U.S. DEPARTMENT OF ENERGY

Disclaimer: All information provided during or after the workshop is considered the opinion of an individual entity (or "individual participants") and not considered part of a group or consensus recommendation.

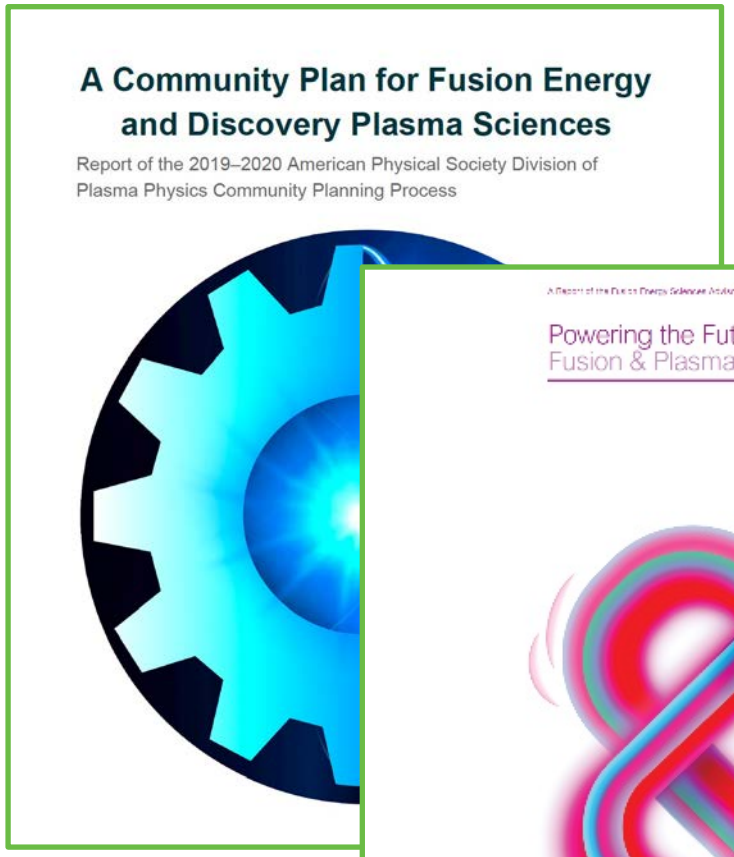
Workshop introduction and objectives

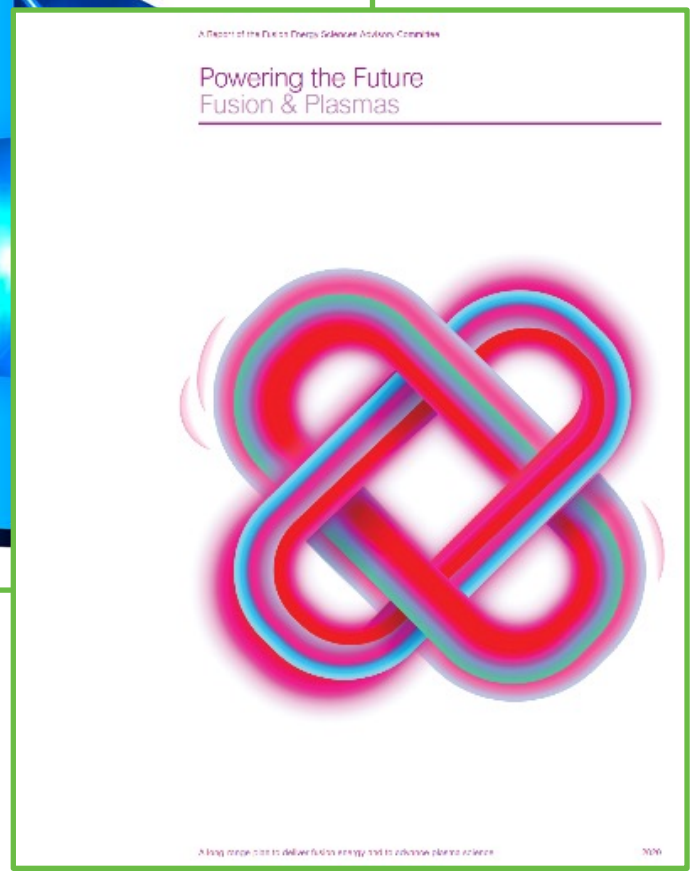
Dr. Scott Hsu, Senior Advisor and Lead Fusion Coordinator, Office of the Under Secretary for Science and Innovation

