U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

# Advanced Manufacturing at the US Department of Energy

## AMO Peer Review


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June 11th, 2019 | Washington, DC

*manufacturing.energy.gov*

# Draft AMO MYPP

## Advanced Manufacturing Office Multi-Year Program Plan for Fiscal Years 2019 through 2023: Final Draft


- Transparent 5-year plan available to internal and external stakeholders
- Clearly communicates AMO plans and priorities
- Serves as an operational guide for AMO to manage activities toward programmatic and agency performance goals
- Sets forth the Office mission, vision, and goals
- Identifies the technology, outreach, and crosscutting activities the Office plans to focus on over the next five years.

The updated draft plan reflects consideration of the comments received.

## AMO Vision and Mission

**Vision**: U.S. global leadership in sustainable and efficient manufacturing for a growing and competitive economy.

**Mission**: Catalyze research, development and adoption of energy-related advanced manufacturing technologies and practices to increase energy productivity and drive U.S. economic competitiveness.

# AMO Multi-Year Program Plan (MYPP)

# AMO Strategic Goals

## AMO Strategic Goals

- Improve the productivity and energy efficiency of U.S. manufacturing.
- Reduce life cycle energy and resource impacts of manufactured goods.
- Leverage diverse domestic energy resources in U.S. manufacturing, while maintaining environmental stewardship.
- Advance materials, critical materials, and rare earth elements to avoid supply chain disruptions for U.S. manufacturing.
- Transition DOE supported innovative technologies and practices into U.S. manufacturing capabilities.
- Stimulate information technology solutions leading to data-driven process control, high performance computing capabilities, and secure manufacturing plants.
- Strengthen and advance the U.S. manufacturing workforce.

# AMO Success Indicators

- Validate advanced materials, processes, and technologies that reduce manufacturing energy intensity by 20% by 2023 compared to the 2015 average technology.

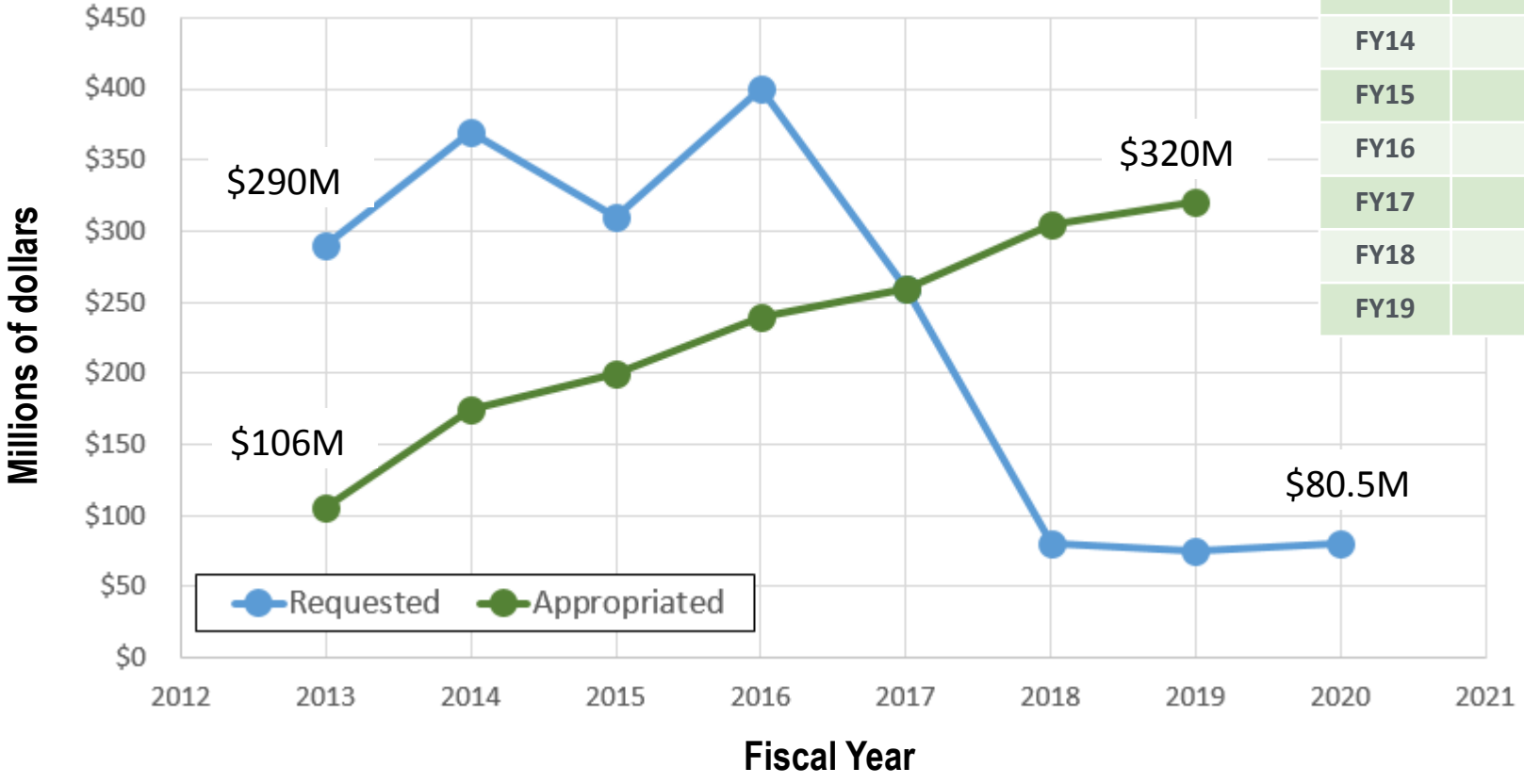
- Advance materials and manufacturing technologies with the potential to reduce **lifecycle energy** by 50% by 2023 compared to the 2015 state-of-the-art.

