

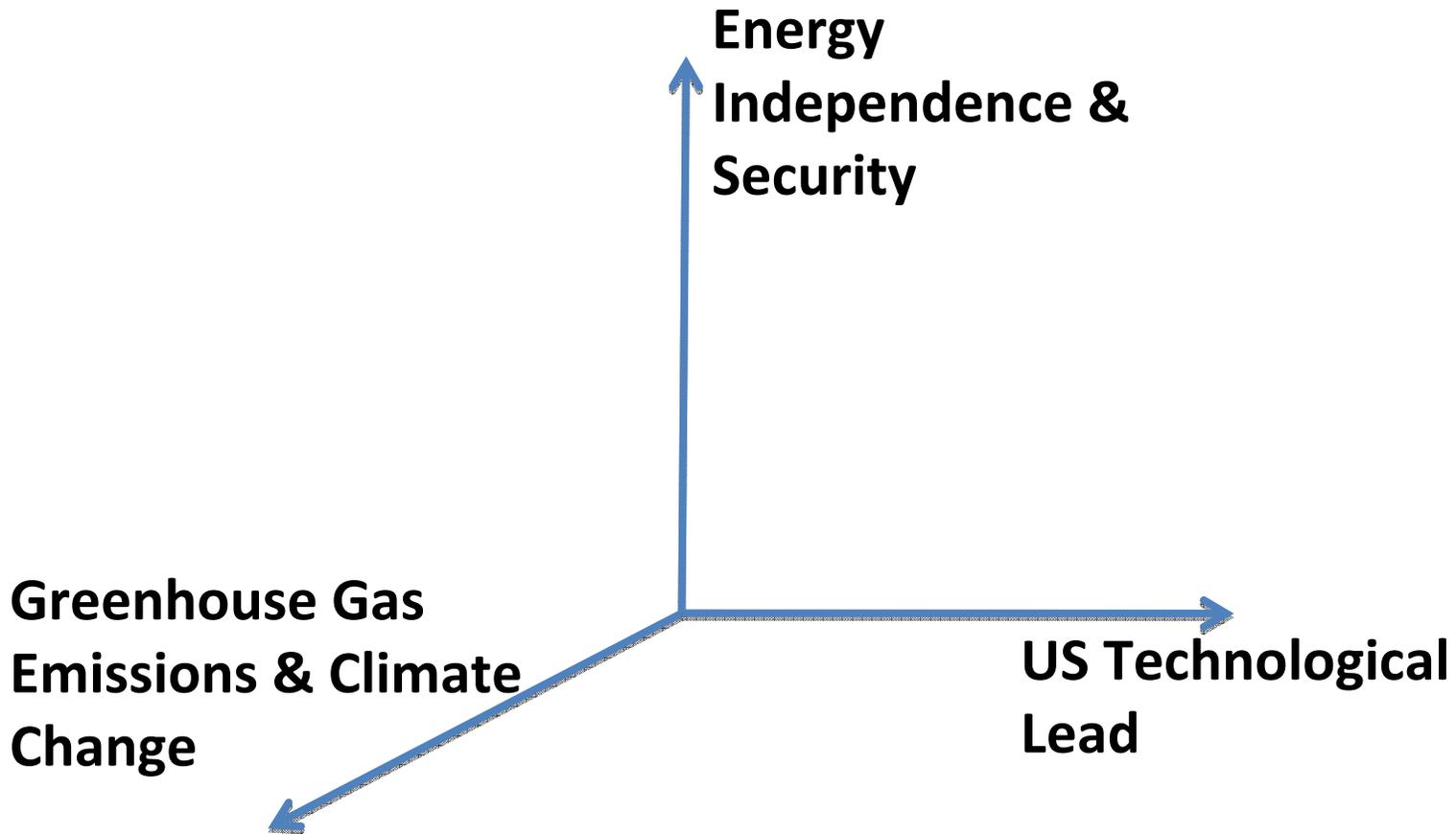


# Advanced Research Projects Agency – Energy (ARPA-E)

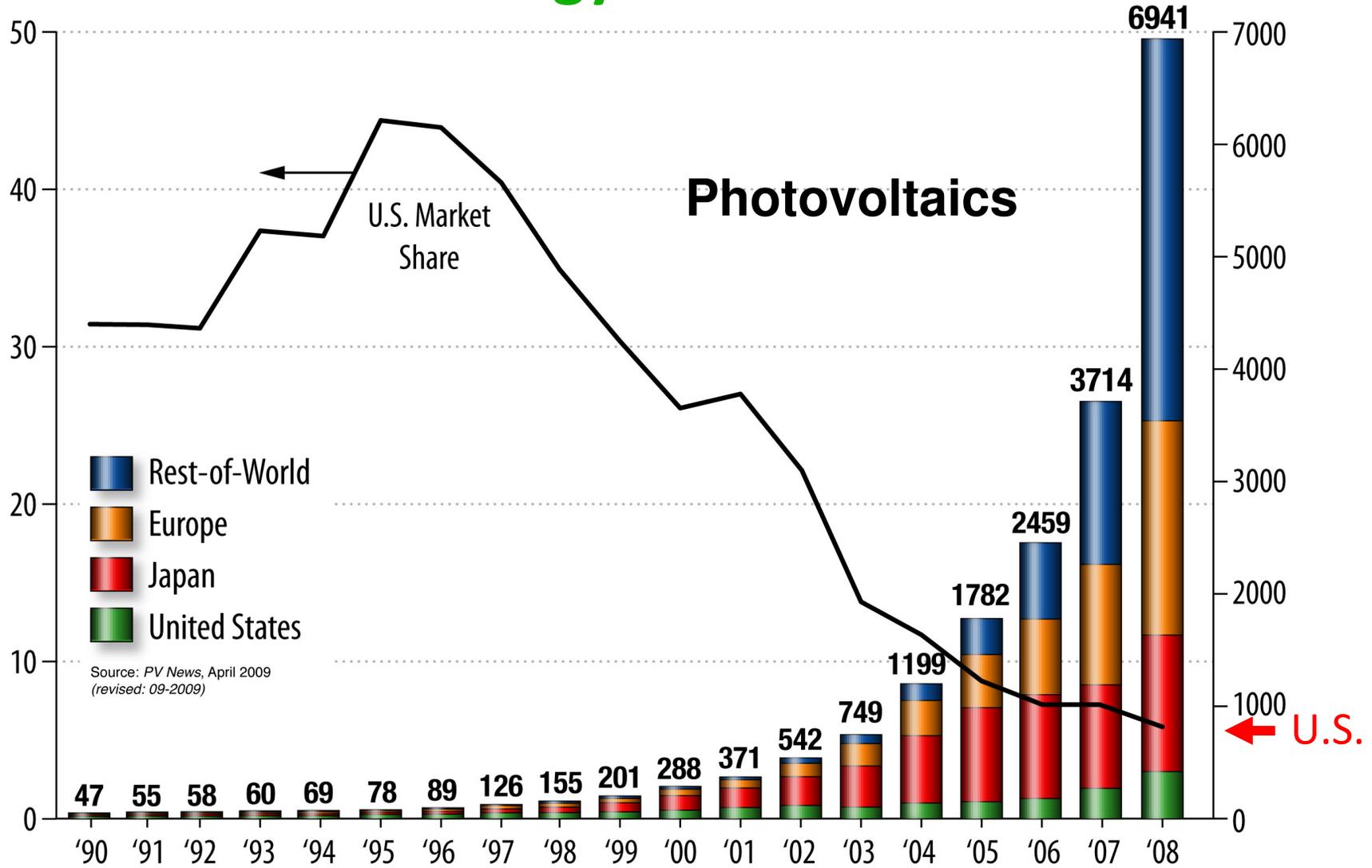
## Program Overview

January 27, 2010

# Three Sputniks of our Generation



# We are falling behind in the clean energy race



Worldwide shipments of Solar Photovoltaics – in Megawatts



# Pace and Scale of Innovations Needed in Energy Technologies



## Game Changers from 20<sup>th</sup> Century

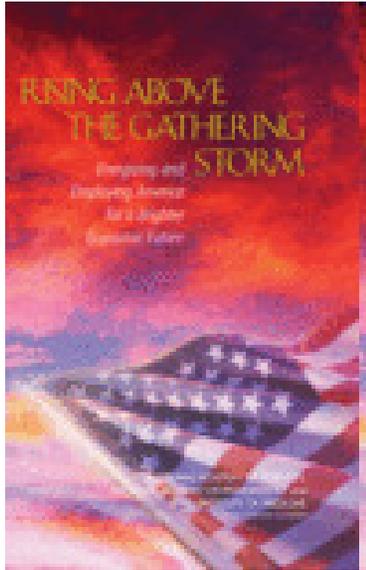
- Artificial Fertilizers
- Green Revolution
- Transistor
- Aeroplanes
- Electrification
- Polio Vaccination
- Antibiotics
- Nuclear Energy
- Integrated Circuits
- Fiber Optic Communication
- CCD cameras
- Wireless Communication
- Internet

**Imagine all of this happening in a span  
of 10-20 years...**

**That is what we need now to address the  
biggest challenge of our lifetimes...**

**Identify and support today's  
Haber, Bosch, Borlaug,  
Bardeen, Shockley, Brattain,  
Salk, Wright brothers, Kilby,  
Noyce, Gates, Jobs, Page, Brin  
of the energy field**

# Background on ARPA-E



## Rising Above the Gathering Storm, 2006 (National Academies)

- Establish an Advanced Research Projects Agency for Energy (ARPA-E)
- “Creative, out-of-the-box, transformational” energy research
- Spinoff Benefit – Help educate next generation of researchers
- Secretary Chu (then Director of Berkeley National lab) on committee



