



# *Exploring Government's Role in Technology Innovation*

## *The Advanced Technology Program: Pioneers in Power for the Digital Information Age*

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**NIST**

National Institute of Standards and Technology • Technology Administration • U.S. Department of Commerce

*To accelerate the development of  
innovative technologies for broad  
national benefit through partnerships  
with the private sector.*





## *Fourteen Years of Innovation*

- Since 1990, **6054 proposals** submitted to **43 competitions**, requesting **\$12,969 million** from ATP
- **709 projects awarded** with **1,433 participants** and an equal number of subcontractors
- **207 joint ventures** and **502 single companies**
- **\$4,101 million** of **high-risk research** funded
  - *ATP share = \$2,114 million*
  - *Industry share = \$1,987 million*
- Small businesses are thriving
  - *65% of projects led by small businesses*
- Over **160 universities** participate
- Over **25 national laboratories** participate

- Emphasis on innovation for broad national economic benefit
- Industry leadership in planning and implementing projects
- Project selection based on technical and economic merit
- Demonstrated need for ATP funding
- Requirement that projects have well-defined goals/sunset provisions
- Project selection rigorously competitive, based on peer review
- Program evaluation from the outset

## Evidence

- Federal funding plays a critical role in crossing the Valley of Death
  - ATP represents a more important element in bridging this gap than may have been appreciated
  - VC, State Government and Universities only contribute between 8 and 16% toward early stage technology development
  - ATP and SBIR account for between 21 and 25%

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# Advanced Power Award Themes

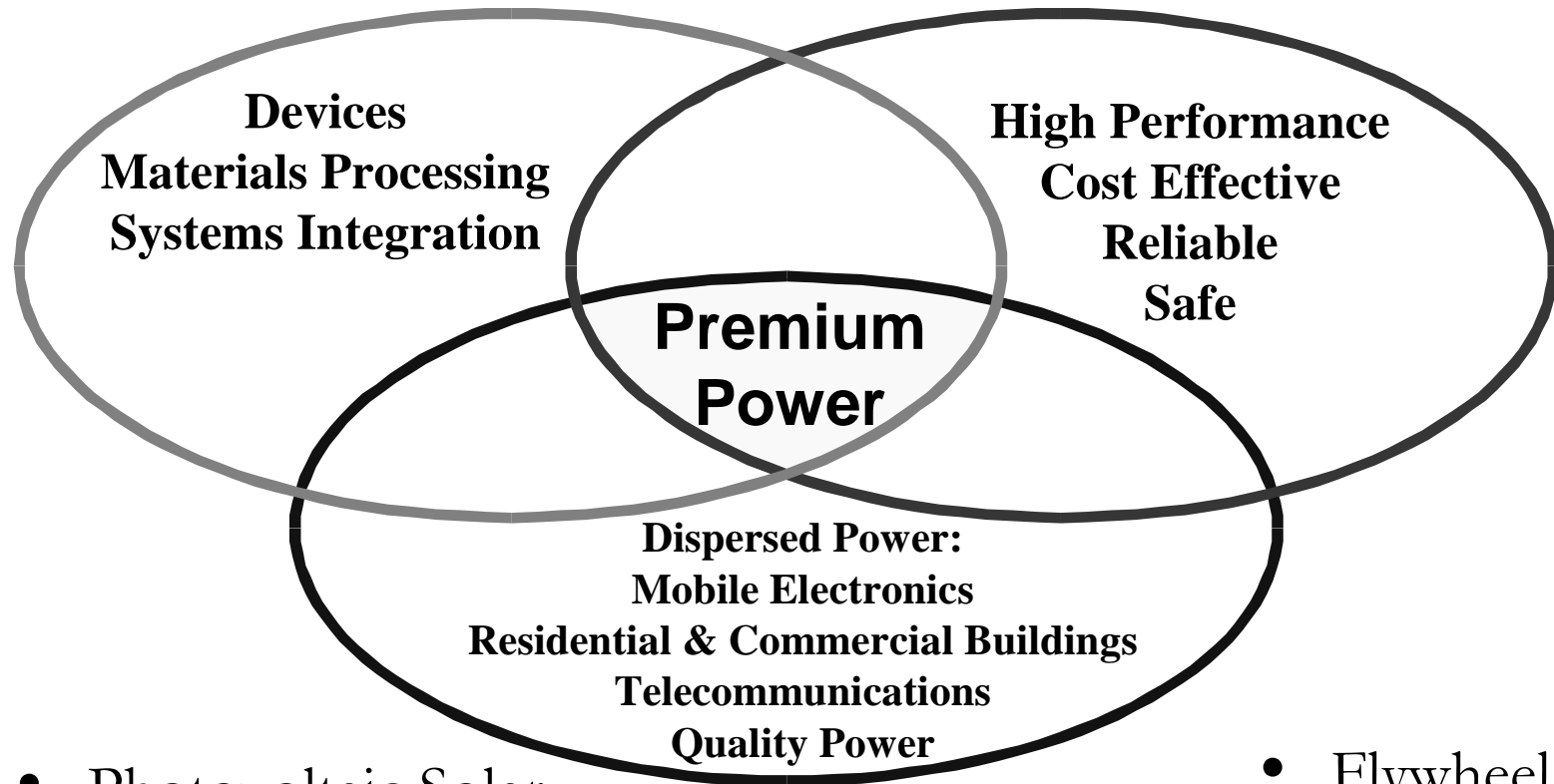
Targets enabling, value-added power technologies critical to the sweeping changes taking place in the way electricity is used and generated