- Establish partnerships resulting in 10,000 U.S. manufacturing facilities implementing AMO-recognized **energy management** products, practices and measures by 2023.

- Double supported **technical education** and training activities in advanced manufacturing made available for private entities, universities, community colleges, and high schools by 2023.

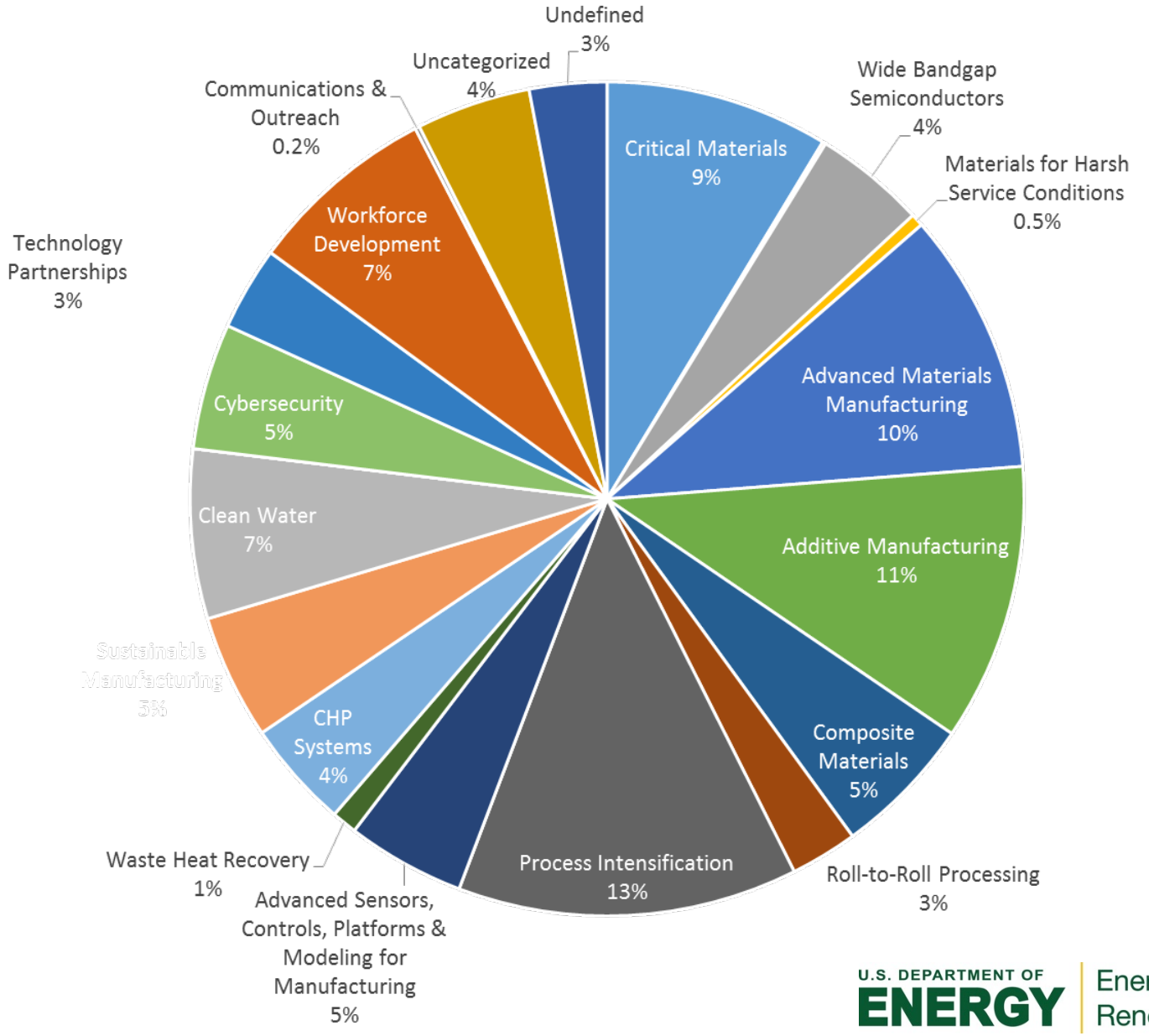
# Continuing bipartisan support

## AMO budget has steadily grown

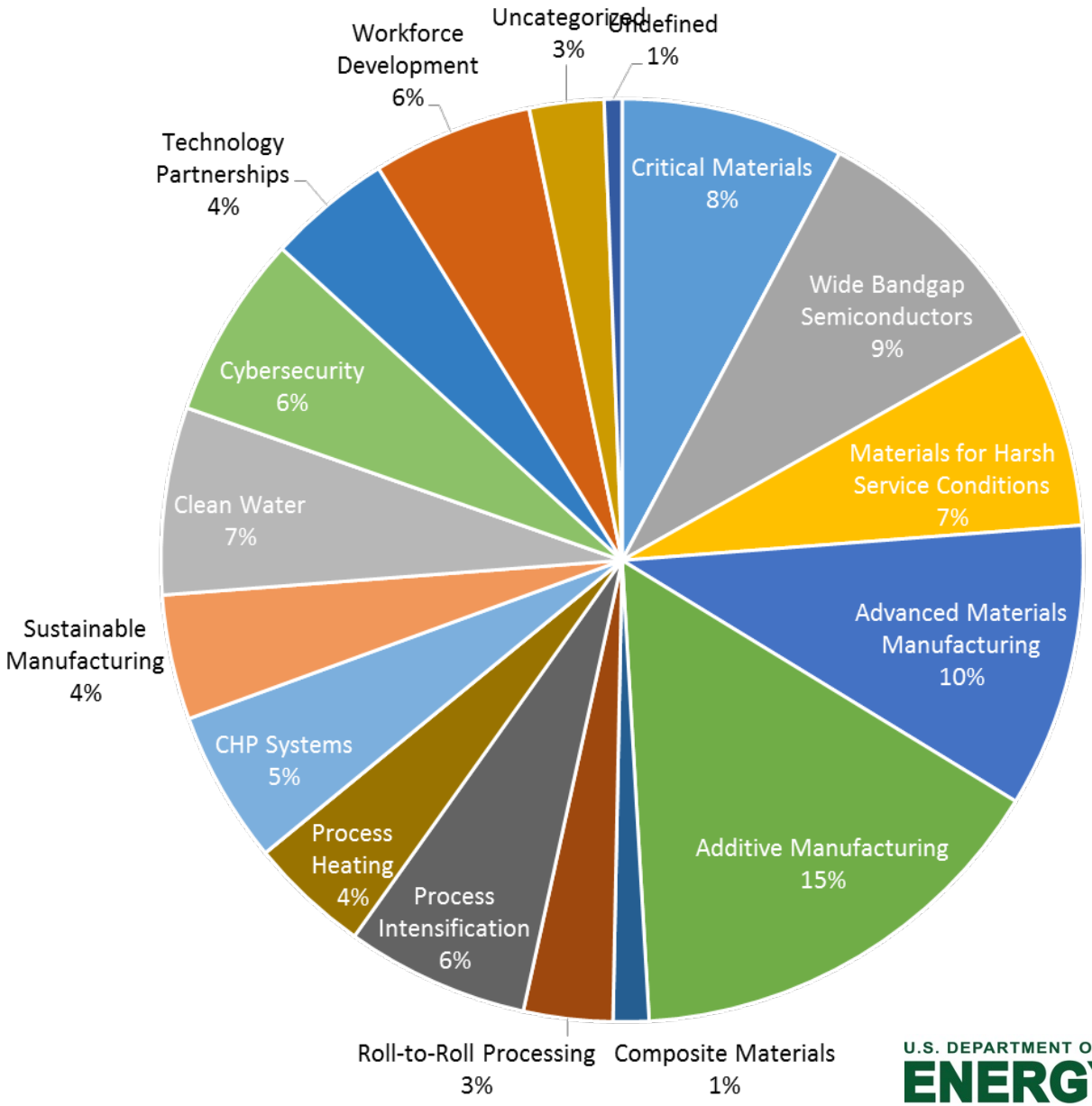



| Year | FTE Count |
|---|---|
| FY13 | 33 |
| FY14 | 32 |
| FY15 | 31 |
| FY16 | 36 |
| FY17 | 34 |
| FY18 | 33 |
| FY19 | 32 |

# FY18 funding by MYPP areas



# FY19 funding by MYPP areas



# AMO: Three complementary strategies

## R&D Projects: Bridging the innovation gap

Research and Development Projects to support innovative manufacturing processes and next-generation materials

## R&D Consortia: Public-Private consortia model

R&D Consortia offer affordable access to physical and virtual tools, and expertise, to foster innovation and adoption of promising technologies

## Technical Assistance: Direct engagement with Industry

Driving a culture of continuous improvement and wide scale adoption of proven technologies, such as CHP, to reduce energy use in the manufacturing sector

# Advanced Manufacturing

AMO supports R&D projects, R&D consortia, and early-stage technical partnerships with national laboratories, companies (for-profit and not-for profit), research institutions, and universities through competitive, merit reviewed funding opportunities designed to investigate novel manufacturing technologies. Technology partnerships inform subsequent research activities as well as provide a vehicle for field verification research, knowledge dissemination, and transfer of novel manufacturing technologies.

| (Dollars in Thousands) | FY 2018 Enacted | FY 2019 Enacted |
|---|---|---|
| Advanced Manufacturing R&D Projects | 120,800 | 113,100 |
| Advanced Manufacturing R&D Consortia | 153,000 | 166,900 |
| Advanced Manufacturing Industrial Technical Assistance | 31,200 | 40,000 |
| **Total** | **305,000** | **320,000** |