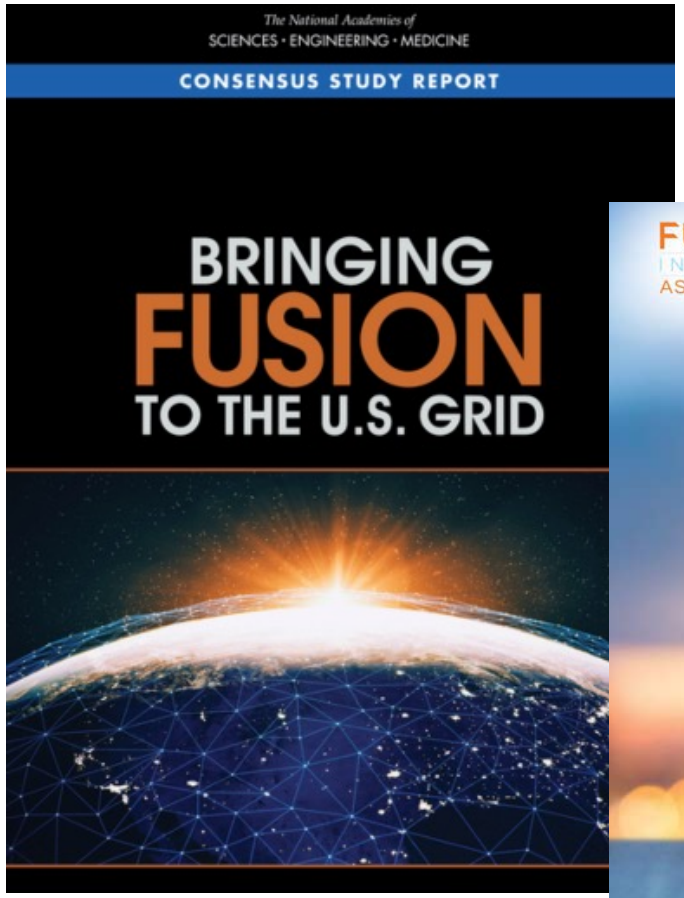
With contributions from Dr. Rich Hawryluk (PPPL, retired)

June 1, 2022

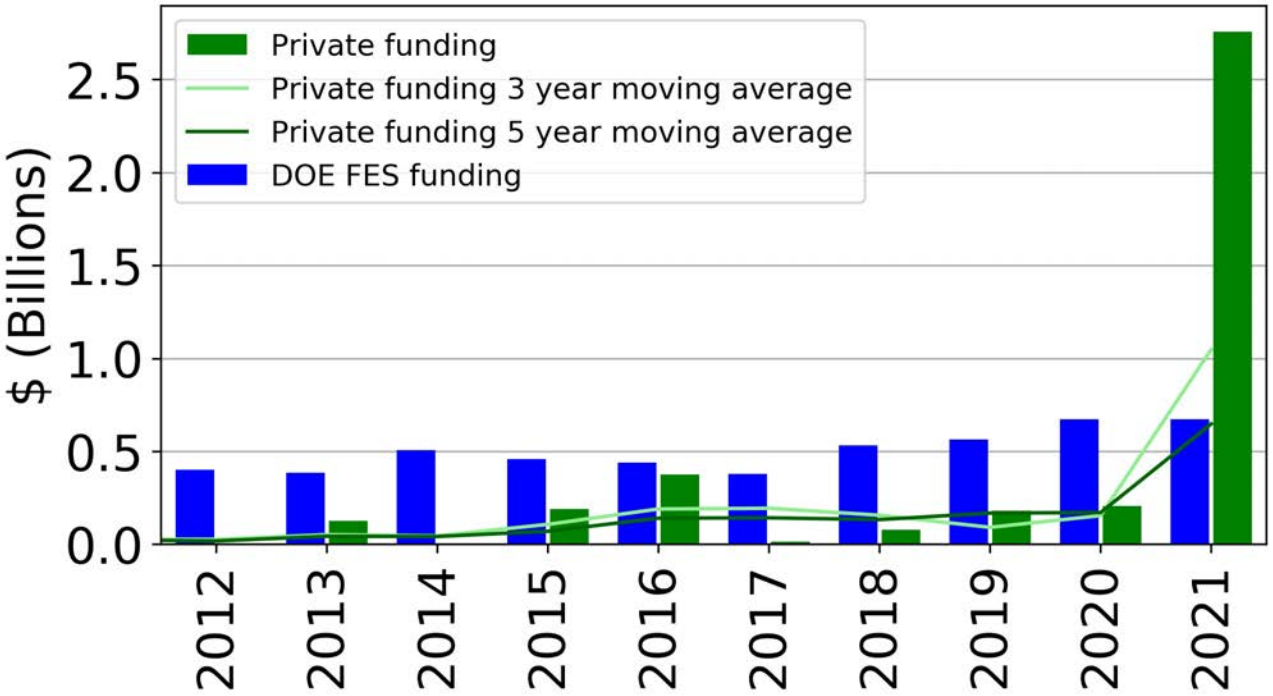
Your efforts have provided the basis for us to move ahead







