

ARPA-E Workshop

Accelerating Grid Technology Introduction and Deployment

Mr. Jon Glass, Acting Deputy Director for Commercialization (jonathan.glass@hq.doe.gov)

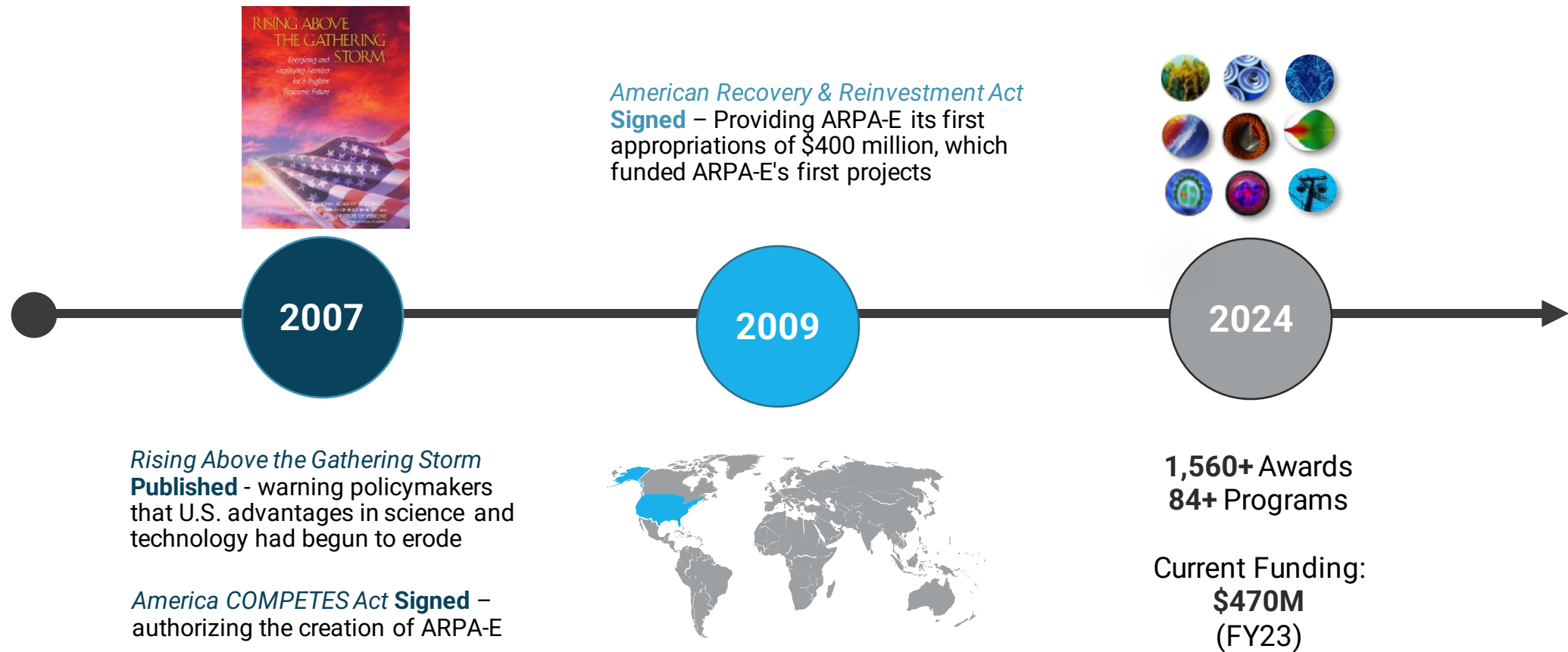
Dr. Philseok Kim, Program Director (phil.kim@hq.doe.gov)

Dr. Christian Vandervort, Tech to Market Advisor (chris.vandervort@hq.doe.gov)

February 29, 2024

History of ARPA-E

In 2007, The National Academies recommended Congress establish an Advanced Research Projects Agency within the U.S. Department of Energy to fund advanced energy R&D.



ARPA-E Mission



REDUCE
imports



REDUCE
emissions



IMPROVE
efficiency



IMPROVE
radioactive waste
management



IMPROVE
energy infrastructure
resilience

What Problems are We Trying to Solve?



Resilient energy infrastructure for the 21st century



Affordable, sustainable energy for all



U.S. economic development



American leadership in science and technology



Reduce energy-related emissions

ARPA-E Technology Initiatives

Providing technology leadership and funding across the energy spectrum:



