on funding new, transformational energy technologies and facilitating awardees' efforts to bring those technologies to market. Most successful ARPA-E performers will eventually need private capital to bring their inventions and innovations to market. Traditional "Venture Capital" funding has decreased by over 50% in the past 5 years for early-stage clean energy ventures[1]. However, there is significant private capital in the U.S. economy that could be available to support this sector[2].

The purpose of this RFI is to solicit feedback from the broader private sector community and other stakeholders on their actual experiences related to: 1) either investing or declining to invest private capital in an early-stage energy enterprise; 2) either succeeding or failing to obtain private capital as an early stage enterprise; and 3) how government grant based capital either assisted or hindered the process. ARPA-E intends to use information that is responsive to this RFI on a non-attribution basis 1) to guide planning and execution of an upcoming ARPA-E public workshop on private capital financing mechanisms (venture, corporate and other funding); 2) for potential dissemination to the broader energy enterprise and stakeholder community; and 3) to strengthen potential new ARPA-E initiatives that would facilitate more private investment in emerging energy technologies.

Interested persons are encouraged to submit comments. In particular, ARPA-E is interested in receiving responses from the following types of experienced experts: 1) for-profit investors and 2) energy technology firms seeking post-grant phase funding from for-profit investors. For-profit investors include "angels", venture capital, corporations, family offices, multilaterals and developmental institutions that have made recent investments or are considering making investments in early stage energy technologies/companies. ARPA-E welcomes factual information/comments specified in the questions below.

ARPA-E will not provide funding or compensation for any information submitted in response to this RFI. This RFI is not seeking/accepting applications for financial assistance or financial incentives, and

[1] Venture Capital and Cleantech: The Wrong Model for Clean Energy Innovation, An MIT Energy Initiative Working Paper July 2016

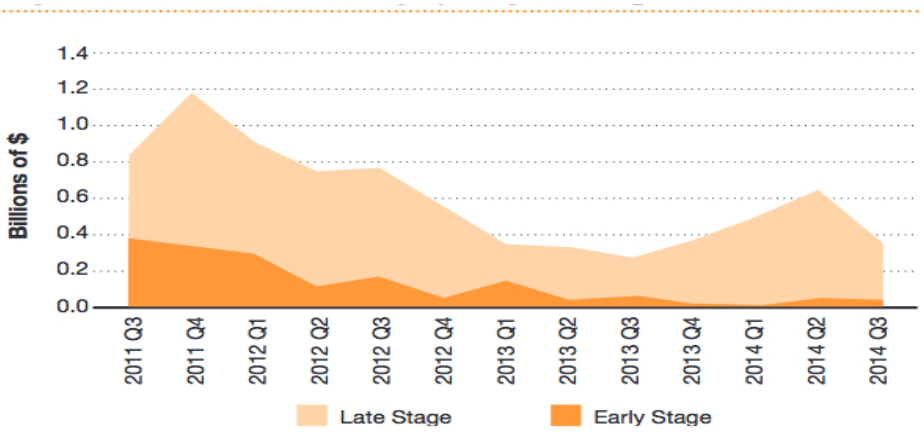
[2] Global Trends in Renewable Energy Investment 2016, Frankfurt School-UNEP Centre/BNEF. 2016.

a response to this RFI will not be viewed as a binding commitment to develop or pursue the ideas discussed. No material submitted for review will be returned. ARPA-E intends to summarize, for public release, the information submitted to response to this RFI on a non-attribution basis. ARPA-E will not publish a public compendium of each response received. ARPA-E has no obligation to respond to those who submit comments, and/or give feedback on any decision made based on the responses received.

Background:

Over the past seven years, ARPA-E has awarded over $1.25 billion applied research investments aimed at transformational energy inventions and innovation. Private capital is needed to usher these technologies into the marketplace. While ARPA-E project teams have demonstrated success in moving their early-stage energy technologies beyond their ARPA-E funded outcomes[3], the available private capital is trending negative (Figure 1). On the other hand, there are several new for-profit and nonprofit investment trends in both early and later stage energy investments that portend innovation in this capital sector.

Figure 1 – Cleantech investment funding by stage each quarter 2011-2014, PWC CleanTech[4]



What is the opportunity?