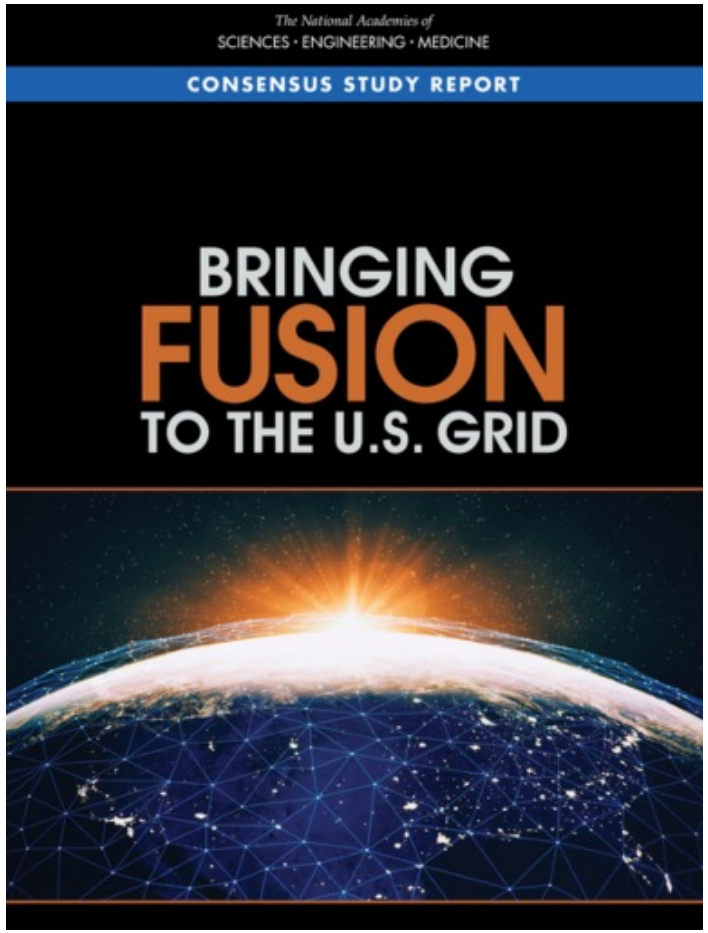
Since those reports, the fusion landscape has evolved further significantly



