

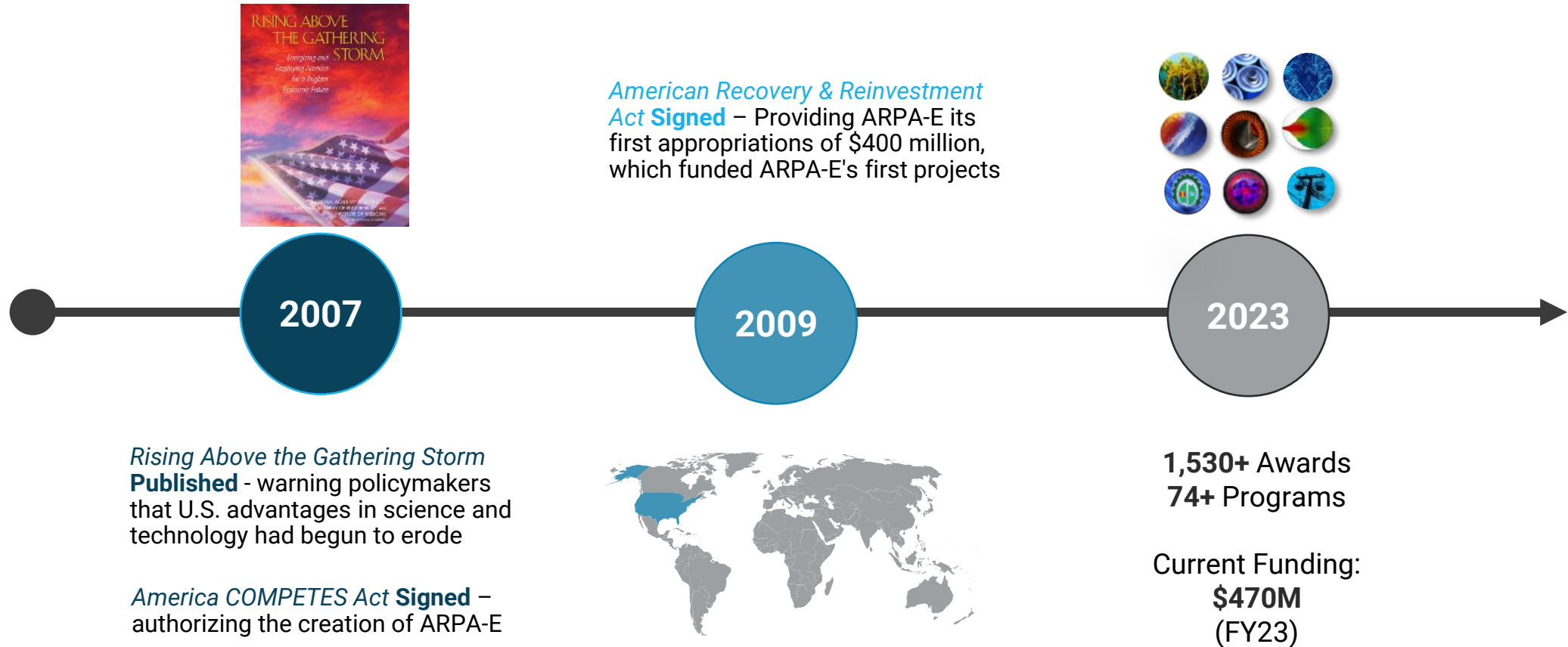
2024 sCO₂ Symposium – DOE Panel

Dr. Christian Vandervort
T2M Advisor, DOE ARPA-E

February 28, 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

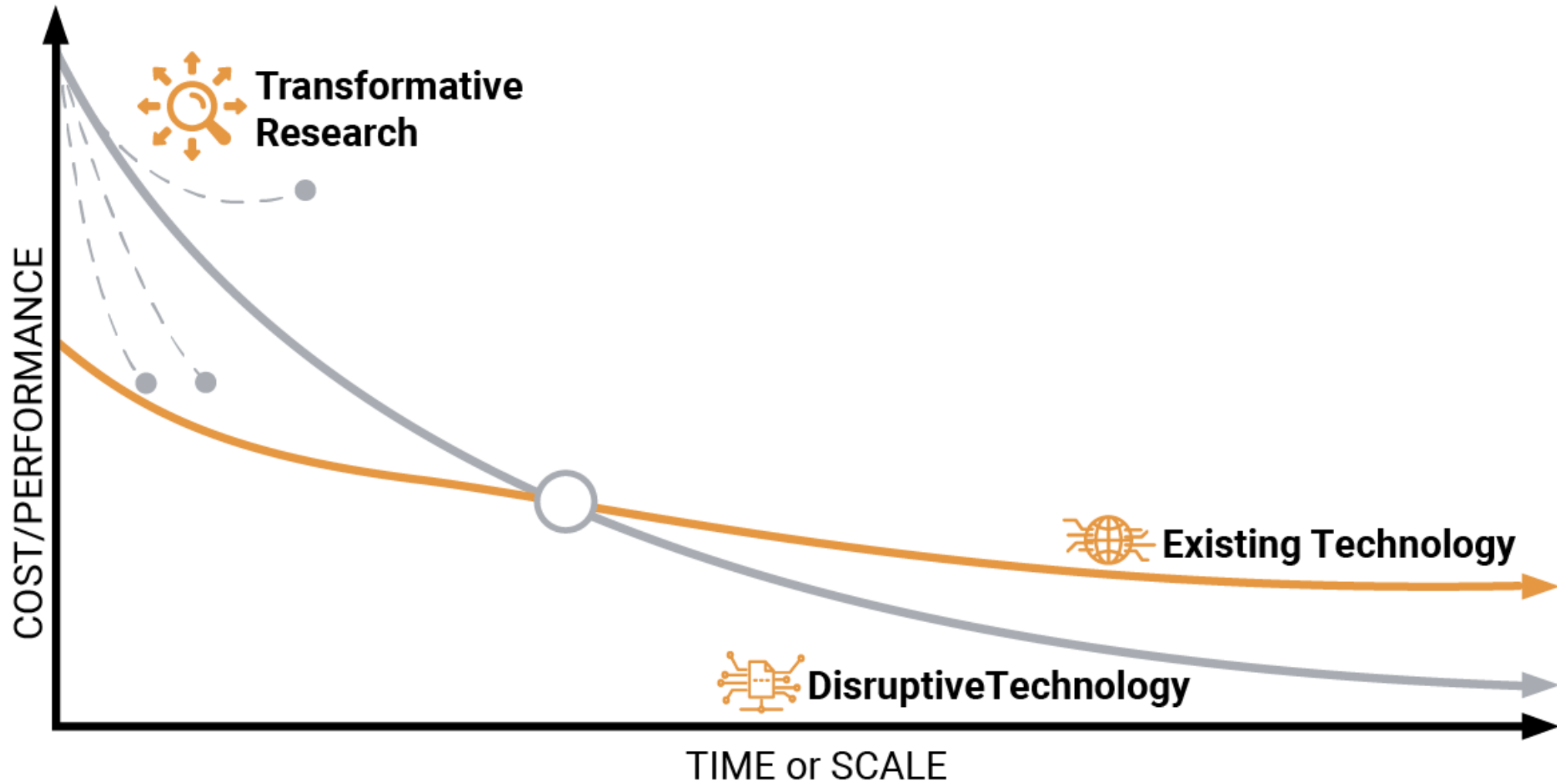


IMPROVE
radioactive waste
management