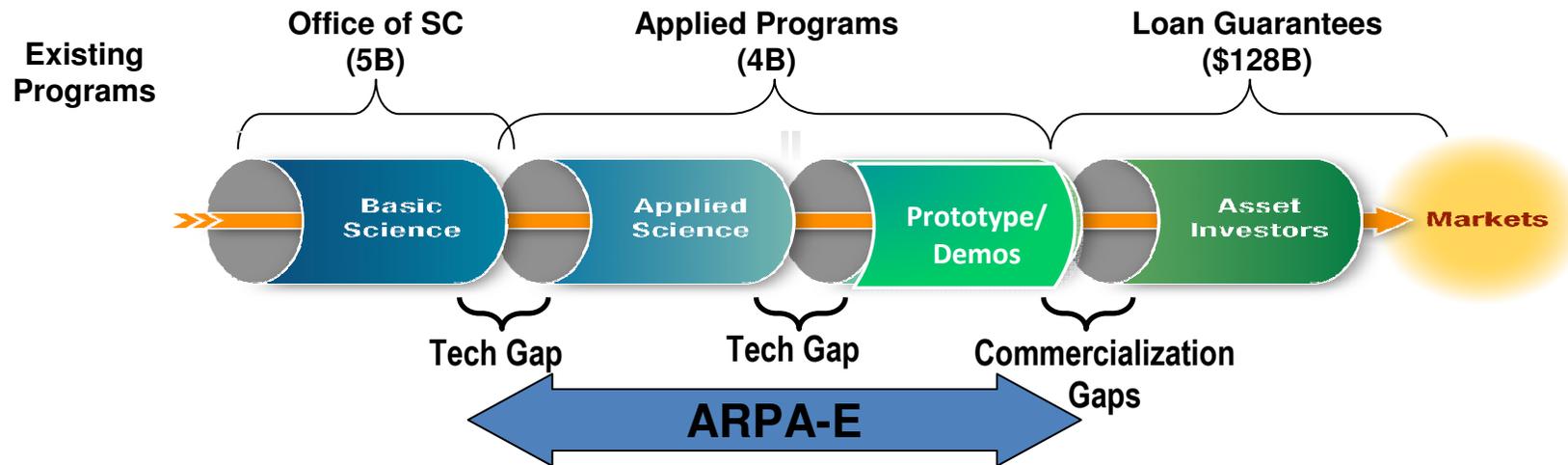
## America COMPETES Act, 2007

- Authorizes the establishment of ARPA-E

## American Recovery and Reinvestment Act of 2009 (Recovery Act)

- \$400M provided for ARPA-E
- President Obama launches ARPA-E in a speech at NAS on April 27, 2009

# Energy Innovation Pipeline



## What ARPA-E will do

- Disruptive transformational projects
- High risk, high potential programs
- Projects in need of rapid and flexible experimentation/engineering
- Marry technical opportunities with mission gaps
- Breakthrough science that can transform a field
- Outcome focused: to meet climate & energy security objectives; not on a particular scientific problem
- Technology development

## What ARPA-E will not do

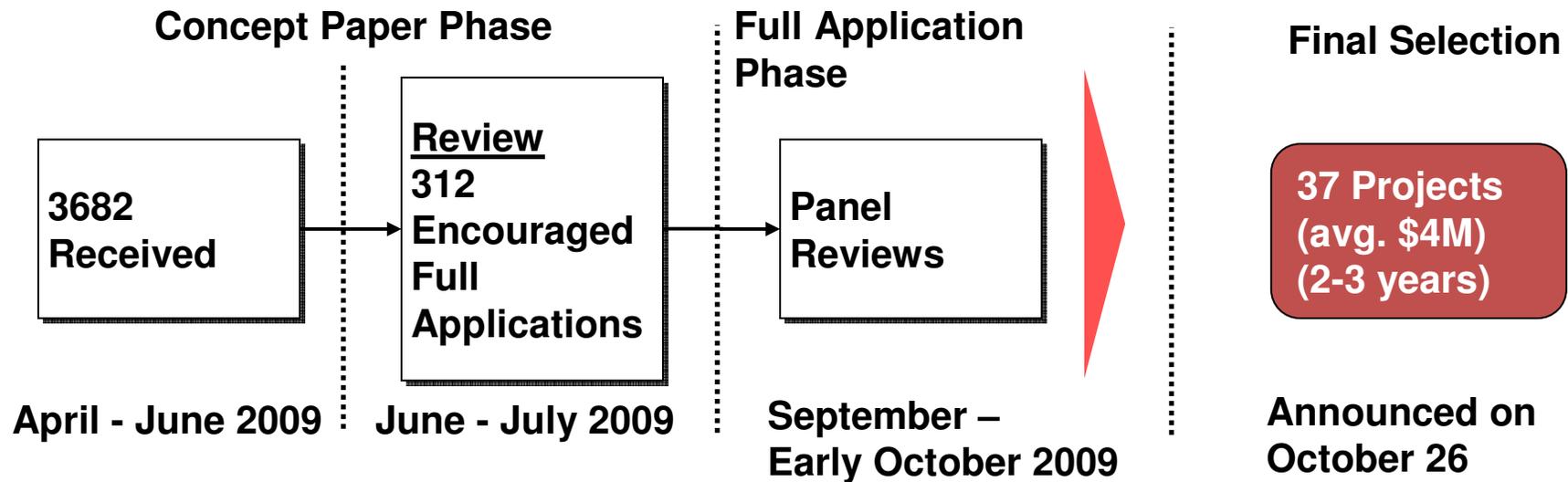
- Basic Research
- Lowest Technology Readiness Levels project
- Projects longer than 5 years
- Evolutionary improvements
- Large scale commercial viability demos



