Technology Transfer

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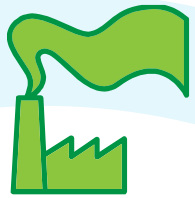
Goal of U.S. Technology Transfer: Availability and Use of Innovations

Government

- Research/Invent
- Regulate

- Public benefit
- Consumer

Private Industry



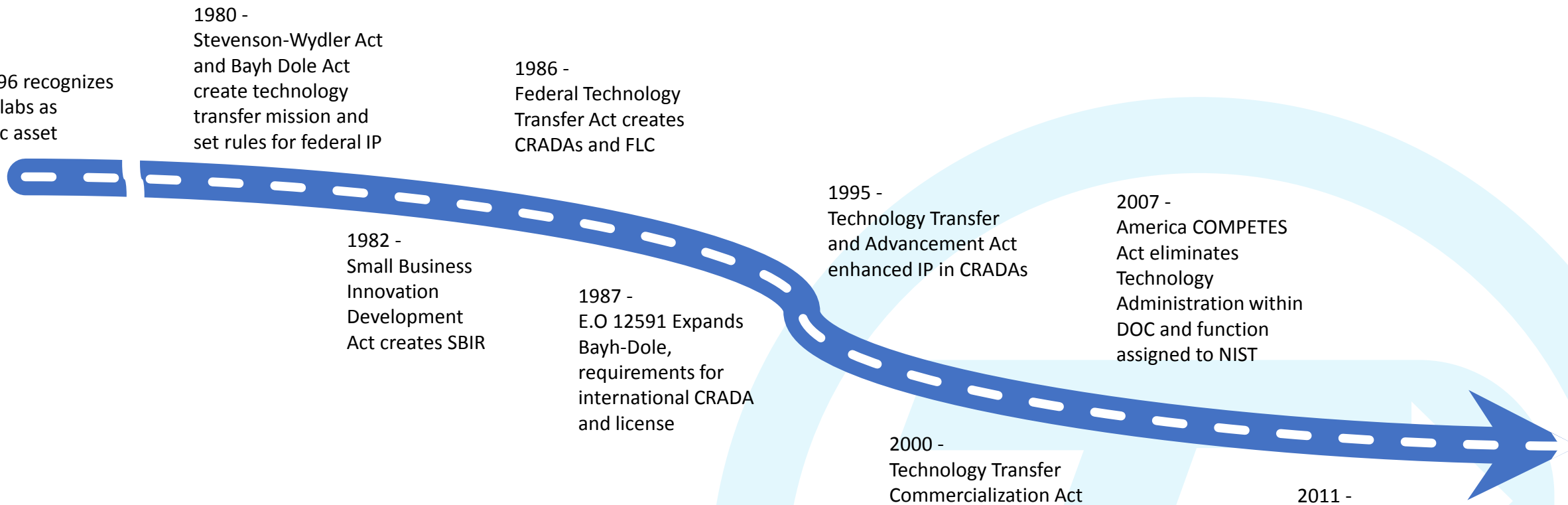
- Develop
- Manufacture
- Distribute

- Market
- Sell
- Requires private capital

Government Sponsored Transfer Technology

- Large investment in mission focused research, including basic research ~ $140 billion
- Missions range from space flight at NASA, defense industries, energy production, health care and many others
- Useful as an economic engine for innovation and growth of new businesses
- We consider an expansive view of technology transfer
  - Patenting/Licensing
  - Technical publications
  - Collaborations – formal and informal
  - Public Domain software

Timeline


1947 -
E.O. 10096 recognizes national labs as economic asset
1980 -
Stevenson-Wydler Act and Bayh Dole Act create technology transfer mission and set rules for federal IP
1982 -
Small Business Innovation Development Act creates SBIR
1986 -
Federal Technology Transfer Act creates CRADAs and FLC
1987 -
E.O 12591 Expands Bayh-Dole, requirements for international CRADA and license
1995 -
Technology Transfer and Advancement Act enhanced IP in CRADAs
2000 -
Technology Transfer Commercialization Act Rules for exclusive licensing and creates reporting requirement
2007 -
America COMPETES Act eliminates Technology Administration within DOC and function assigned to NIST
2011 -
America Invents Act modified US patent process

Statutory Drivers

- Intellectual Property
  - Bayh-Dole Act - 35 USC 200 et seq., Stevenson-Wydler Act/Federal Technology Transfer Act/Technology Transfer Commercialization Act – 15 USC 3710 et seq.
  - 37 CFR 404, 501; 15 CFR 17
  - Executive Orders 10096 and 12591

- Collaborations
  - Federal Technology Transfer Act – 15 USC 3710a
  - NIST Organic Act – 15 USC 272(c)(7)
  - OMB Circular A-25

- SBIR
  - Small Business Innovation Development Act (P.L. 97-219)
  - Small Business R&D Enhancement Act of 1992
  - Series of reauthorizations

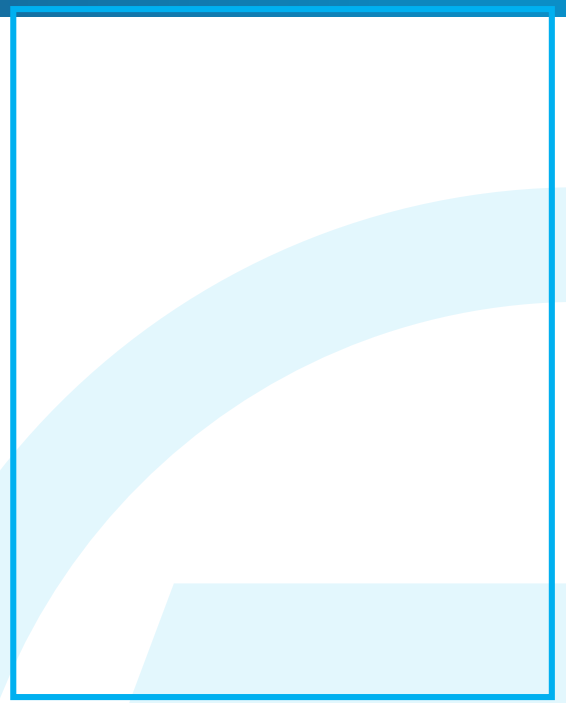
- Cross-agency Leadership
  - DOO 30-2A
  - NSTC L2M Subcommittee
  - OMB Circular A-11
  - 15 USC 3710 e through g