# FY18/FY19 Lab Call

### Office of Science Laboratories

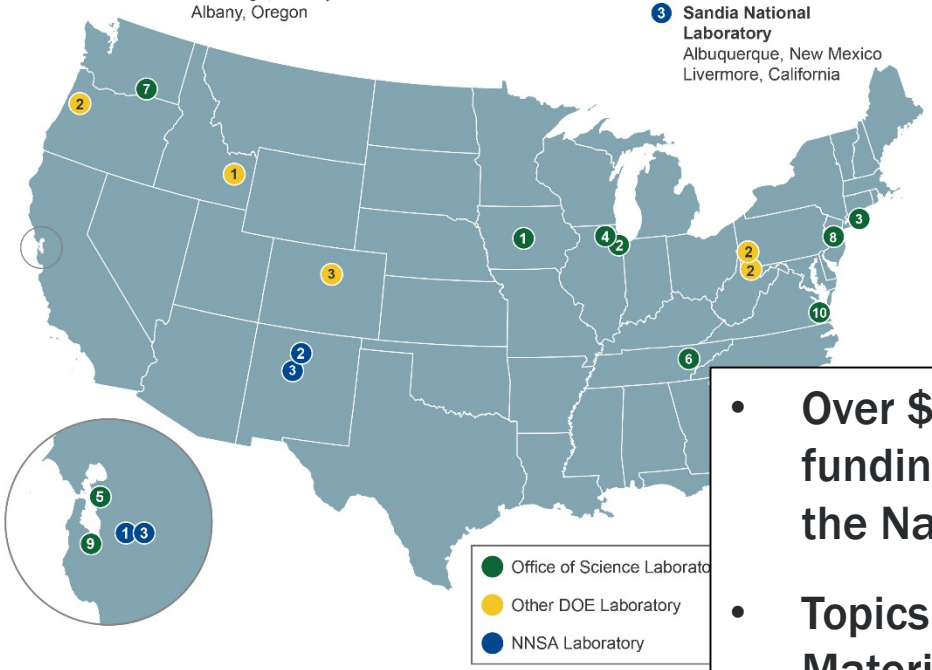
1. **Ames Laboratory**
   Ames, Iowa
2. **Argonne National Laboratory**
   Argonne, Illinois
3. **Brookhaven National Laboratory**
   Upton, New York
4. **Fermi National Accelerator Laboratory**
   Batavia, Illinois
5. **Lawrence Berkeley National Laboratory**
   Berkeley, California
6. **Oak Ridge National Laboratory**
   Oak Ridge, Tennessee
7. **Pacific Northwest National Laboratory**
   Richland, Washington
8. **Princeton Plasma Physics Laboratory**
   Princeton, New Jersey
9. **SLAC National Accelerator Laboratory**
   Menlo Park, California
10. **Thomas Jefferson National Accelerator Facility**
    Newport News, Virginia

### Other DOE Laboratories

1. **Idaho National Laboratory**
   Idaho Falls, Idaho
2. **National Energy Technology Laboratory**
   Morgantown, West Virginia
   Pittsburgh, Pennsylvania
   Albany, Oregon
3. **National Renewable Energy Laboratory**
   Golden, Colorado
4. **Savannah River National Laboratory**
   Aiken, South Carolina

### NNSA Laboratories

1. **Lawrence Livermore National Laboratory**
   Livermore, California
2. **Los Alamos National Laboratory**
   Los Alamos, New Mexico
3. **Sandia National Laboratory**
   Albuquerque, New Mexico
   Livermore, California



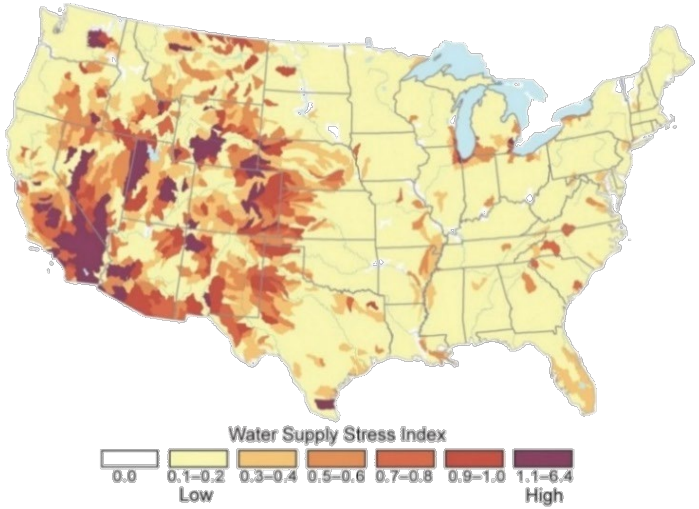

- Over $127M in FY 18 and FY19 funding to support 33 projects across the National Lab network
- Topics include Harsh Environment Materials, Wide Band Gap Semiconductors, Combined Heat and Power, Additive Manufacturing, and more*