# Report on First Funding Opportunity Announcement

# ARPA-E has moved on from an extensive review process to an aggressive award schedule

## FOA 1 Overview

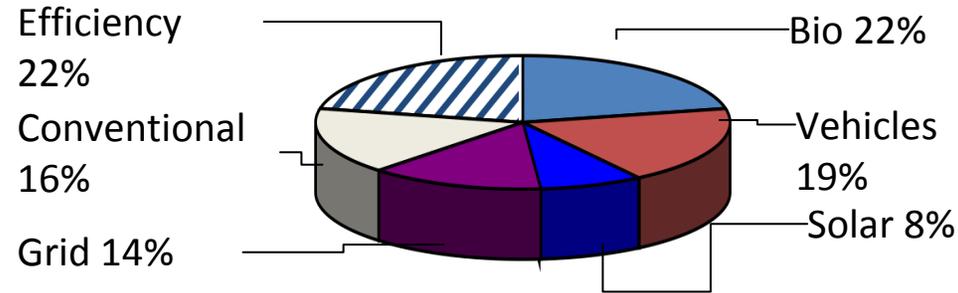


## Award Negotiation

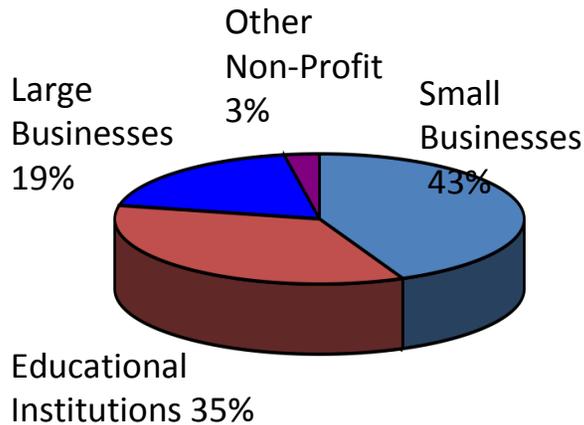
- Between October 26<sup>th</sup> and January 15<sup>th</sup>, ARPA-E completed negotiations totaling:
  - 35 out of 37 (95%) of award agreements signed
  - \$134 M out of \$151 M (89%) total FOA 1 funding awarded
- All negotiations will be completed by January 31, including three TIA (Other Transactions)
- ARPA-E has cut 60% off the average DOE procurement cycle time, defining a new benchmark for program performance

# Summary of Applications Funded

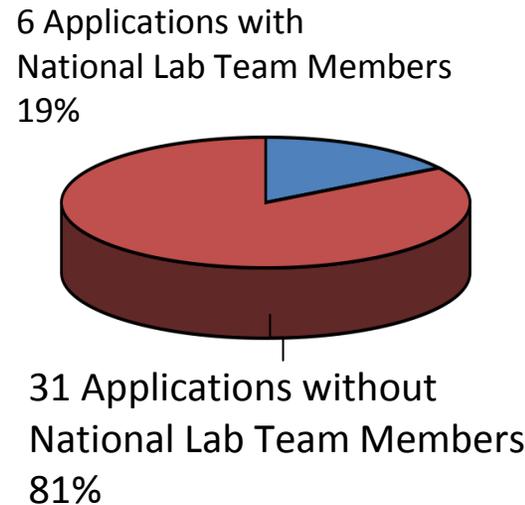
**Application Distribution by Topical Panel**



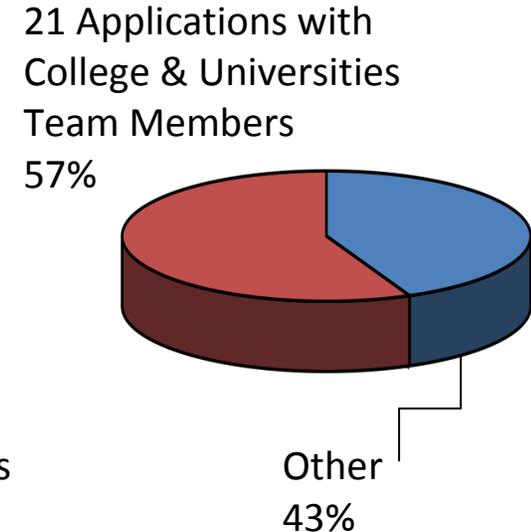
**Lead Organization Type for Selected Projects**



**National Lab Participation**



**College & University Participation**

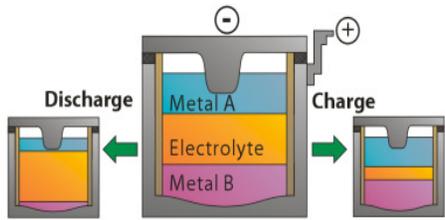




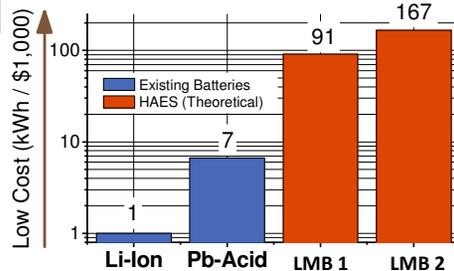
## High Amperage Energy Storage Device: Energy Storage for the Neighborhood – MIT

### Proposed Technology vs. State of the Art

A new approach: Liquid Metal Battery (LMB)

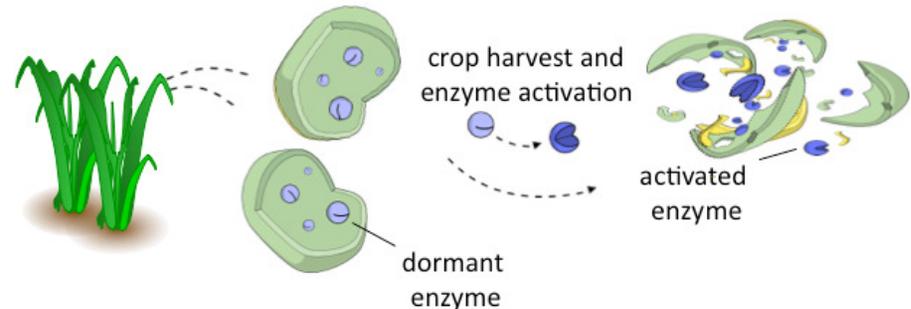


More energy than Li-ion,  
cheaper than Lead-Acid



## Agrivida

### GreenGenes™ Technology

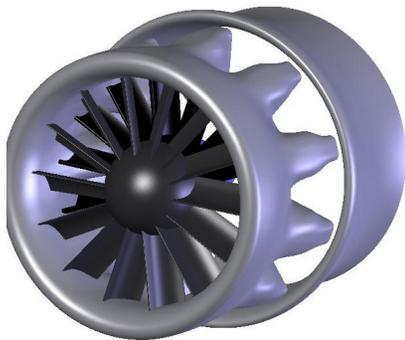


Trigger biomass breakdown using plants' own genes

## Breakthrough High Efficiency Mixer/Ejector Wind Turbine (MEWT) –

FloDesign Wind Turbine Corp.