- **information systems**
- **telecommunications**
- **electric power industries**

Targets power technologies for the digital information age:

- *Advanced batteries and micro-fuel cells for portable wireless electronics*
  
- *Black-out free, distributed electric power with fuel cells, photovoltaic solar cells*
  - *commercial / residential buildings*
  - *for broadband telecommunications*
  - *power quality uses wherever micro-processors are used*

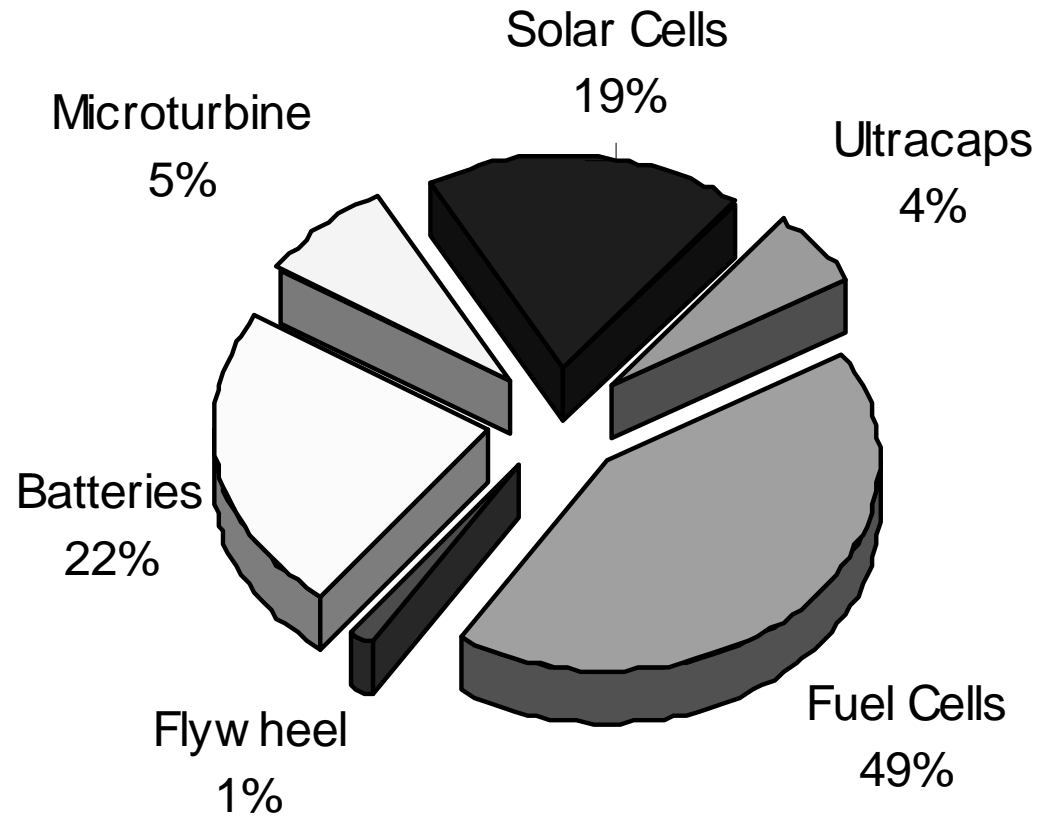
- Advanced Rechargeable Batteries
- Fuel Cells