Plot credit: Sam Wurzel, Technology-to-Market Advisor, ARPA-E

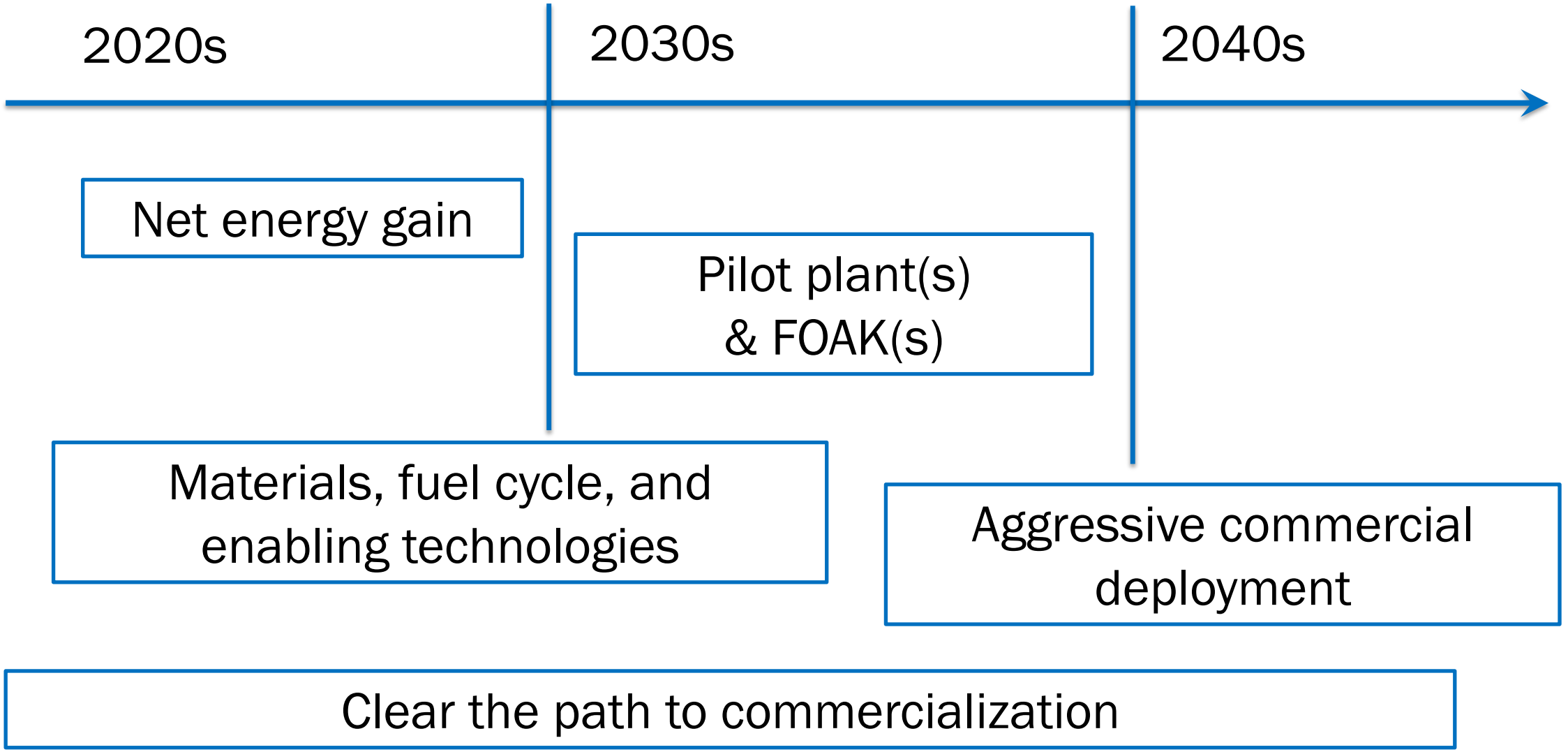
Our mandate leading up to and following the White House event is that a new strategy is warranted for accelerating fusion energy RD&D in the United States.

The new strategy is guided by the NASEM report *Bringing Fusion to the U.S. Grid* (2021)