Transportation
Fuels



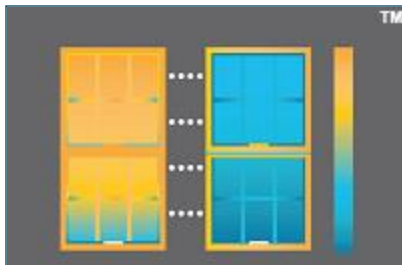
Advanced
Batteries



Power Conversion
& Smart Grid



Power
Generation



Building
Efficiency



Agriculture
Technologies

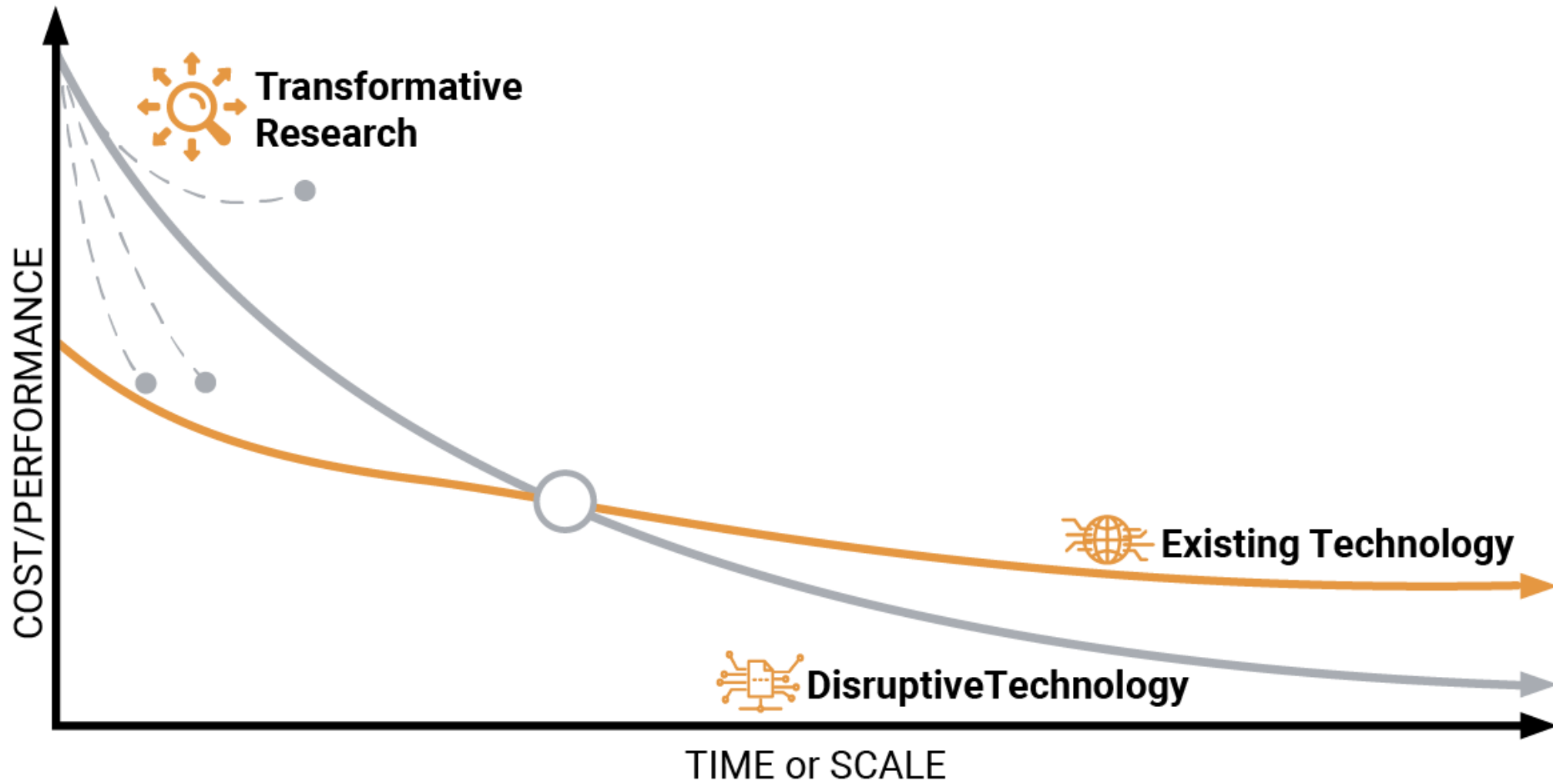