- Photovoltaic Solar Modules
- Flywheels
- Ultracapacitors

# 50 Advanced Power Projects

(As a Percentage of \$118M Awarded)



Total Project  
Costs = \$220M

Total ATP  
Costs = \$118M



# ATP Technology Clusters

1997-2003

## Advanced Power Technologies

## Fuel Cell Technologies

Active or completed projects:	50	24
Estimated ATP funding:	\$ 118 M	\$ 58 M
Industry cost-share funding:	<u>\$ 102 M</u>	<u>\$ 51 M</u>
Total Impact:	\$ 220 M	\$ 109 M



*Pioneering in PEM and SOFC Fuel Cells for  
Distributed Power(1997-2003)*

- AVISTA Labs
- Plug Power, Polyfuels, SRI
- H Power, Nuvera
- Materials and Systems Research
- Superior MicroPowders(3)
- Babcock & Wilcox SOFCo
- ECD Ovonics, Crucible Research
- ITN Energy Systems
- Blasch Precision Ceramics
- Microcell
- Plug Power (3)
- Technology Management Inc (TMI)
- Tiax

## **Two Major Criteria**

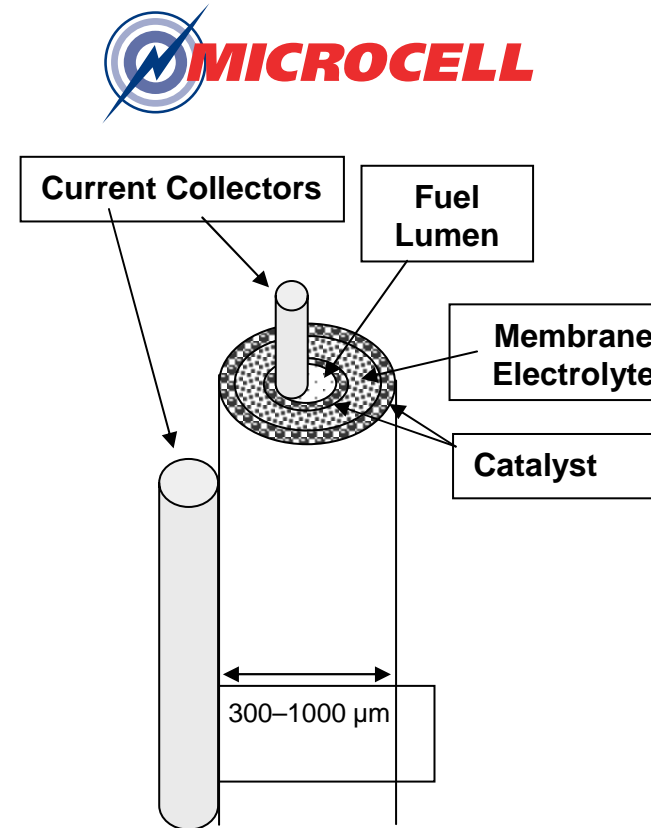
- Scientific and Technological Merit (50%)
  - Technical Rationale
    - high technical risk & feasibility
    - technological innovation
  - R&D Plan
- Potential for Broad-Based Economic Benefits (50%)
  - National Economic Benefits
  - Need for ATP Funding
  - Pathway to Economic Benefits

- ATP is a primary funder in the niche of small fuel cells for portable electronic devices
- MTI and partner duPont developing 1 watt, advanced direct methanol fuel cell
- Replacement for Lithium batteries (same size)
- Full month (rather than few days) of power per fueling (charge)
- Scope includes fuel cell, microfluidics, and electrochemical capacitor