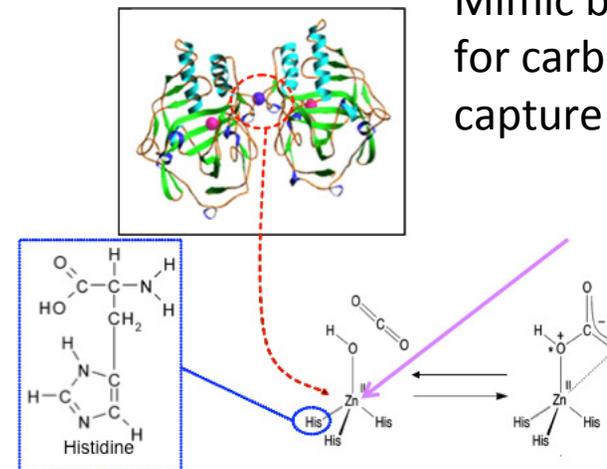
### Proposed Technology vs. State of the Art



- Mimic jet engines, not propellers for wind turbine
- 40% lower cost expected vs. horizontal axis wind turbines (HAWT)

## CO<sub>2</sub> Capture using a Synthetic Analogue of Carbonic Anhydrase - UTC

Mimic biology for carbon capture



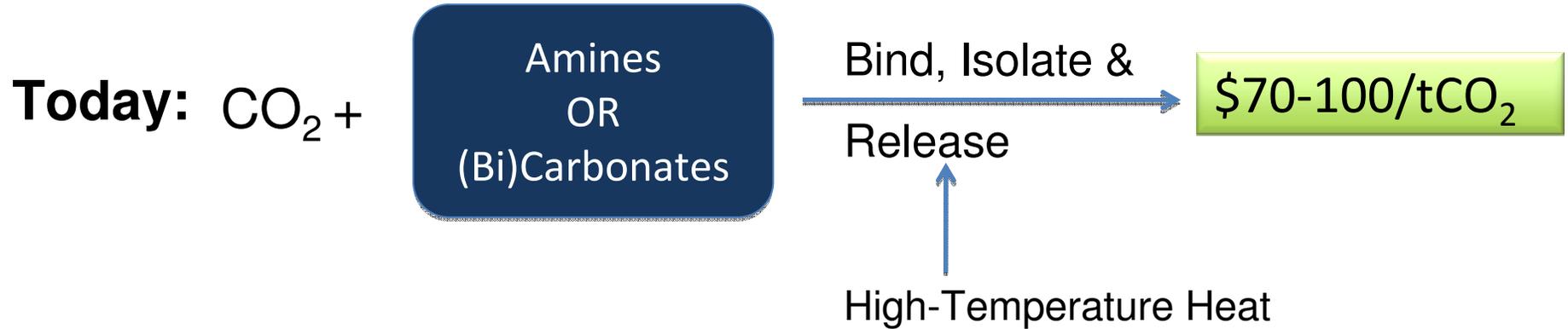


# Funding Opportunity Announcement 2

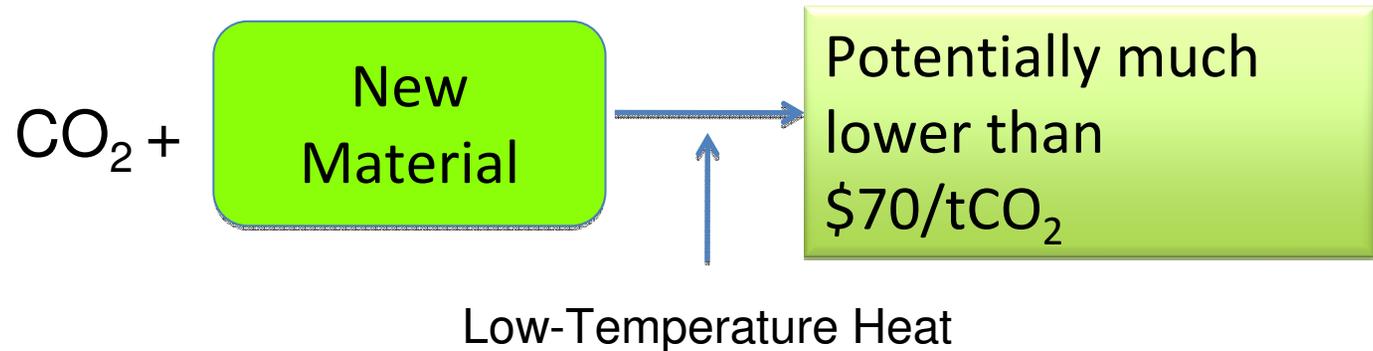
Announced Dec. 7<sup>th</sup>, Closed Jan. 15<sup>th</sup>