Materials and
Manufacturing

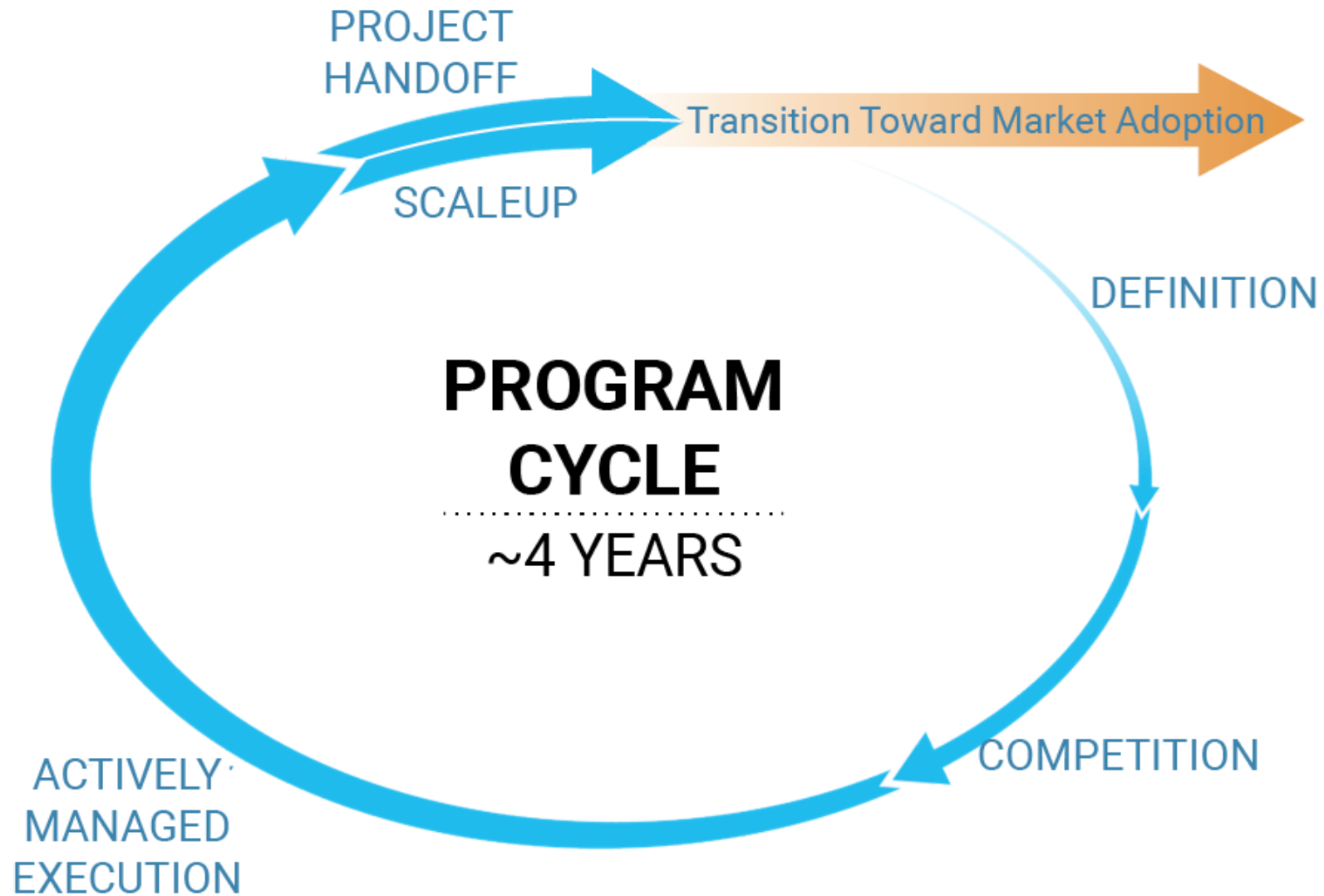


Transportation
Technologies

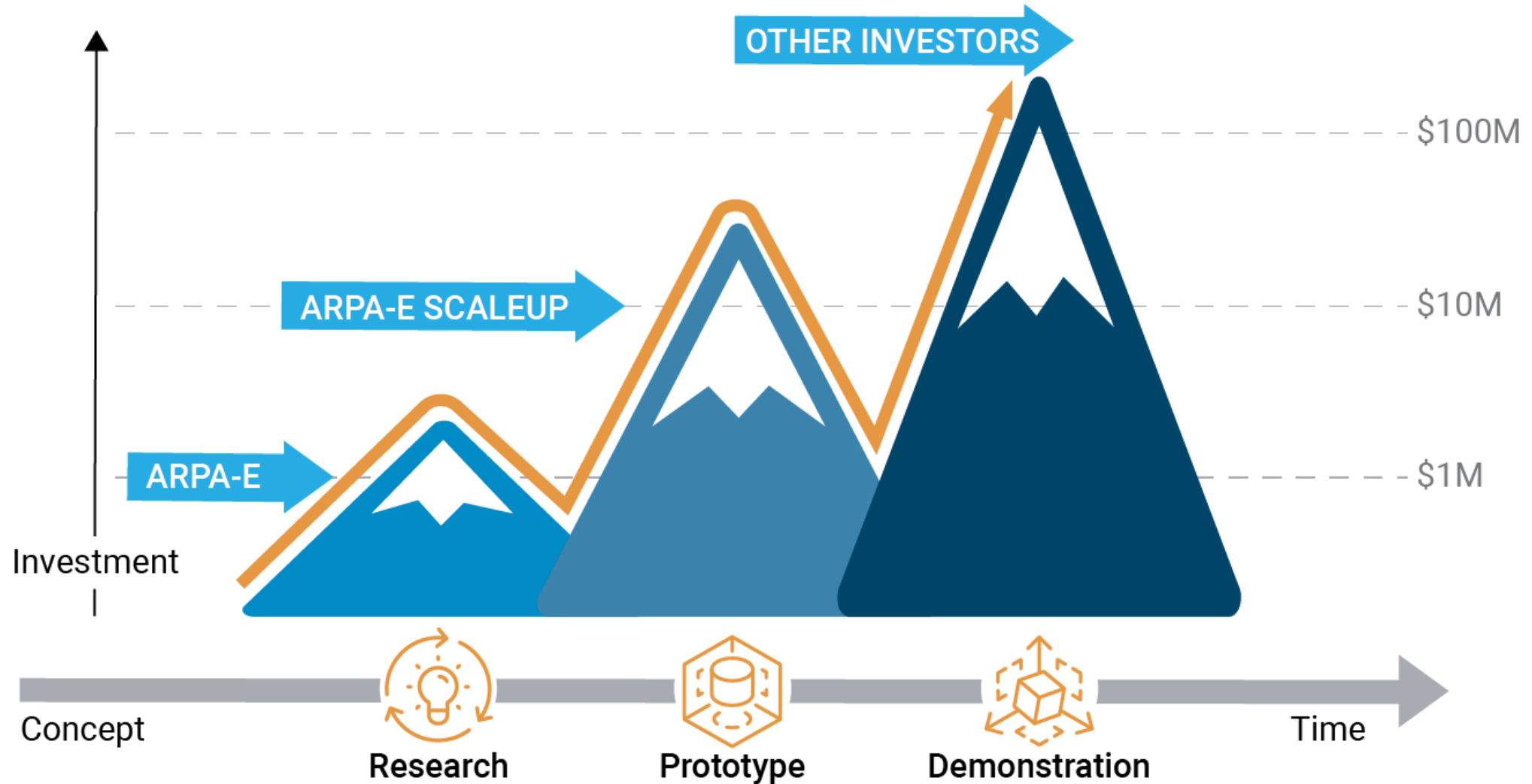
ARPA-E Role in Research



ARPA-E Program Cycle



ARPA-E "Mountains of Opportunity"