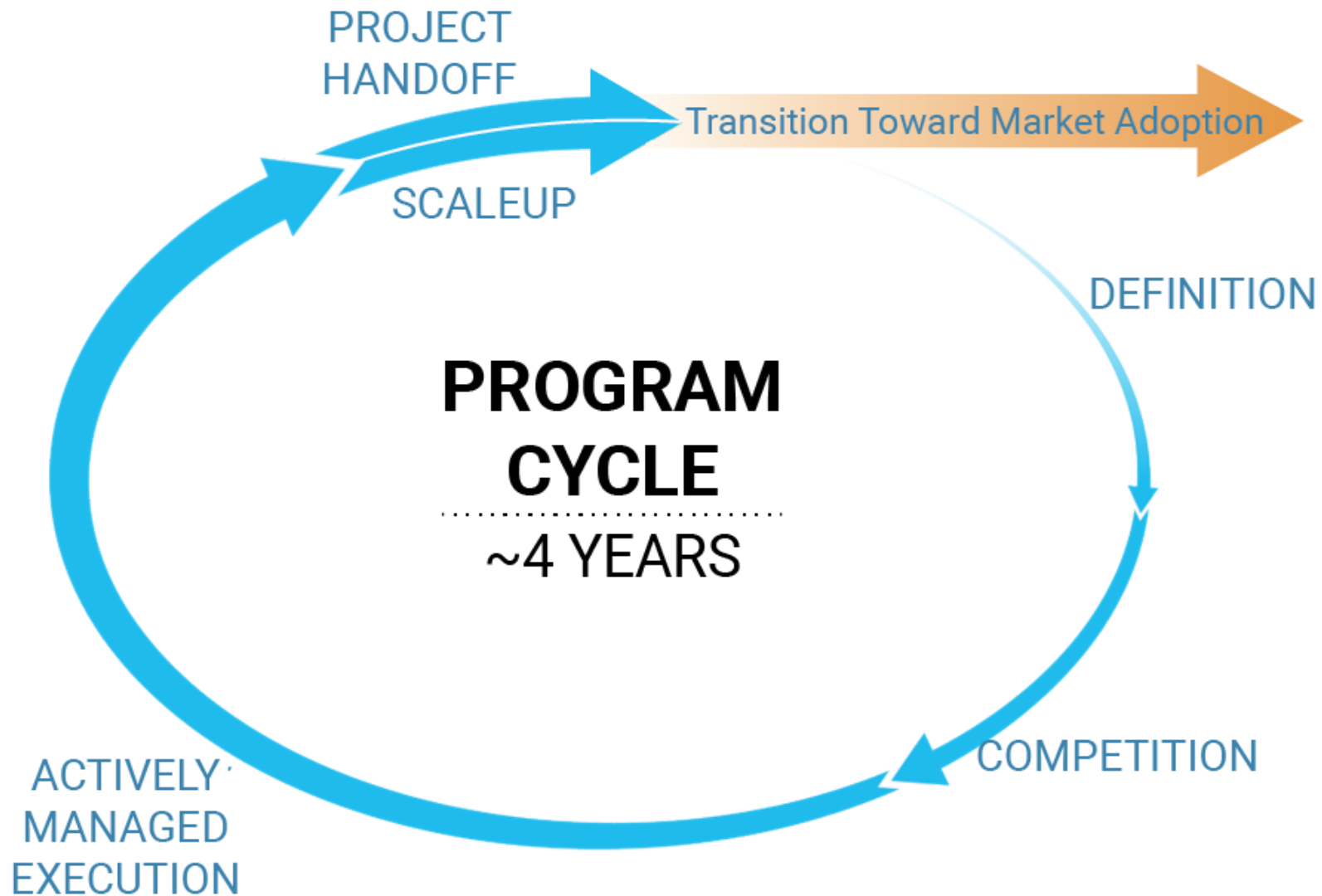


IMPROVE
energy infrastructure
resilience

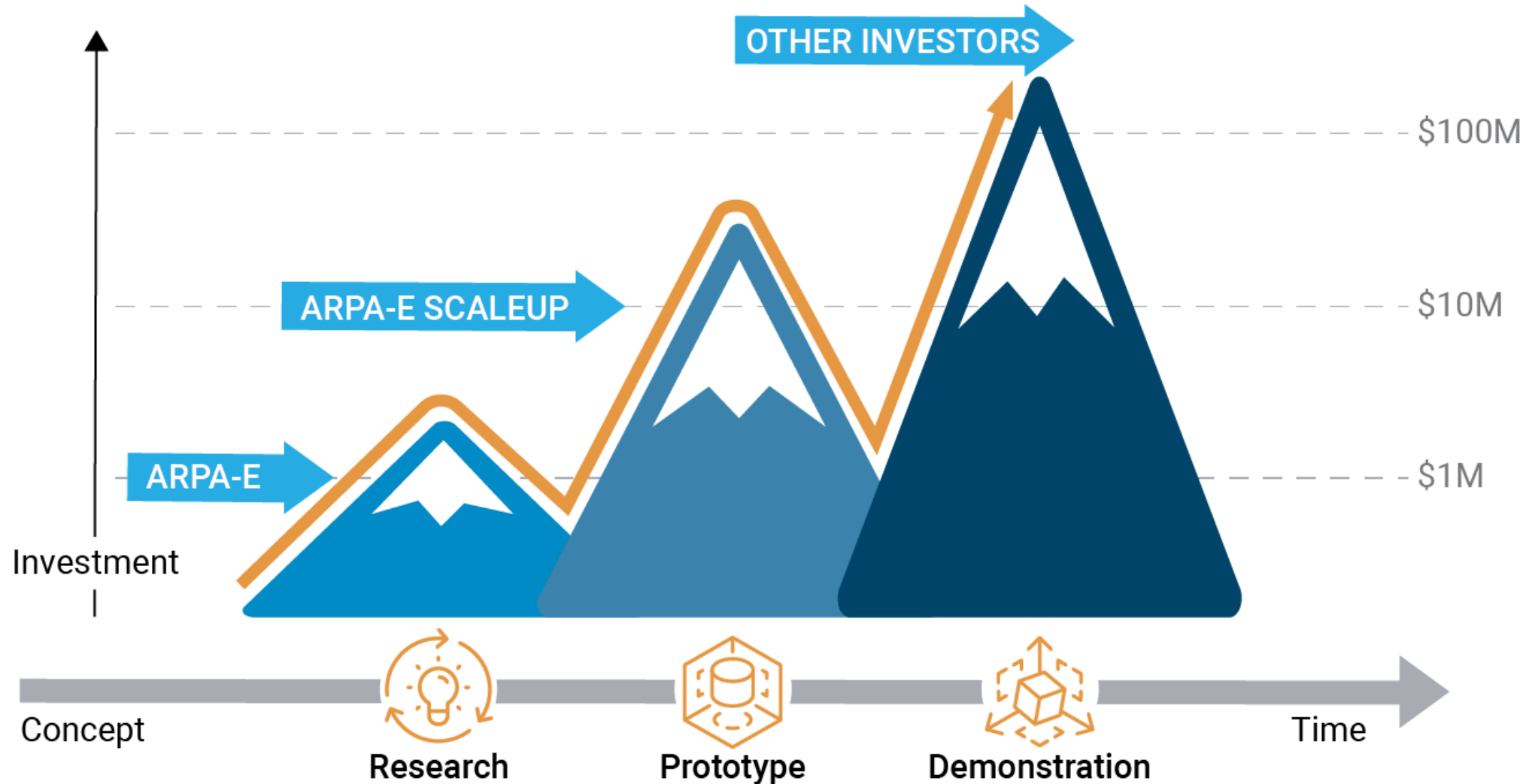
ARPA-E Role in Research



ARPA-E Program Cycle



ARPA-E "Mountains of Opportunity"



ARPA-E Impact Indicators 2023

Since 2009
ARPA-E has provided
\$3.68 billion
in R&D funding to
more than **1,530 projects**
+ 41 selected projects



218 projects
have attracted more than
\$11.8 billion
in private-sector follow-on funding



150 companies
formed by
ARPA-E projects



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



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



7,047
peer-reviewed
journal articles
from ARPA-E
projects



1,073
patents
issued by
U.S. Patent and
Trademark Office



323
licenses
reported from
ARPA-E projects



As of September 2023

ARPA-E Technology Initiatives

Providing technology leadership and funding across the energy spectrum:



Transportation
Fuels



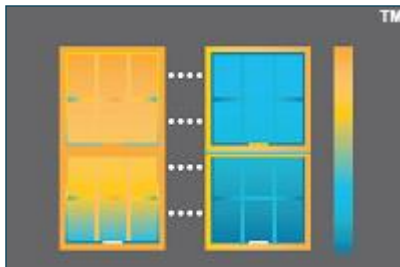
Advanced
Batteries



Power Conversion
& Smart Grid



Power
Generation



Building
Efficiency



Agriculture
Technologies



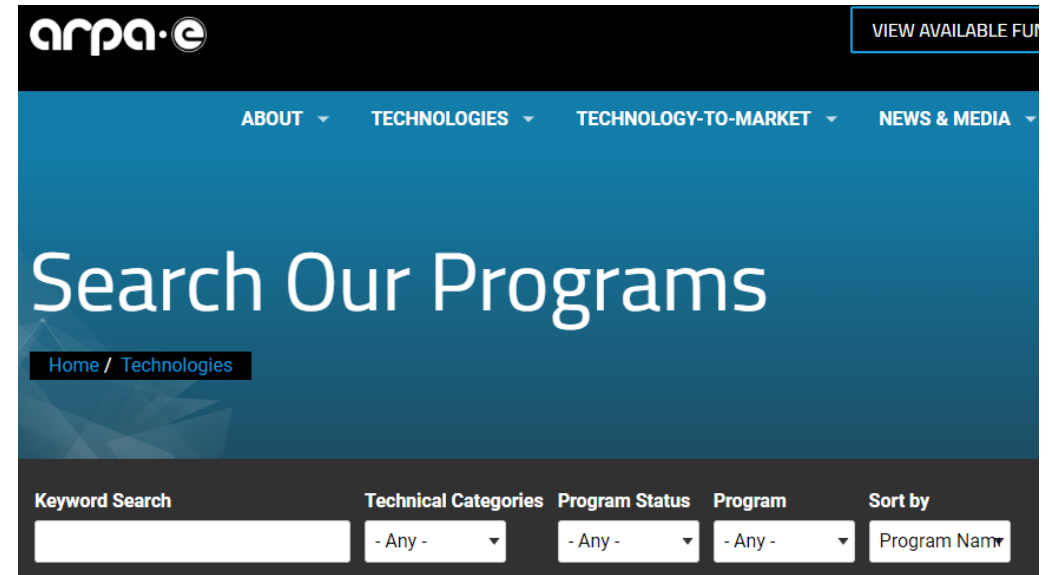
Materials and
Manufacturing



Transportation
Technologies

ARPA-E: Programs w/ Supercritical CO2 projects

- ▶ DAYS: Thermal Energy Storage – Pumped Hydro-like costs but sited anywhere
- ▶ HITEMMP: High temperature, high pressure, efficient, and highly compact heat exchangers
- ▶ ASCEND: ultra-efficient electric motors, drives, and associated thermal management systems
- ▶ REEACH: innovative, cost-effective and high-performance energy storage and power generation (ESPG) sub-systems



[Search Our Programs | arpa-e.energy.gov](https://arpa-e.energy.gov)

What are the next transformational applications for sCO₂?

Brainstorm: would be ideal future power gen system for energy transition?

- Cost-effective
- High efficiency > 65-70%
- Operability: Startup time, ramp rates, turndown
- No CO₂ emissions
- Reliable, Available, & Maintainable
- Modular – 1 MW? – 10MW – 100 MW
- Compact (if weight & volume important for application)
- Constructable with 30-36 month NTP-COD
- Regulatory acceptance for siting and permitting

sCO₂ power cycle differentiators

- **Compact** → low cost?, Low thermal mass?
- High Temperature - High efficiency
- Rankine cycle – heat source independent
- Good heat transfer fluid/fire safe



Next Generation Nuclear



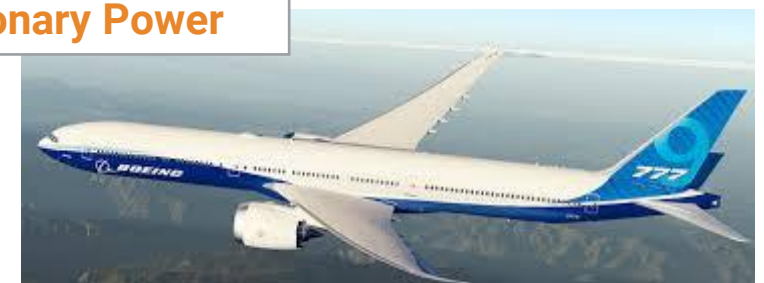
Concentrating Solar Power



Advanced Stationary Power



Hydrocarbon Processing Industry



Next Generation Aviation

ARPA-E Summit 2024

2024 SUMMIT PHOTO GALLERY



[Home \(arpae-summit.com\)](https://arpae-summit.com)

A blue-tinted image of Earth from space, showing the curvature of the planet and the dark blue of the oceans. The text 'If it works...' is overlaid in white, bold, sans-serif font.

If it works...

will it matter?



U.S. DEPARTMENT OF
ENERGY

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

Bio: Christian Vandervort, PhD, PE (New York)

- Joined ARPA-E in December 2021 as a Technology-to-Market Advisor. Supporting programs in power generation (FLECCS), high temperature materials & coatings (ULTIMATE), nuclear fission (GEMINA, OPEN), and power distribution (GOPHURRS)
- Previously served with General Electric for 29 years with roles at GE Power and GE Global Research Center (GRC).
- Product Manager for the 9HA.02 Gas Turbine and Combined Cycle Power Plant.
- PhD in Mechanical Engineering from Rensselaer Polytechnic Institute. MS in Nuclear Engineering and BS in Nuclear Engineering & Mathematics at the University of Wisconsin-Madison.
- Awarded 38 patents