# Innovative Materials and Processes for Advanced Carbon Capture Technologies (IMPACCT)



**ARPA-E  
High-Risk/  
High-Reward:**



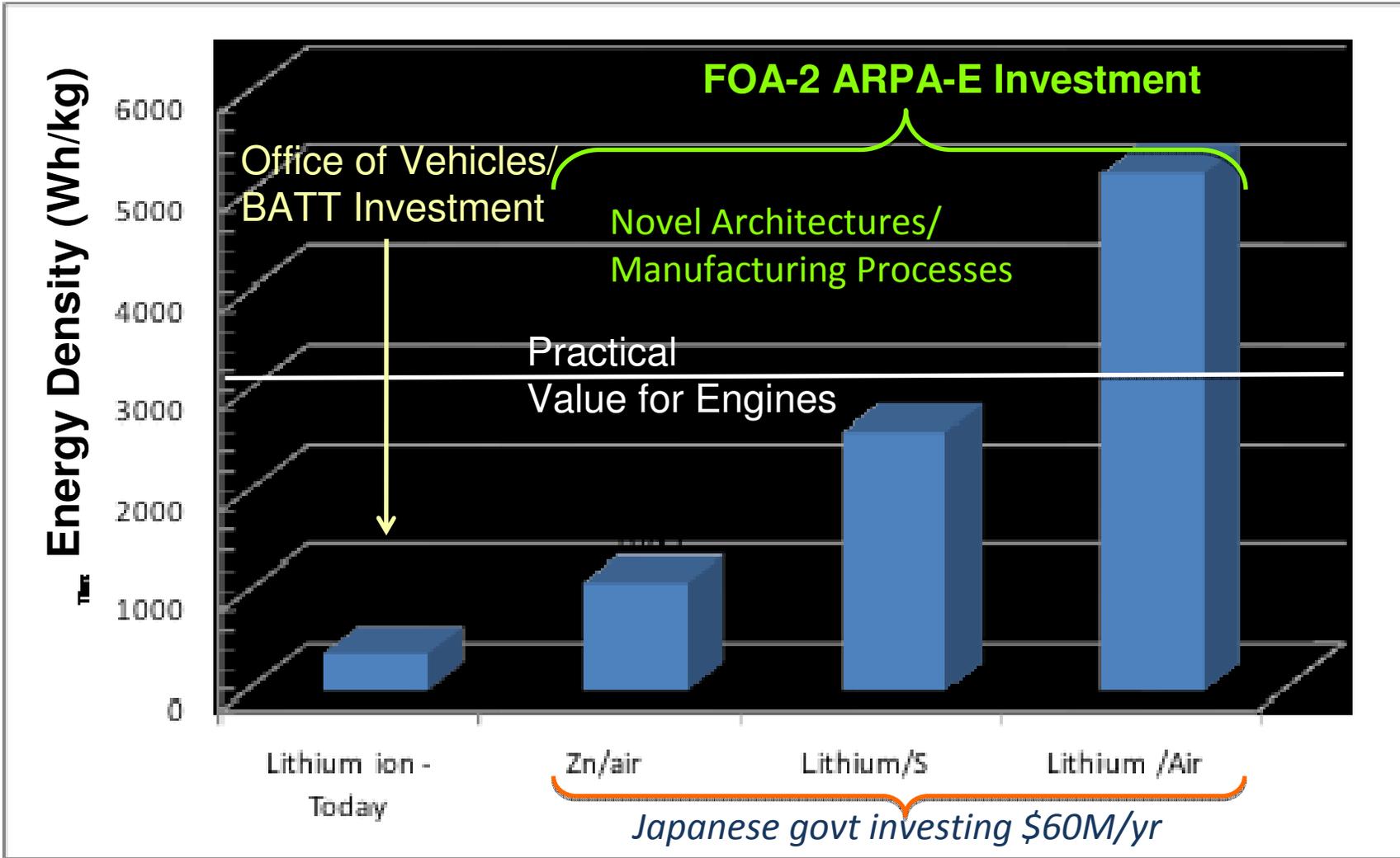
**RFI + ARPA-E Workshop on Oct 29<sup>th</sup>**