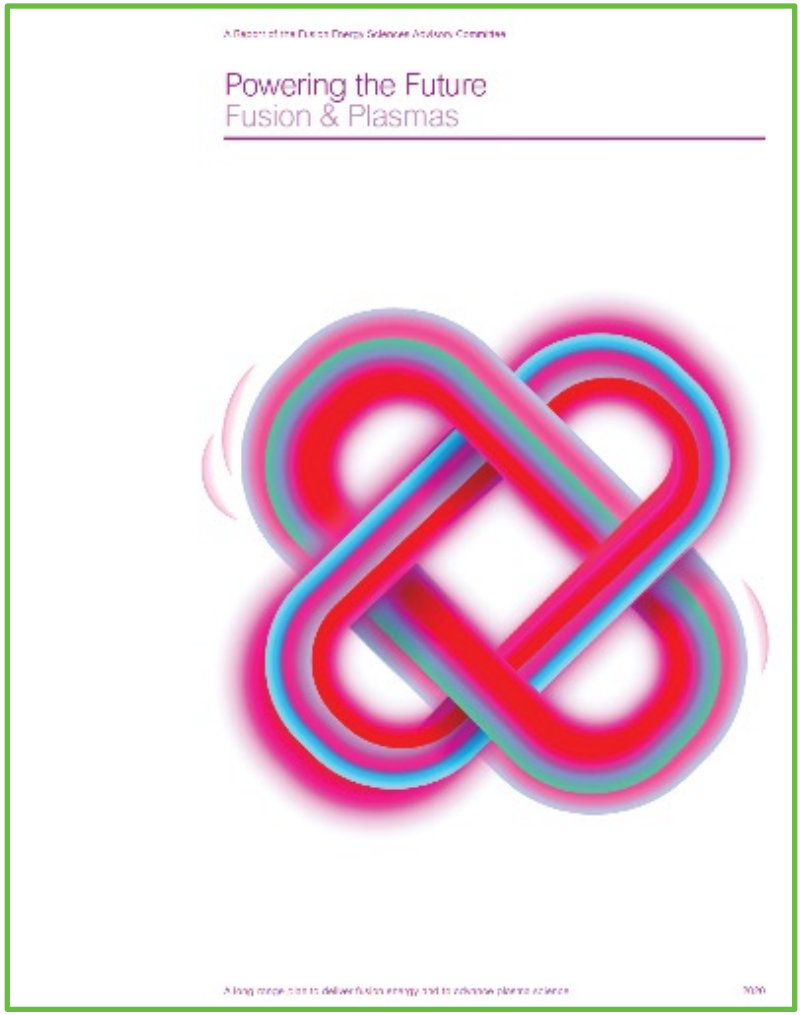


- **To ensure US leadership and impact the transition to net-zero by 2050, DOE and the private sector should demonstrate net electricity in a fusion pilot plant in the 2035–2040 timeframe**
  - White House Summit declared ambition to accelerate this to the early 2030s
- **DOE should move forward now via public-private partnerships to develop and bring fusion to commercial viability**
  - First step is a milestone-based fusion-development program to be launched as soon as possible using enacted FY22 appropriations
- **Urgent investments by DOE and private industry are needed to resolve the remaining S&T issues to realize a fusion pilot plant**
  - We are working to build support for the needed public investments

The bold decadal vision aims to enable…



At the same time, we recognize that public-sector R&D remains critically essential



- **Overcoming significant remaining R&D challenges**
  - Achieving/sustaining a burning plasma (predictive capability for plasma core)
  - Engineering for extreme conditions (including materials and heat-exhaust solutions)
  - Harnessing fusion power (including tritium fuel cycle)
- **Developing design capabilities for fusion pilot plants**
- **Helping to deliver test/user facilities, e.g., fusion prototypic neutron source (FPNS)**
- **DEIA, workforce development, public engagement**
- **Foundational fusion/burning plasma science and non-fusion plasma science & technology**

Beyond overcoming S&T challenges, we need to continue building strong partnerships to enable timely commercialization and deployment

Purpose of this workshop is to gather actionable input on…

Decadal needs beyond S&T to clear the path to commercialization

Ways to align public- and private-sector R&D activities in support of bold decadal vision

Milestone-based fusion-development program

Distilled summaries of these discussions will be posted publicly.

Clearing the path to commercialization (beyond the R&D)

- Right-sized regulatory framework
- Export control
- Waste disposition/recycling
- Energy justice
- Workforce development and DEIA
- Nuclear and cybersecurity
- Public engagement and social acceptance
- Finance scaling/partnerships
- Industrial and manufacturing base/partnerships
- Advanced market assistance/commitments by the government
- Streamlining contracting and delivery of test facilities
- Supply chain and fuel supply (e.g., enriched Li-6 and startup tritium)
- Partnerships with environmental and climate advocates
- International coordination
- Role of fusion in energy markets
- Engaging eventual customers/utilities
- Inclusion of fusion in energy projections/planning
- Outreach and education

Aligning the public and private sectors (a possible model)