ARPA-E Impact Indicators 2024

Since 2009
ARPA-E has provided
\$3.76 billion
in R&D funding to
more than **1,560 projects**
+ 54 selected projects



230 projects
have attracted more than
\$12.1 billion
in private-sector follow-on funding



154 companies
formed by
ARPA-E projects



29 exits
market valuations worth
\$21.9 billion
from mergers, acquisitions, and IPOs



340 projects
have **partnered with**
other government
agencies
for further development



7,318
peer-reviewed
journal articles
from ARPA-E
projects



1,120
patents
issued by
U.S. Patent and
Trademark Office

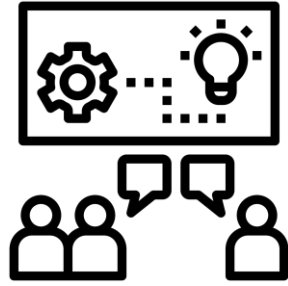


405
licenses
reported from
ARPA-E projects



As of January 2024

How to engage with us



Workshops



Teaming lists



Funding opportunity announcements



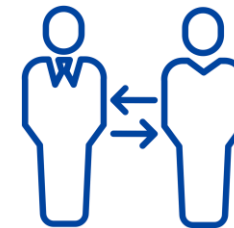
Annual meetings



Energy Innovation Summit



Regional showcases



1:1 engagements

Connect with ARPA-E

Technology programs

<https://arpa-e.energy.gov/technologies/programs>

Commercialization initiatives

<https://arpa-e.energy.gov/technology-to-market>

Funding opportunity announcements

<https://arpa-e-foa.energy.gov>

Newsletter & upcoming events

<https://arpa-e.energy.gov/news-and-media/newsletter>

Career opportunities

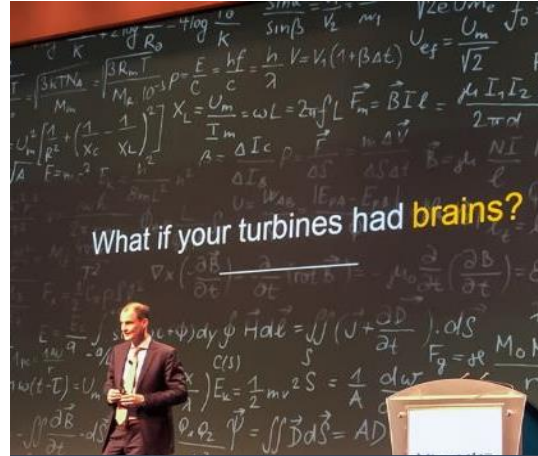
<https://arpa-e.energy.gov/career/job-opportunities>



energy innovation summit



**Highly Selective
Technology Showcase**



Inspiring Keynotes



**Unparalleled
Networking**



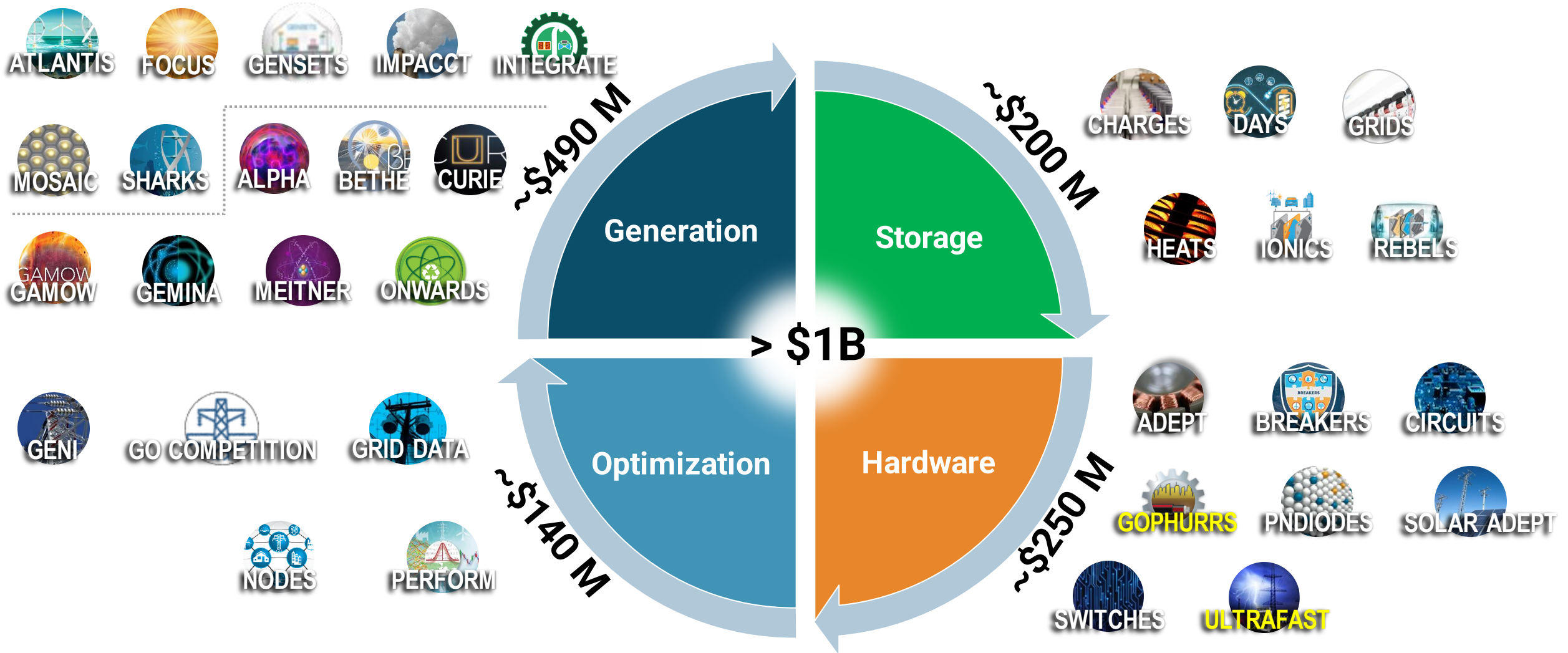
**Fast-Paced
Technology Pitches**

arpae-summit.com

May 22-24, 2024

Dallas, Texas

Selected Prior and Ongoing Investments in the Grid



Workshop objectives

The objectives of this workshop are:

- 1) engage the key stakeholders to accelerate the adoption and deployment of the grid related technologies developed at ARPA-E,
- 2) better understand the pain points and potential technology gaps for grid decarbonization and modernization,
- 3) provide an opportunity for ARPA-E project teams to directly engage utility companies in their commercialization efforts.

Workshop agenda

THURSDAY, FEBRUARY 29, 2024

12:30 – 1:00 PM NETWORKING LUNCH

1:00 – 1:20 PM WELCOME: ARPA-E OVERVIEW AND GRID TECHNOLOGY INITIATIVES

Jon Glass, Deputy Director for Commercialization, ARPA-E
Chris Vandervort, Technology-to-Market Advisor, ARPA-E

1:20 – 2:40 PM ARPA-E SELECT GRID RELATED PROJECT TEAM PITCHES

Introductions: Phil Kim, Program Director, ARPA-E

• Switched Source – Charles Murray: *'Improving Reliability, Managing Electrification, and Integrating Distributed Generation with the Phase-EQ, a new Medium Voltage Distribution Automation Device'*

• Georgia Tech University – Deepak Divan: *'Towards Grid as an Ecosystem'*

• Melni Technologies – Mark Melni: *'The Future of Underground Connections for a Stronger National Power Grid'*

• Georgia Tech University – Sakis Meliopoulous: *'Resilient, Cyber Secure Centralized Substation Protection (rCSP)'*

• GE – Radislav Potyrailo: *'Gas-Leak Monitoring of Grid Assets Beyond 20th Century Approaches'*

• VEIR – Kevin Dunn: *'Unlocking Electricity Transmission Growth Using High Temperature Superconductors'*

2:40 – 2:50 PM BREAK

2:50 – 4:00 PM GRID COMMUNITY PERSPECTIVES ON CHALLENGES, TECHNOLOGY GAPS AND POTENTIAL COLLABORATION OPPORTUNITIES

Moderator: Phil Kim, Program Director, ARPA-E

Panelists:

• William Fairechio, R&D Department Manager, Con Edison

• Brenden Russell, Principal Manager, Technology Strategy, Southern California Edison

• C. P. Smith, Executive Director, Cooperativa Hidroeléctrica de la Montaña

4:00 – 4:55 PM OPEN DISCUSSION

4:55 – 5:00 PM CLOSING REMARKS

Chris Vandervort, Technology-to-Market Advisor, ARPA-E

5:00 – 6:00 PM "NO HOST" HAPPY HOUR

Rocks – Lobby Bar

The world's largest "single" machine. **But...**

In numbers:

- 25k generators
- 70k substations
- 600k miles of AC transmission
- 5.5M miles of distribution



Importance to ARPA-E



IMPROVE THE RESILIENCE,
RELIABILITY, AND SECURITY OF
ENERGY INFRASTRUCTURE



IMPROVE
EFFICIENCY

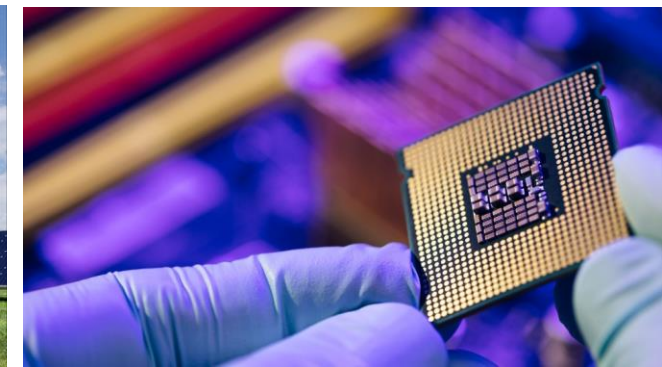
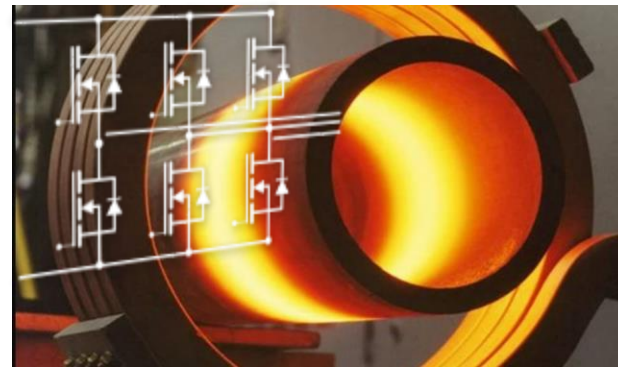


