

# ALPHA Annual Review Day #2



# Goals for meeting

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## Technical updates

- ALPHA teams (Day 1)
- Other private fusion companies (Day 2)

## How can we stage-gate fusion development?

- Day 1 breakout – common metrics for benchmarking
- What can and should ARPA-E do next?

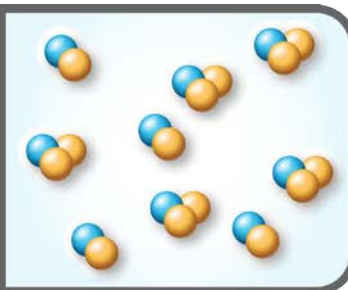
## Helping companies succeed...

- ...in the short term (Day 2 discussion on launching companies)
- ...and long term (Day 2 breakout on public-private partnership)

## FUSION CORE VIABILITY

Few \$100Ms | 5-10 years

Energy breakeven equivalent



## REACTOR SUBSYSTEM DEVELOPMENT

Many \$100Ms | 5-10 years

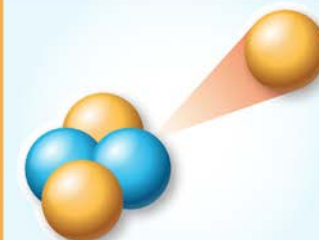
Fuel and neutron handling, operating cycle



## PROTOTYPE PLANT DEMONSTRATION

>\$1B | 5-10 years

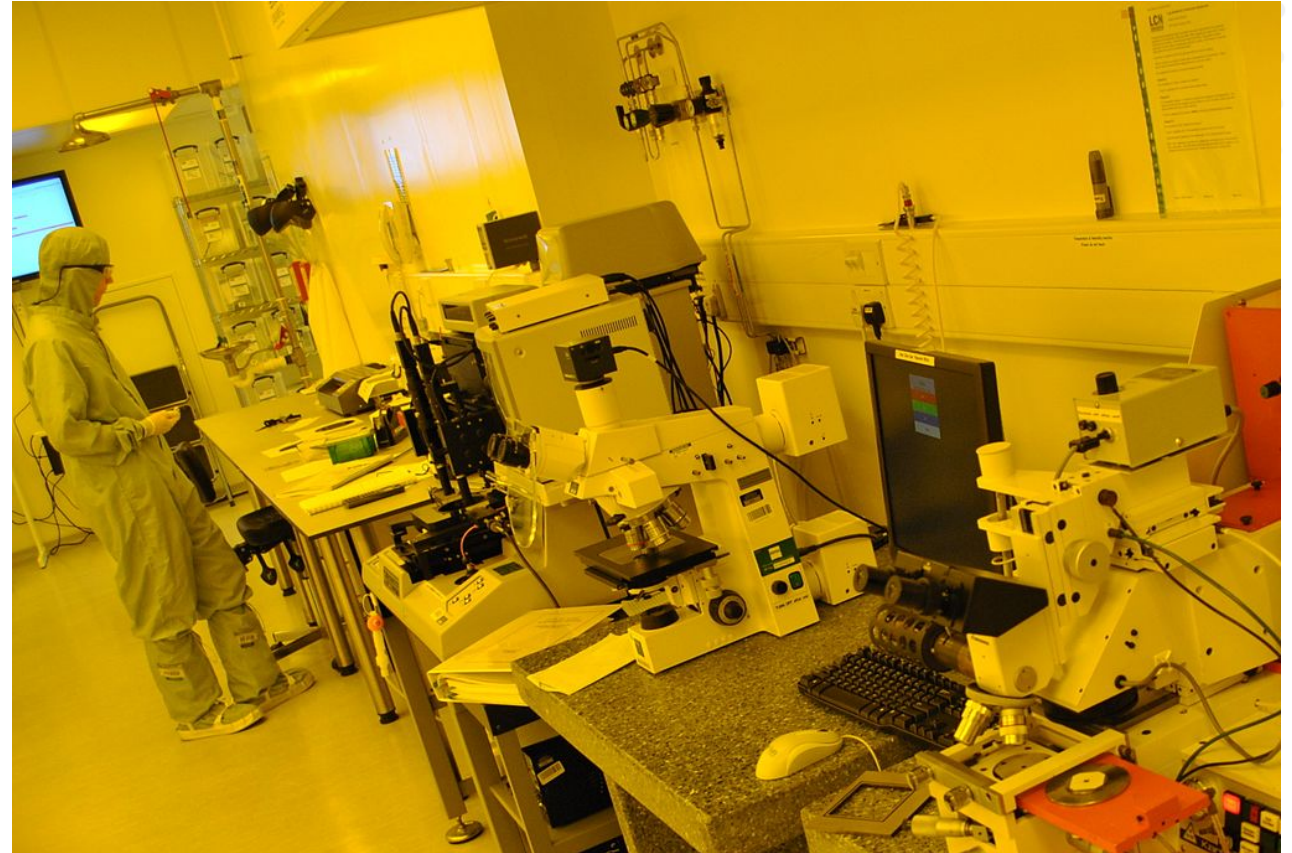
Full system integration and operation;  
design certification