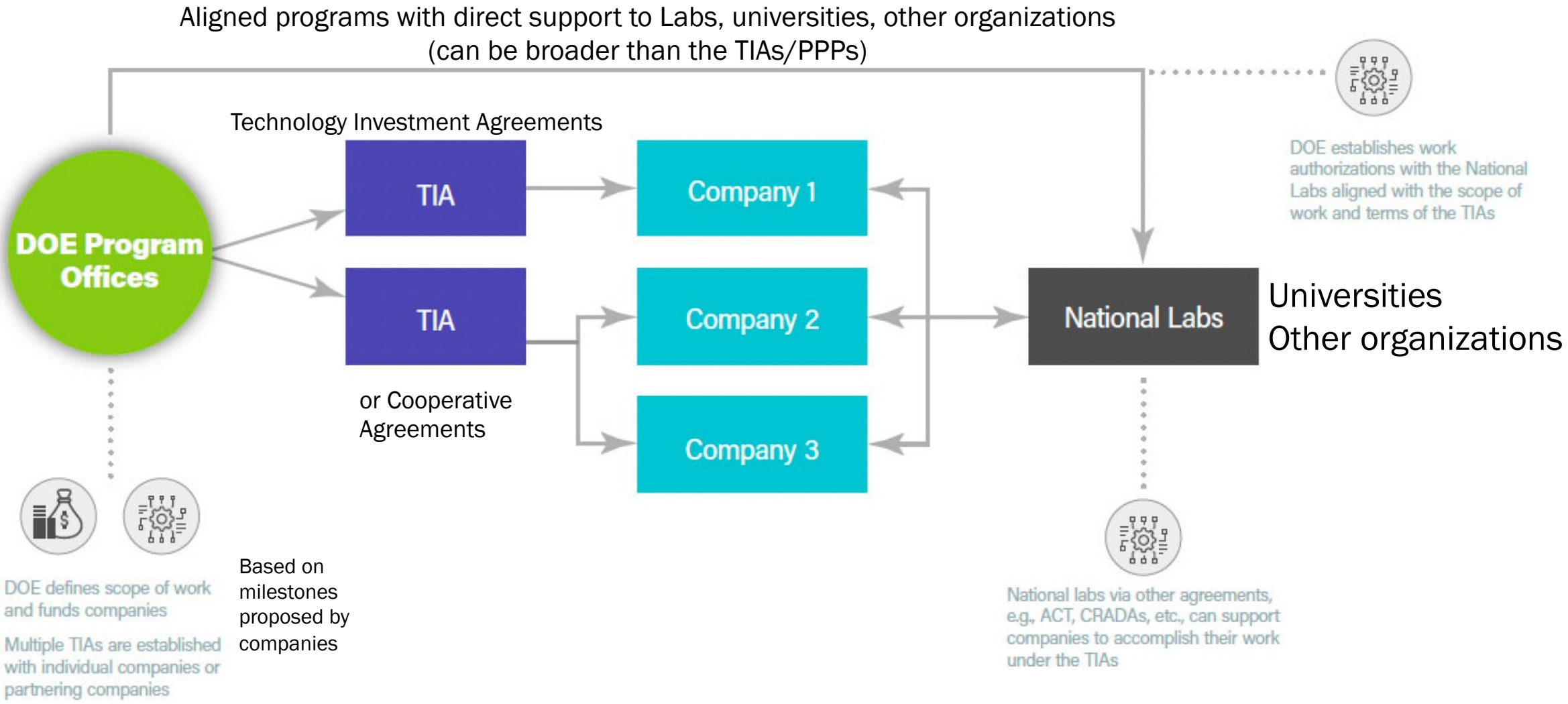


Fig. B-6 from V. Pena and M. Ishimaru, "Draft Green Paper – Background and Options for DOE to Enhance Use of the Other Transactions (OT) Authority" (March, 2022)

Milestone-based fusion-energy development program

- **John Mandrekas' talk on day #3**
- **Possibly broad objectives**
  - R&D toward credible FPP design
  - Delivery of test facilities or other capabilities
  - Component/enabling technology RD&D
- **Program structure and contracting options**
- **Enabling private-public teaming via multiple mechanisms**
- **Metrics/criteria (technical and non-technical)**

Several Fusion Crosscut Team members are at this workshop

Fusion Energy Crosscut Team will coordinate relevant DOE-wide activities, FOAs, and budget requests (working with program offices) in support of bold decadal vision.

At workshop:

- Jim Van Dam (SC FES), co-chair
- Sam Wurzel (ARPA-E), co-chair
- Ann Satsangi (NNSA)
- Mike Goff (Nuclear Energy)
- Yasmin Yacoby (Economic Impact and Diversity)

Attending virtually:

- Lali Chatterjee (SC ASCR)
- John Vetrano (SC BES)
- Tony Polk (SRS/EM)

Decadal needs beyond S&T to clear the path to commercialization

Ways to align public- and private-sector R&D activities in support of bold decadal vision

Please provide constructive input and voice your concerns in the moderated breakout discussions!

Milestone-based fusion-development program