REDUCE
EMISSIONS

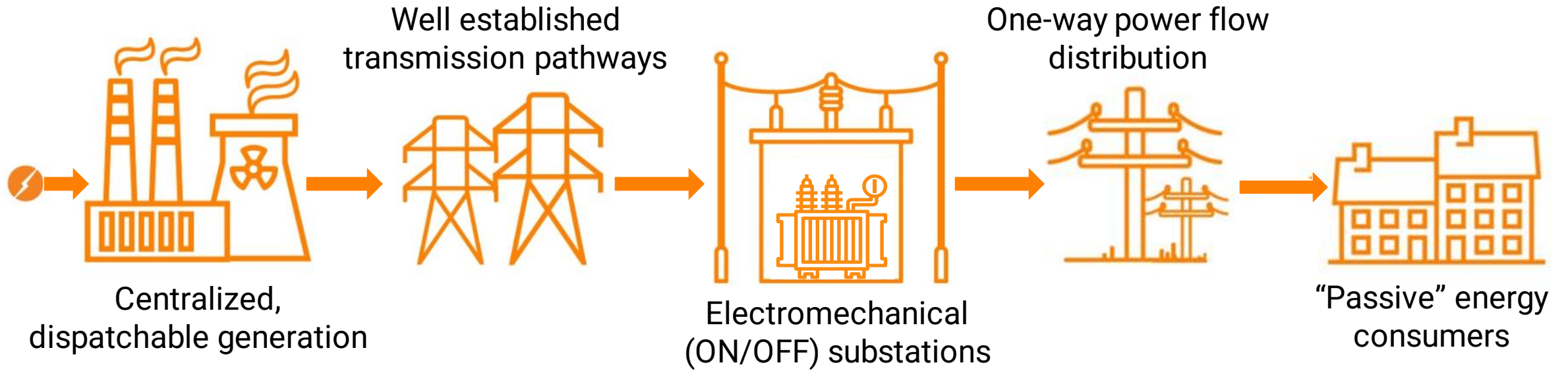


REDUCE
IMPORTS

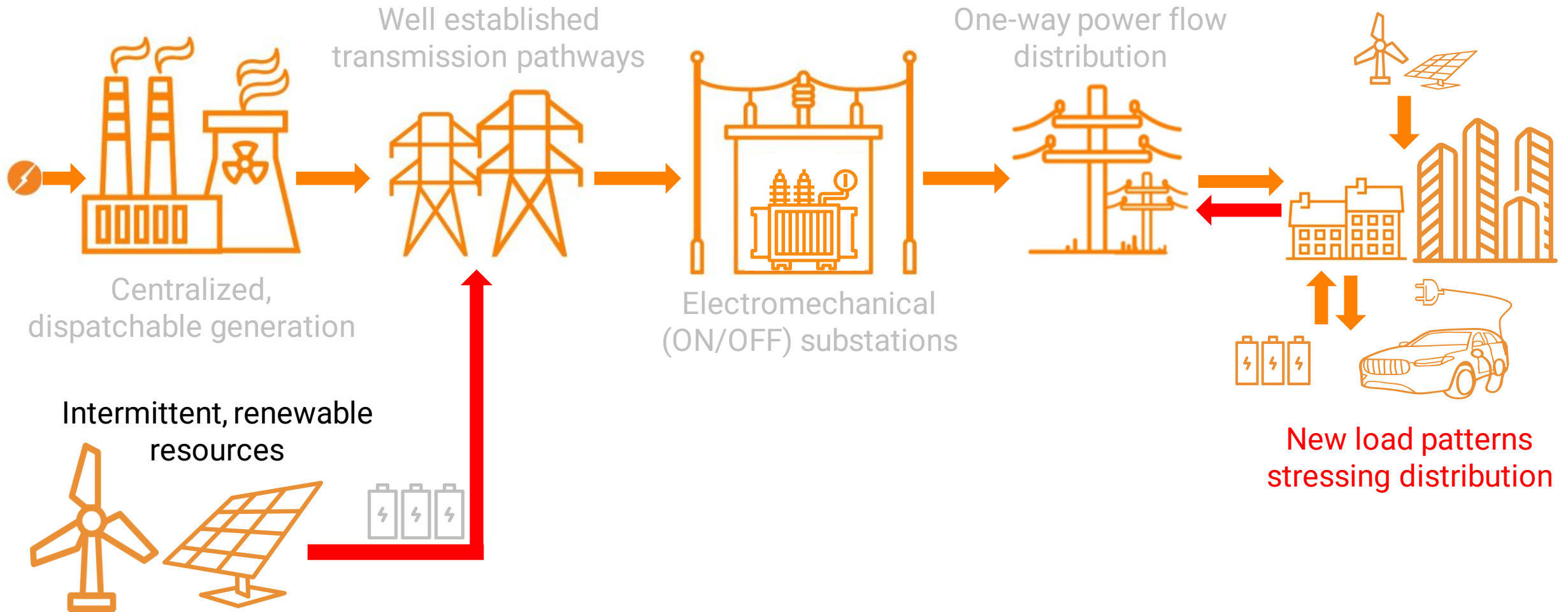
Clean, affordable electricity, on demand