# Batteries for Electrical Energy Storage for Transportation (BEEST)



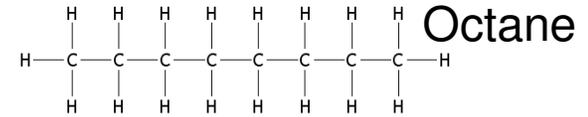
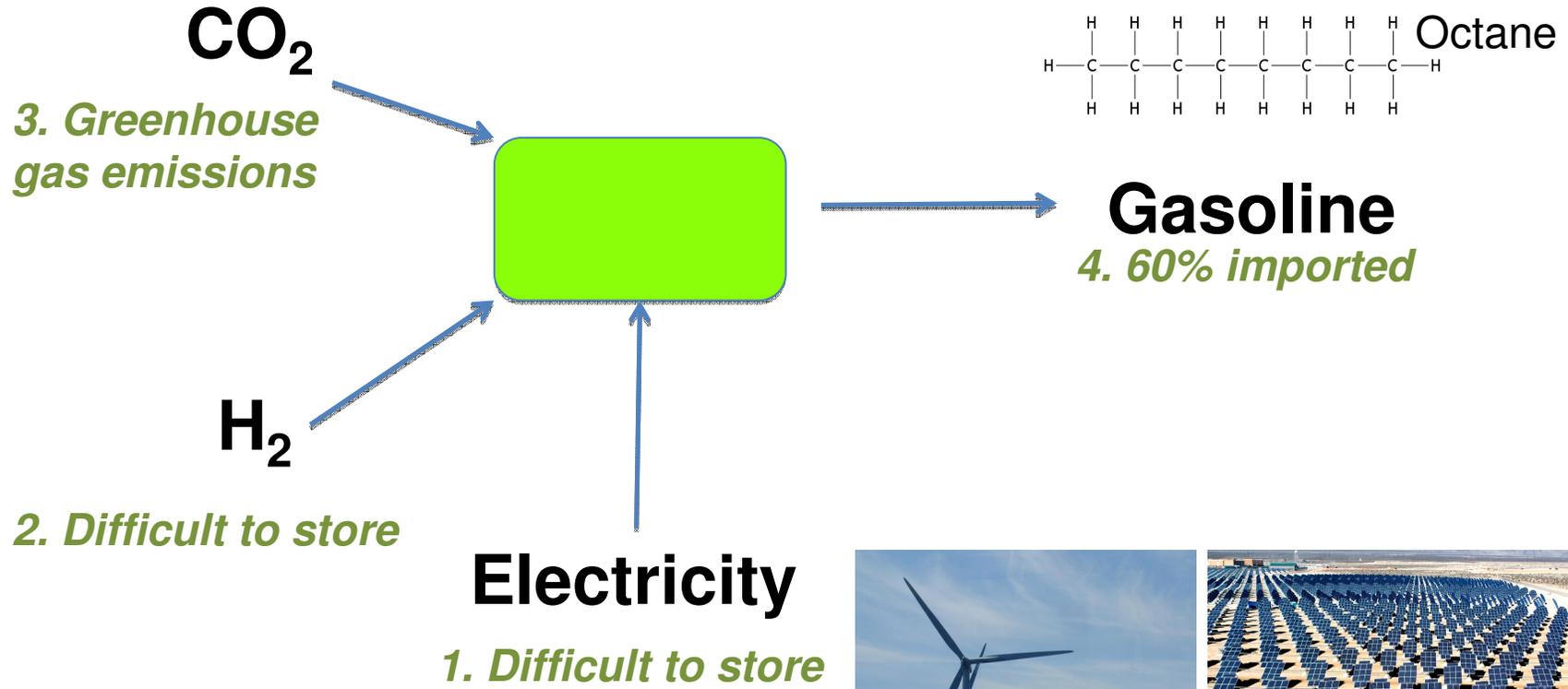
RFI+ ARPA-E Workshop on Next Gen. Batteries, Nov 3<sup>rd</sup>