ARPA-E believes that the stakeholders' interest in participation has grown significantly since 2015 with new financial intermediaries, new hard technology venture capitalists, growing end user awareness and local governmental initiatives on energy resiliency. There is also interest in the role of public policy to encourage and sustain the continuous progress of innovative energy technologies throughout this cycle by reducing or eliminating pervasive obstacles to the flow of capital[5].

[3] https://arpa-e.energy.gov/?q=news-item/arpa-e-projects-receive-more-125-billion-private-follow-funding-transformational-energy
[4] PwC Cleantech Moneytree Report: Q4 2014. http://www.pwc.com/cleantech
[5] Jenkins, J. & Mansur, S. "Bridging the Clean Energy Valleys of Death", Breakthrough Institute, November 2011.

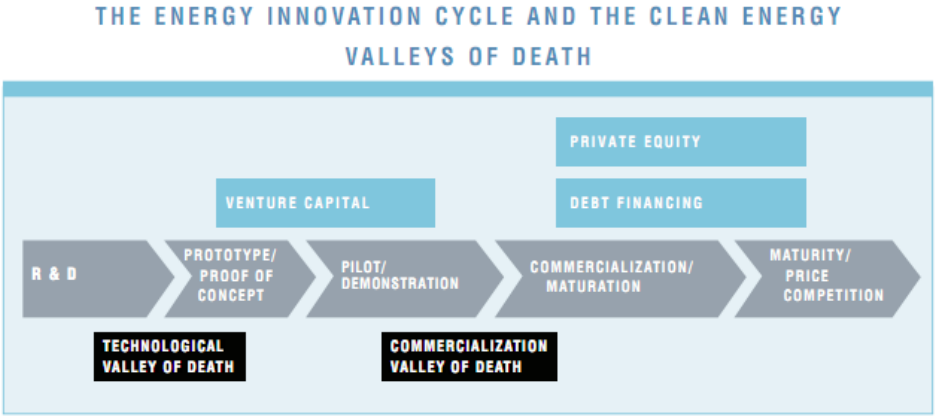


Figure 2 – Energy Innovation Cycle

In an attempt to understand the implications of the up-trending curve, ARPA-E has initiated a strategic review of private capital financing mechanisms among the prevailing practices and experiences of vintage investors and energy technology firms to evaluate the risks and opportunities within the current system. Responses to the RFI will assist ARPA-E in specifying the problems its technically successful project teams face in the existing "valley of death"[6] in available investment capital, and from this developing options for ARPA-E to consider in its role as a critical enabler in the technology maturation value chain.

In January 2017, ARPA-E plans a public workshop of experts in financial engineering to address mechanisms (venture, corporate and other funding) that would facilitate more private investments in emerging energy technologies. The anonymized responses to this RFI will enable ARPA-E to characterize an investment framework to share with the participants in an open discussion of relevant mechanisms that represent all the stakeholder objectives. A goal of the workshop will be examination of framework mechanisms that are related to financial engineering mechanisms, investment criteria, infrastructure, public policies and other capacity related enablers. Additionally, components of a new investment framework will be developed and debated by the participants for potential dissemination to the broader Government and private sector community.

Invited participants will include a broad spectrum of stakeholders to participate at the workshop: 1) capital sources (coalition groups, single family offices, endowments and public pension funds, multilateral and development institutions); 2) financial intermediaries (tax experts, insurance, credit enhancement, investment bankers, etc.); and 3) commercialization ecosystem (entrepreneurs, corporate executives and accelerators/ incubators, etc.).

ARPA-E's objective for this work is to strategically understand and act on opportunities for delivering the best value through its projects during a time of evolving structure in investments for clean energy technology. The first step in the process after the workshop will be to communicate the results of this RFI and the workshop at the ARPA-E Innovation Summit in Feb/March 2017. Subsequently, empirical evidence will be presented in the form of whitepapers or published articles that highlight what was learned about the new frameworks and/or mechanisms that could mobilize capital into early stage energy technology development and commercialization.

[6] Hartley, P. R., & Medlock III, K. B. (2014). *The Valley of Death for New Energy Technologies*. University of Western Australia, Economics.

Guidelines:

Responses to this RFI should be submitted in Word format by e-mail only to ARPA-E-RFI@hq.doe.gov no later than **5:00 PM Eastern Time on ~~December 2, 2016~~ January 13, 2017**.