Our Grandparents' Grid

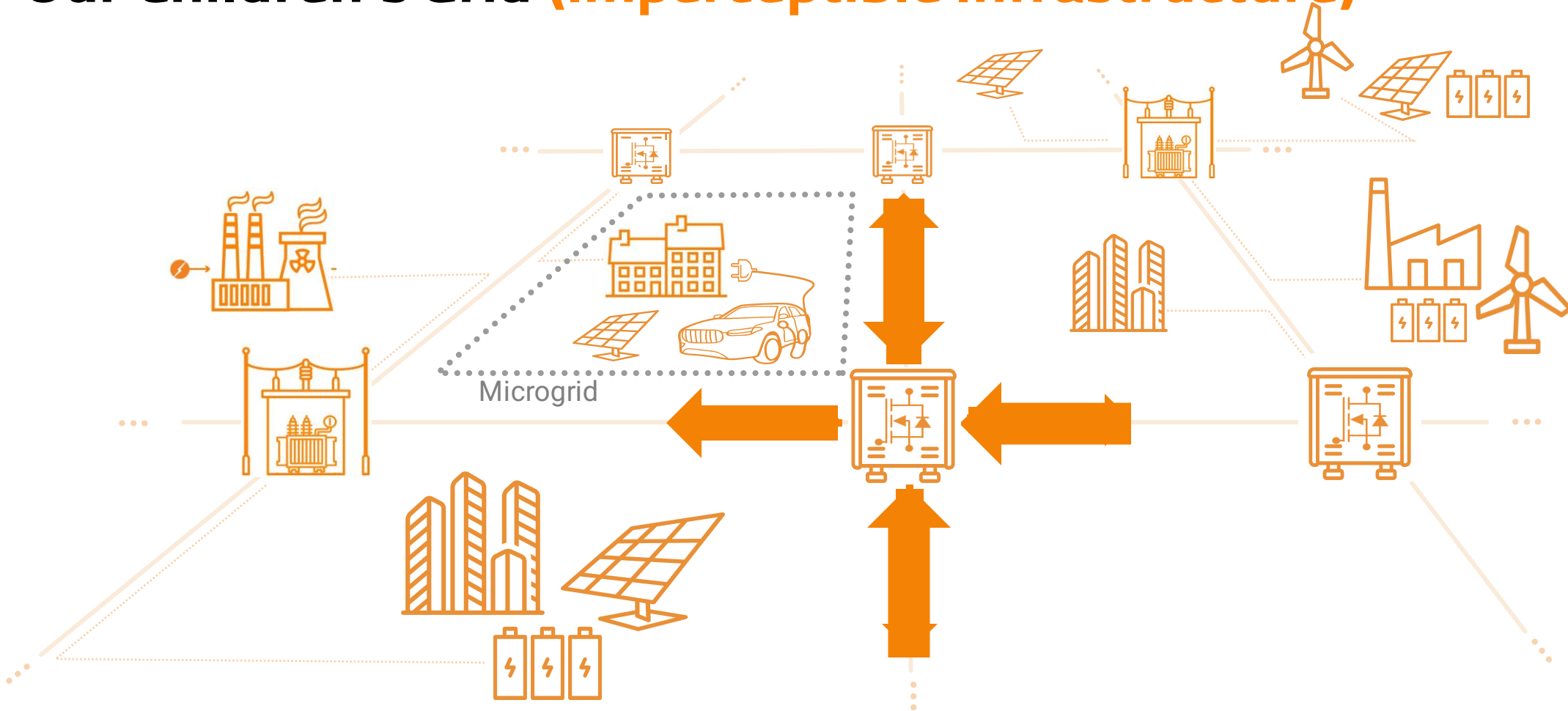


Our Grid (patching up our Grandparents')



New load patterns
stressing distribution

Our Children's Grid (Imperceptible Infrastructure)



- AC/DC mix
- Solid-state and traditional substations
- Distributed mixed generation (and storage)

- Dynamic, two-way power flow... Everywhere
- Prosumers
- Microgrids

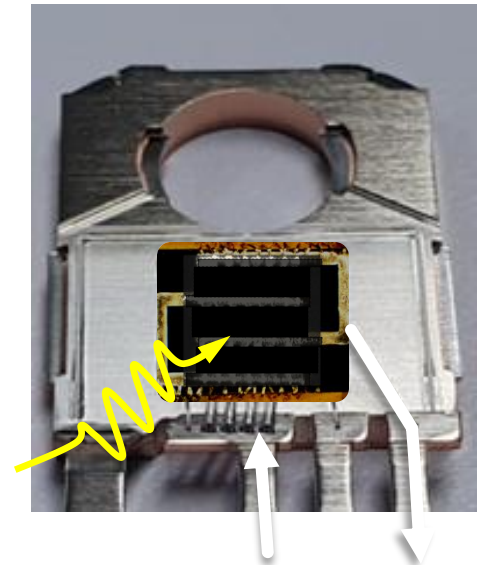
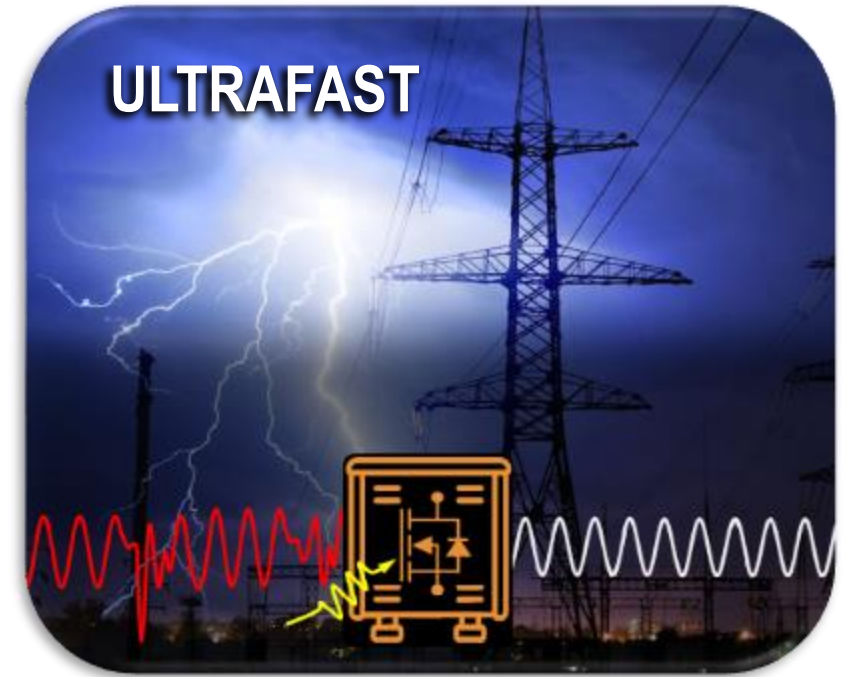
ULTRAFAST Program