# Electrofuels



RFI + ARPA-E Workshop on Direct Solar-to-Fuel, Oct 21<sup>st</sup>



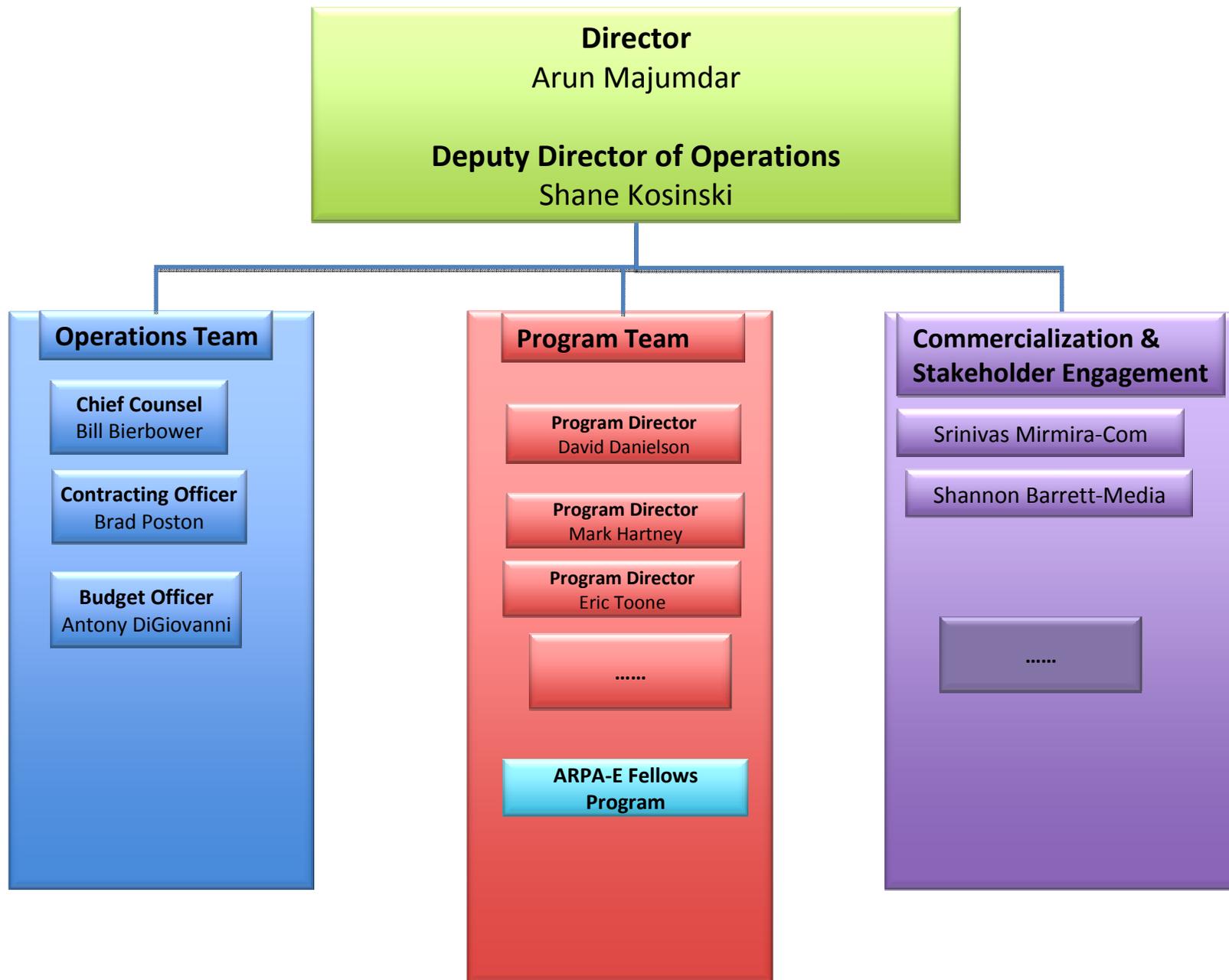


# ARPA-E: Innovations in Process

- **Organization:** Flat, nimble, agile, collaborative, internal debates and discussions
- **Excellence:** Recruit all-star team to ARPA-E; focus on highly selective and potentially game-changing ideas; enable creation and support of the best teams
- **Openness:** Open to best ideas regardless of origin; sharing and partnership with Congress and other stakeholders; public understanding of value of technology for society
- **Integrity:** New program creation and proposal review process
- **Speed:** Streamline transactions; accelerate science to market; respond to community input
- **Metrics of Success:** quantitative value creation



# ARPA-E Organization



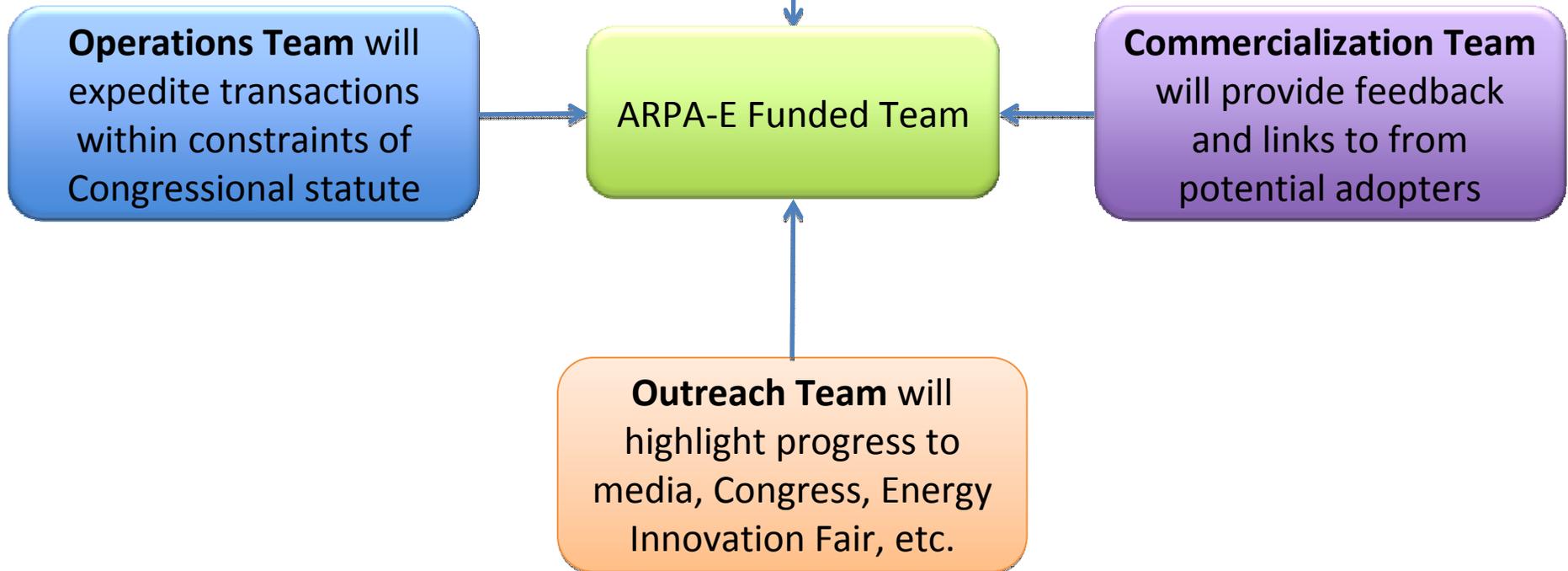


# Value of ARPA-E Investment



The funded teams don't just get ARPA-E \$....

They will get full coordinated support and scrutiny from ARPA-E team.....



- **ARPA-E Energy Innovation Summit (March 2<sup>nd</sup> & 3<sup>rd</sup>)**

- Annual Event in Washington DC

- Purpose

- Showcase ARPA-E technology innovations
- Provide platform for PIs who did not get funded by ARPA-E to other potential investors
- Engage stakeholders and discuss means to create smooth innovation pipeline



- **ARPA-E Day on the Hill (Day before the Energy Innovation Fair)**

- Explain our vision/mission and showcase ARPA-E technologies

- **ARPA-E -Venture Capital Day (Annual event)**

- Identify strategies for leveraging

- Identify strategies to accelerate scaling of ARPA-E technologies for market impact