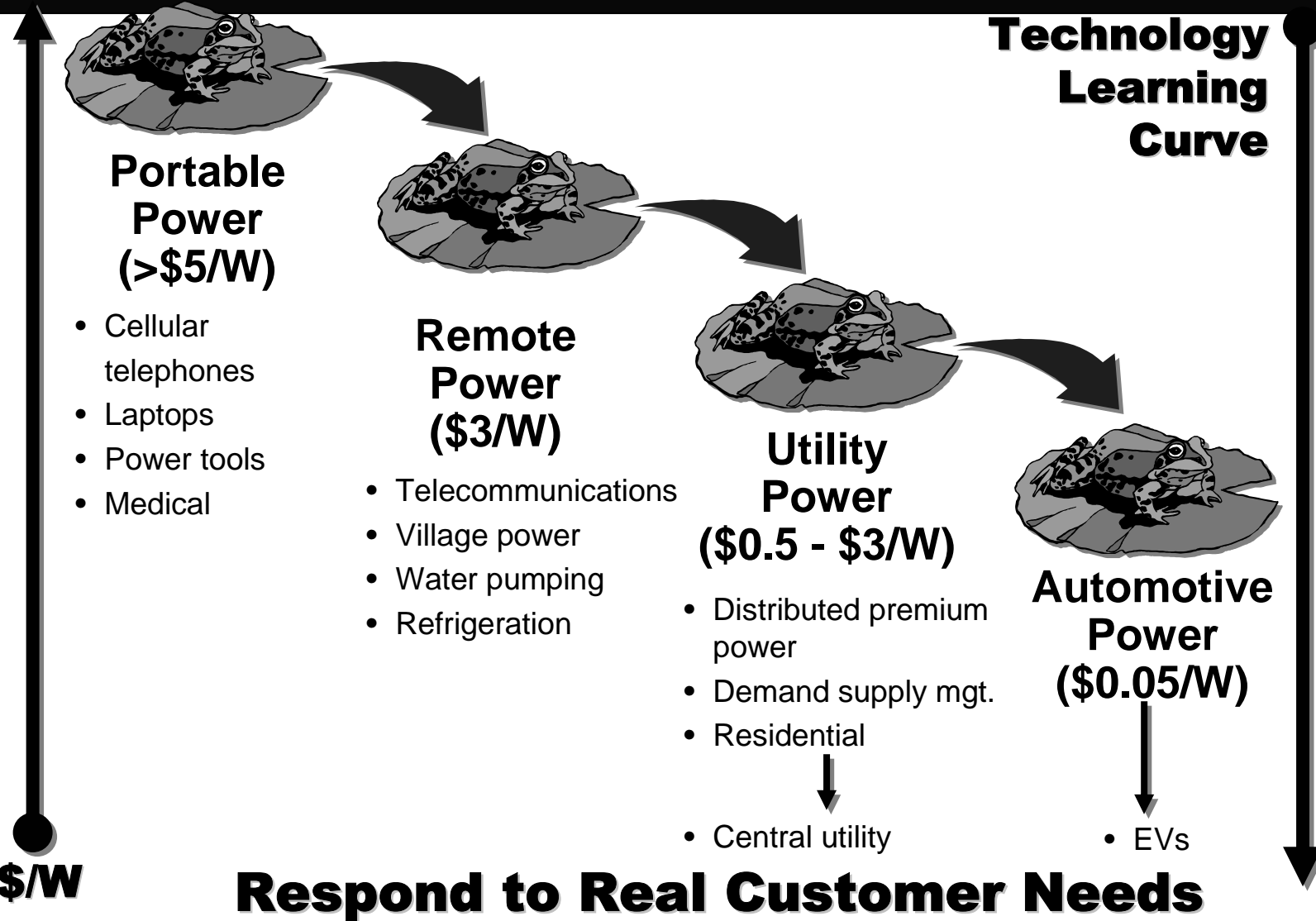


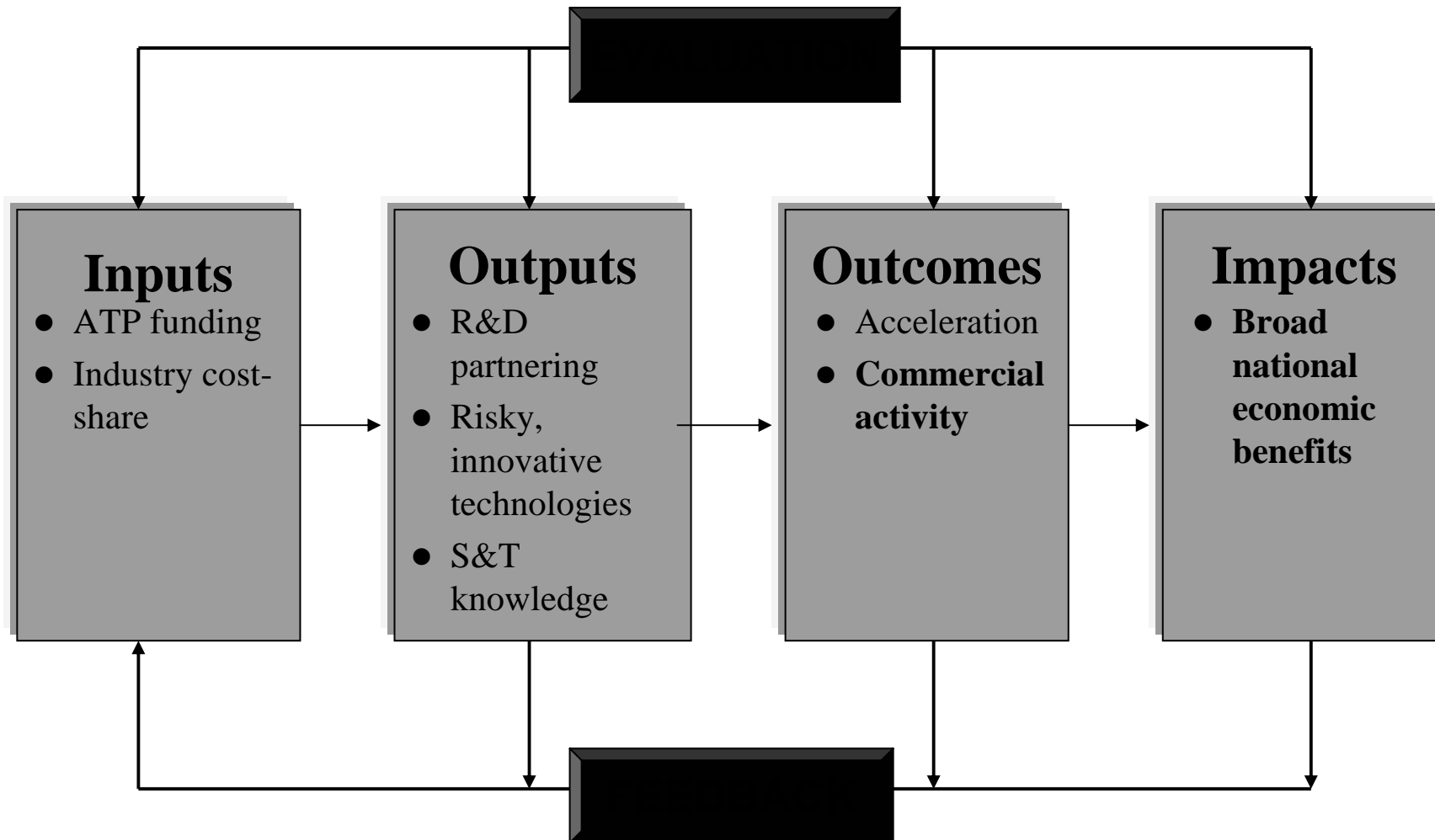
<http://www.mtimicrofuelcells.com/>

- ATP is a high-risk funder of novel fuel-cell concepts
- ATP funded after other funding agencies declined as too risky
- Key objective: new fuel-cell technology based on a micro-fiber membrane structure, with revolutionary increases in power density
- Inherently low cost: one can extrude all the components together (preassembled)