# Public-Private Partnership Models



- ▶ Founded by 14 U.S. semiconductor manufacturers with funding support from DOD/DARPA in 1987-88
- ▶ Enabled by National Cooperative Research Act of 1984 (grants partial antitrust exemption to registered R&D consortia)
- ▶ Goal: revitalize the U.S. semiconductor industry by finding ways to reduce manufacturing costs and product defects
- ▶ Impact: accelerated the timeline and decreased the growth of R&D funding required to achieve several new generations of miniaturization



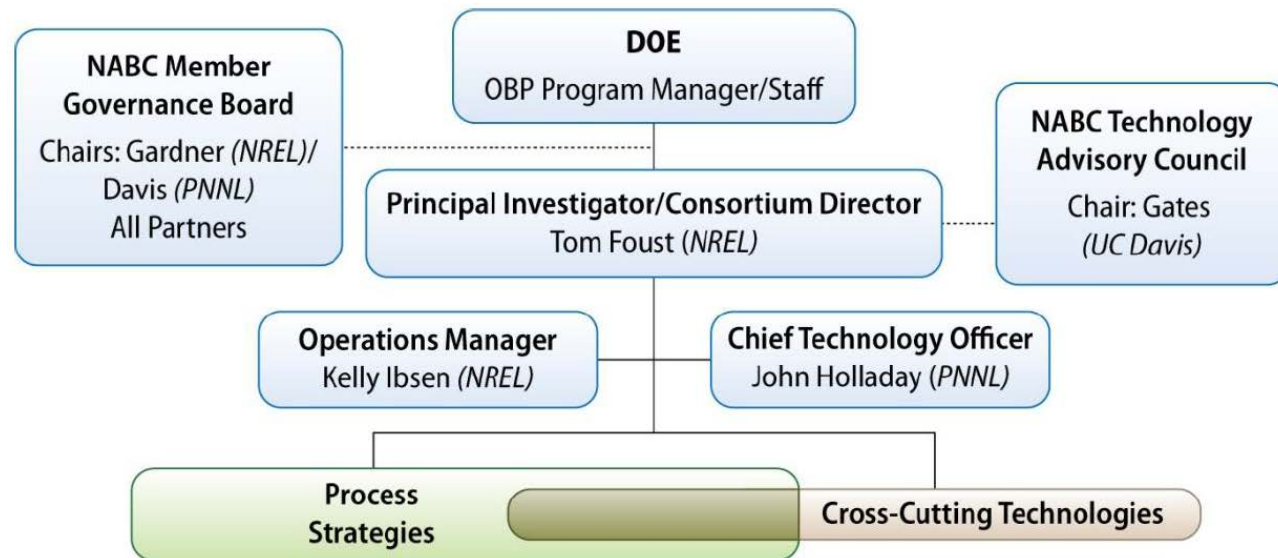
By UCL Mathematical and Physical Sciences from London, UK - Cleanroom - photolithography lab, CC BY 2.0, <https://commons.wikimedia.org/w/index.php?curid=50506832>

# Public-Private Partnership Models



<http://www.nabcprojects.org/>

- ▶ 5-yr effort with \$35M from Govt and \$25M from Industry
- ▶ Goal: develop cost-effective technologies that supplement petroleum-derived fuels with advanced “drop-in” biofuels that are compatible with today’s transportation infrastructure and are produced in a sustainable manner
- ▶ Intake: 6 approaches at TRL 5-7
- ▶ Result: 2 -> pilot plant, 2 -> further development, 2 -> no longer pursued



# PRIZES ARE POWERFUL TOOLS FOR INNOVATION

1. Very EFFICIENT
2. Highly LEVERAGED
3. Open to innovators EVERYWHERE
4. It's about MORE than the purse
5. Audacious but ACHIEVABLE target
6. Clear, MEASURABLE outcomes



**\$2.5M – Start-up**



**\$10M - Purse  
Ansari Family**



**>\$120 Million  
Teams' spend**



**~\$3 Billion  
Industry**



**XPRIZE**



U.S. DEPARTMENT OF  
**ENERGY**

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