* Topics mapped to AMO's MYPP and congressional direction

# Energy-Water Desalination Hub

**FOA Released: March 26, 2019**
**Federal Funding: $120M (pending appropriations)**
**Cost share:** 20%
**Concept Papers Due: 2/7/2019**
**Full Applications Due: 5/7/2019 (CLOSED)**
**Part of Department of Energy's Water Security Grand Challenge**

Water Stress in the U.S. [1]




- Hubs are integrated research centers that combine basic and applied research with engineering to accelerate scientific discovery that addresses critical energy issues.
- The Hub will focus on early-stage research and development (R&D) for energy-efficient and cost-competitive desalination technologies including manufacturing challenges, and for treating non-traditional water sources for multiple end-use applications.
- Four topic areas:
  - Materials Research and Development
  - New Process Research and Development
  - Modeling and Simulation Tools
  - Integrated Data and Analysis

[1] https://nca2014.globalchange.gov/highlights/report-findings/water-supply/graphics/water-stress-u-s

# Cybersecurity in Energy Efficient Manufacturing

**FOA Released: March 26, 2019**
**Federal Funding: $70M (pending appropriations)**
**Cost share:** 20%
**Concept Papers Due: 5/15**
**Full Applications Due: 8/20**
**Led by the Advanced Manufacturing Office (AMO) in partnership with the Office of Cybersecurity, Energy Security and Emergency Response (CESER)**

Manufacturing Innovation Institutes are designed to bring together a wide range of private and public stakeholders to accelerate innovation in industry-relevant technologies, provide education and training for the American workforce, and transition to a privately funded model.

- Link: https://eere-exchange.energy.gov/#FoaIddfdeec54-a32a-4113-bd78-04aa84185034

- A critical path to improving energy efficiency for manufacturing is increased automation and integration across the supply chain.
- Topic 1. Securing Automation innovations:
  - Enabling greater energy efficiency
  - Vulnerabilities in automated control systems
  - Securing communication for smart and digital manufacturing
  - Computing architectures and hardware customized for cybersecurity
  - Identification, alerting and mitigating threats
  - Communicating threats across industry
- Topic 2. Securing the Supply Chain Network innovations:
  - Security for agile supply chain networks
  - Standardization of protocols leading to greater energy efficiency
  - Secure asset and energy management
  - Prescriptive data analytics for security threats
  - Security related network efficiency

# Recently Announced Multi-Topic Funding Opportunity

**FOA Released: May 7th, 2019**
**Federal Funding: $89M**
**Cost share:** 20%
**Concept Papers Due: 6/20**
**Full Applications Due: 8/29**
**Led by the Advanced Manufacturing Office (AMO)**

Supports in innovative, early-stage advanced manufacturing applied R&D projects that focus on specific high-impact manufacturing technology, materials, and process challenges. The topics are aimed at foundational energy-related advanced manufacturing technologies that impact areas relevant to manufacturing processes and broadly applicable platform technologies

- Topic 1. Advanced Materials
  - Advanced Energy Conversion and Storage Materials
  - Innovative Manufacturing Processes for Battery Energy Storage
  - Materials and Manufacturing for Nanocrystalline Metal Alloys
  - Harsh Service Conditions
- Topic 2. Low Thermal Budget Processes
  - Advanced Drying Technologies
  - Thermal Process Intensification
- Topic 3. Connected & Flexible Manufacturing and Energy Systems
  - Medium-Voltage Power Conditioning Systems to Enable Grid-Dispatchable and Resilient Manufacturing Facilities
  - High Efficiency Combined Heat and Power
  - Validation of CHP and District Energy Systems

- Link: https://eere-exchange.energy.gov/Default.aspx#Foaldeaf73ef3-8146-47bd-9f99-a5d7af08a6b6

# Alignment with Administration Priorities

- ✓ Competitively selected
- ✓ Early-stage applied R&D projects
- ✓ Works with universities, laboratories, companies
- ✓ Merit-based & peer-reviewed
- ✓ Support energy productivity across the entire U.S. manufacturing sector.
- ✓ Supports EERE priorities around energy affordability, integration, and storage

# Thank you!

# Questions?