- Please insert "Responses for RFI Number DE-FOA-0001695" in the subject line of your email, and include your name, title, organization, type of organization (e.g., university, non-governmental organization, small business, large business, federally funded research and development center (FFRDC), government-owned/government-operated (GOGO), etc.), email address, telephone number, and area of expertise in the body of your email.

- For the two categories below (A and B), each contains four topics ("Investments Made", "Investments Not Made", etc.). Responses to this RFI must not exceed 2 pages per topic (single space, Times Roman 12-point font size).

- Your response may contain confidential, proprietary, or privileged information that is exempt from public disclosure, provided such information is specifically marked as proprietary. Such marked information shall be used or disclosed only for evaluation purposes. The Government may use or disclose without restriction any information that is not appropriately marked or otherwise restricted, regardless of source.

- ARPA-E may follow-up with any submitter, as needed, to clarify or obtain additional specificity concerning responses to this RFI.

Categories of Interest:

ARPA-E is interested in receiving information on the two categories outlined below. Responses should present facts based on actual experiences. Opinions on relevant topics (improving funding mechanisms, best investment conditions, best valuation methods, etc.) will be addressed separately at the planned public workshop and other forums/means.

Category A: For-Profit Investment Considerations for Venture, Corporates, Institutional, Family Offices etc.

1. [**Investment Made**] What factors are important in decisions to invest in an early stage energy technology entity? Please address the following issues, and others as relevant, using a specific case (or cases) as an example:
    - How was the opportunity discovered? What was the valuation process, investment criteria? What was the recipients' management depth? How did these factors influence the investment amount and terms?

2. [**Investment Not Made**] What factors lead to the rejection of an early stage energy investment after conducting significant due diligence? Please detail an example of a specific technology entity that did not succeed after an investment was made. Please address the following issues related to the entity:

- How much of the rationale for the investment rejection was the technology, leadership or lack of policy incentives? Please provide details if the technology firm received an investment elsewhere?

3. [**Policy Incentives**] How large a factor is it for targeted energy technology firms to have previously received government grants/financial resources? Please address the following issues using a specific example (or examples) of a technology entity you have considered:
    - What are the details of the federal, state, or local grants received? What was the amount, purpose, and government organization that provided funding? How did the receipt of government grants influence the decision to invest into the entity?

4. [**Investment Metrics**] What factors would have resulted in an enhancement of your investments into early stage technology firms? How does it differ for hard technology entities? Please address the following related issues:
    - How does the role of government grants improve the risk-return characteristics? What conditions would enhance the risk-return profile? Does co-investments with social and nonprofit investors positively influence the decision to invest?

Category B: Considerations for For-Profit Energy Technology Entities that have received or sought Investments from For-Profit Investors:

1. [**Grant]** What factors lead to an early technology entity receiving a federal, state, or local grant or financial resources? Please address the following related issues using a specific example (or examples) from your experience::
    - What are the details of the federal, state, or local grants received including the amount, purpose, and government organization that provided funding?
      How did the government grant process occur? What was the grant impact on your firm' ability to innovate early stage CR/EE technologies? How did the early stage government grant assist in achieving later stage private capital? How did the process differ from the follow-on funding from for-profit investors?

2. [**Investment Received**] What factors have led to successful private capital investment into your firm? What conditions facilitated the meetings with the investors? Please use a specific recent example (or examples) to address these questions and the related issues:
    - What conditions were considered in the due diligence process? valuation discussions? What investment amount was received? What are the different investment standards among the various investor types?

3. [**Investment Rejection**] What conditions have led to a for-profit investor rejecting the investment in spite of performing due diligence process? Please use a specific recent example (or examples) to address this question and the following related issues:
    - How extensive was the investment review? What investment did you receive from other investors? What factors led to the investments received from other for profit investors? What policy incentives could have turned the rejection into a positive investment?

4. [**Investment Metrics**] What presentation materials and strategy was deployed by your entity to achieve a successful investment from private capital investors? Please address these related issues:

- What kind of assistance did your entity receive in preparing for investors from ARPA-E or others? What factors did your presentation emphasize - e.g. cost advantage, market scale, location of your firm, prototype, commercialization time frame? How did the due diligence process differ between corporate and private investors? What factors are considered in selecting to partner with corporate investors and private venture capital?