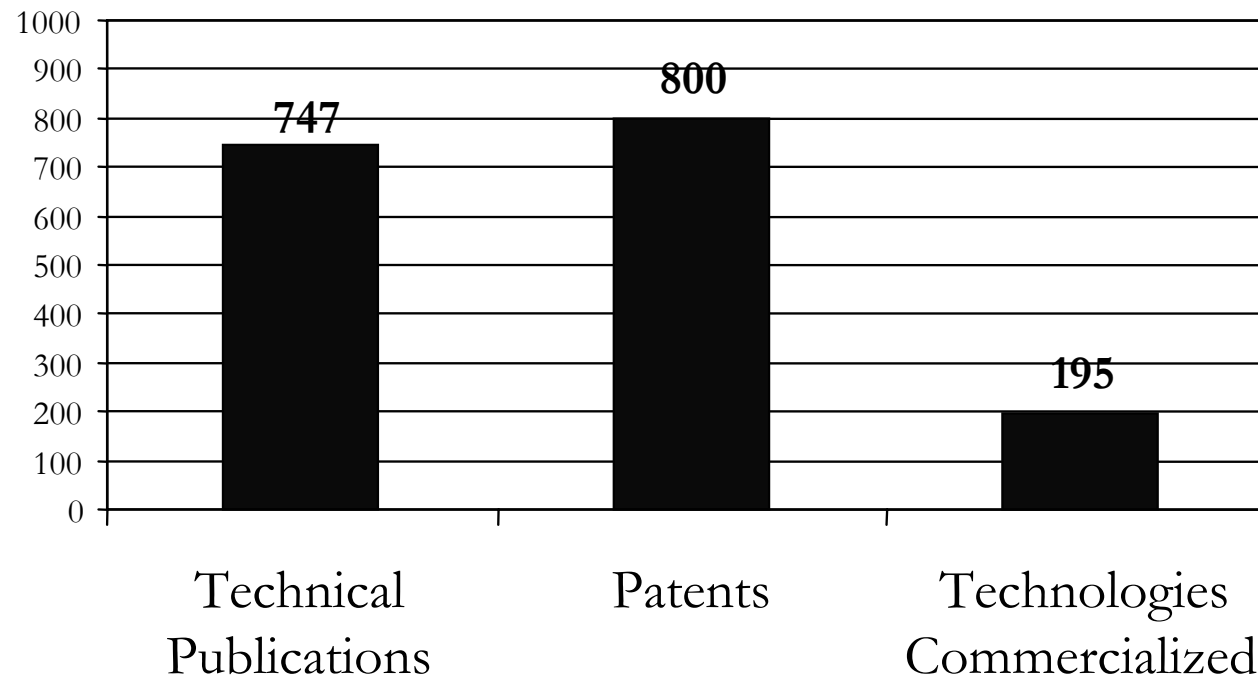


- Novel large area, thin film/ membrane multilayer device structures
- First row elements
- New chemistries
  - rocking chair, intercalation batteries
  - multicomponent, solid state inorganics
  - nano-materials
  - new carbon
- Solid state ionic devices
- New processing, increased molecular engineering
- Rapid, high volume, low cost fabrication





*Identify goals that reflect program's purpose*



- 300 projects completed
  - 50% have technologies under commercialization

- ATP accelerates technology development.
  - 86% of project participants report that they are ahead in their R&D cycle as a result of ATP funding.
  - Over half said that they are ahead by 1 to 3 years.
- ATP fosters collaboration.
  - 85% of projects engaged in collaborations with other companies, universities and federal labs.

## ATP Firms Commercialize Technology

- Technologies under commercialization--  
More than 195 technologies under commercialization
  - **By end of ATP, 1 out of 4 of projects commercialize an early application**
  - **By 2-3 years after ATP, 1 out of 2 projects commercialize an early application**

## **ATP Projects Lead to Spillover Benefits**

- Spillover benefits accrue to customers of ATP-funded technology
  - 8 out of 10 companies report that use of ATP technology reduces the customer's costs of production
  - 1 out of 2 report 'very significant' reduction of the customer's production costs

## **ATP Projects Produce Large Benefits**

- **Benefits:** Net Social Benefits on 8 ATP projects is \$16 Billion
- **Costs:** Total cost of ATP program between 1990 and 2003 is \$2 Billion

Source: ATP-EAO Benefit-Cost studies

## *What Happened to Nonfunded Projects?*

When ATP decides to not fund a project, what happens to these projects?

- 41% of these projects are not pursued.
- 40% are pursued on a smaller scale.
  - 4 out of 5 report that project is less than 40 percent of proposed ATP project.

Source: Survey of Applicants, 2000

- Focuses on the civilian sector
- Funds enabling technologies with high spillover potential
- Focuses on overcoming difficult research challenges
- Encourages company-university-laboratory collaboration - capitalize on R&D investments
- Requires commercialization plans and implementation to ensure societal outcomes
- Measures against mission in their evaluation work