Goal:

Next generation material, device, and modules for improved power distribution and control of future grid – enables solid state substations

Program Metrics:

Parameter \ FOA	Category 1	Category 2
Rated Voltage	≥ 20 kV	≥ 3.3 kV
Rated Current	≥ 250 A	≥ 10 A
Switching frequency	n/a	1-100 kHz
Voltage slew-rate	≥ 500 V/ns	≥ 250 V/ns
Current slew-rate	≥ 200 A/ns	≥ 100 A/ns
Loss	$\geq 30\%$ lower than SOTA	



GOPHURRS Program

- ▶ Develop and demonstrate technologies that **simplify the construction of underground medium voltage (MV, 5 – 46 kV) electric power distribution**
 - Improved technologies creating new products for
 - Concurrent drilling and conduit installation
 - Reducing inefficiencies while improving installation quality
 - Improvements in reliability and resiliency
 - Streamline for:
 - Installation of urban and suburban power distribution
 - Projected 4-5 “x” expansion by 2050 to support distributed energy resources, electrification, and EV’s



TM

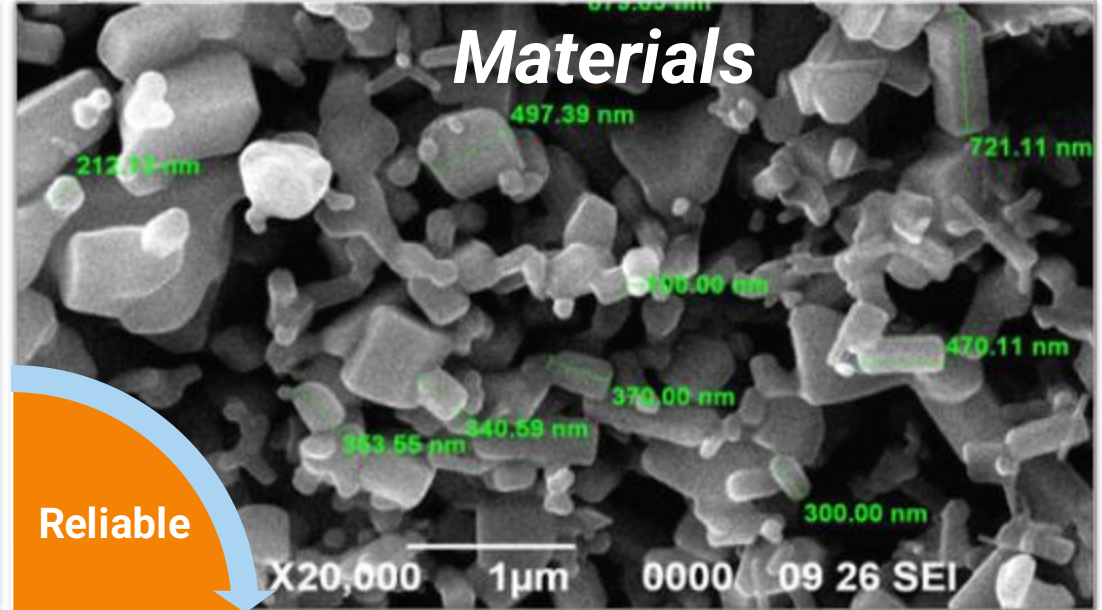


Other Innovation Opportunities

Architectures, control & optimization



Materials



Safe

Reliable

Affordable

Sustainable

Power transmission



Grid Hardware



We Need Your Engagement – Let's Talk

Technology



Suppliers



Policy



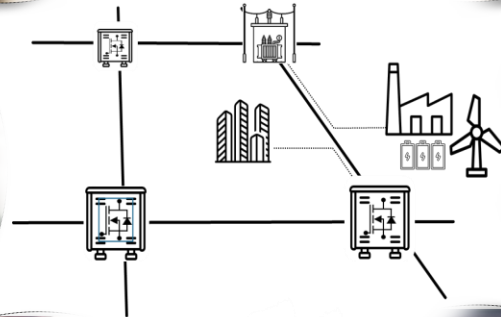
Operators



Investors

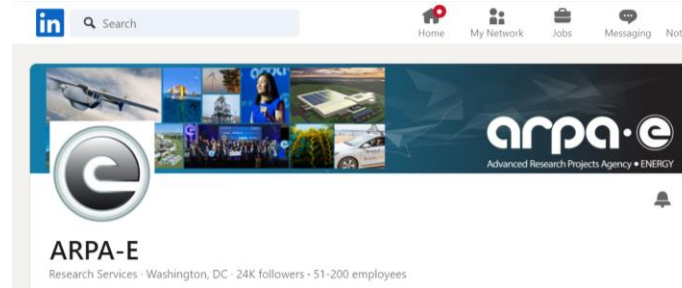


End Users



Follow ARPA-E on social media

LinkedIn



X(formerly Twitter)



Facebook