Policy Leadership

- As part of the Department of Commerce, NIST has a unique role in promoting and reporting on the overall strength of federal efforts
- Policy coordination, promulgation of technology transfer regulation
- Interagency Workgroup for Technology Transfer (11 agencies) and Interagency Workgroup for Bayh-Dole
- Annual reports for the President, the Congress, and OMB on utilization of technology transfer by DOC and across all agencies
- Support Lab-to-Market NSTC Subcommittee/Appropriation
- NIST has a statutory role as the “Host Agency” for the Federal Laboratory Consortium for Technology Transfer

Technology Transfer Reports

- Annual Report to OMB on DOC Technology Transfer
- Includes NIST, NOAA, ITS



- Annual Report to President and Congress on Federal Laboratory Technology Transfer (FY 2014)
- Produced by NIST through the Interagency Workgroup for Technology Transfer

Return on Investment: Public vs. Private Sectors

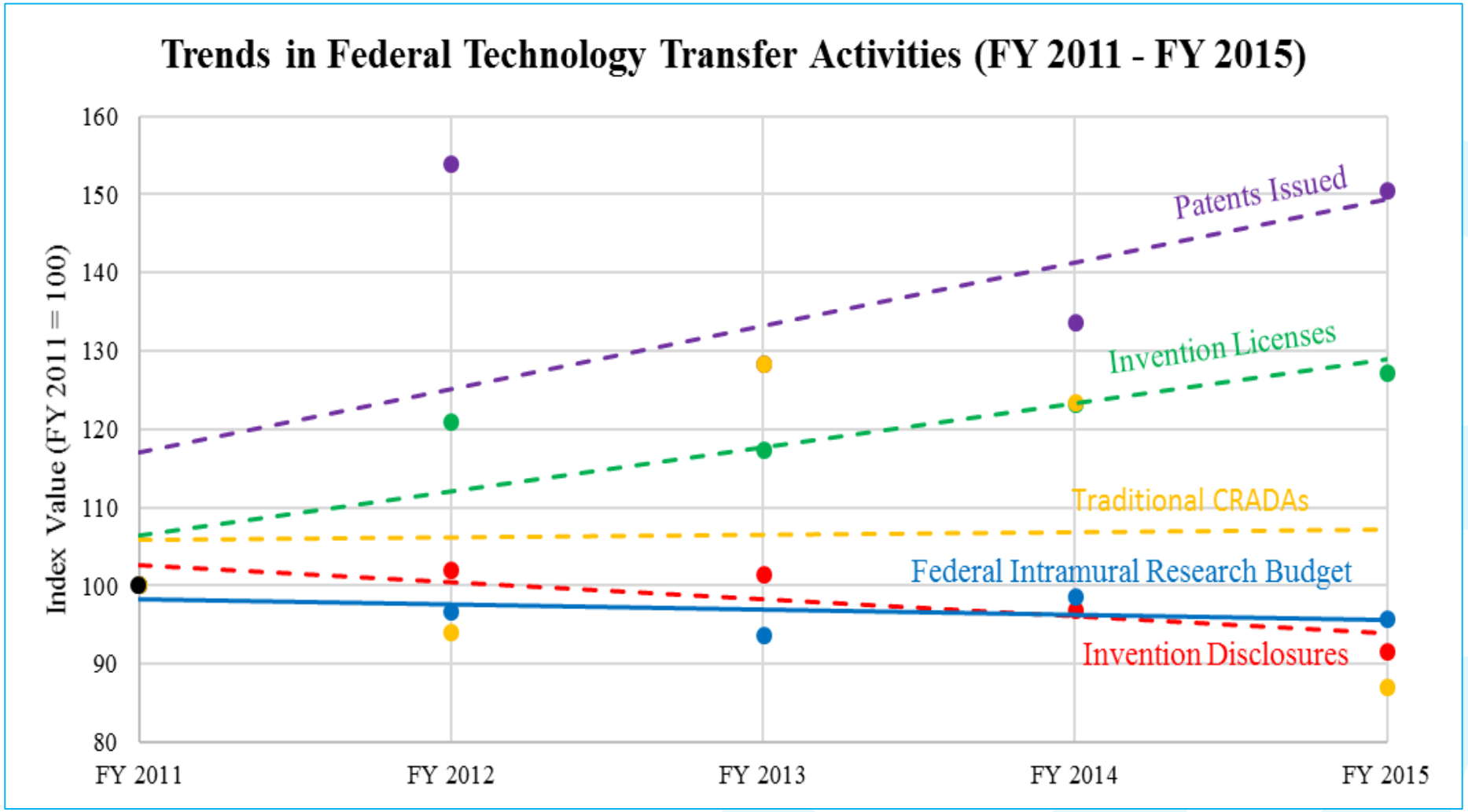
Private Sector

- Basic Science vs. Applied Research
- Invention vs. Innovation
- Market vs Non-Market Mechanisms
- Return on Investment: Profit, Net Benefits

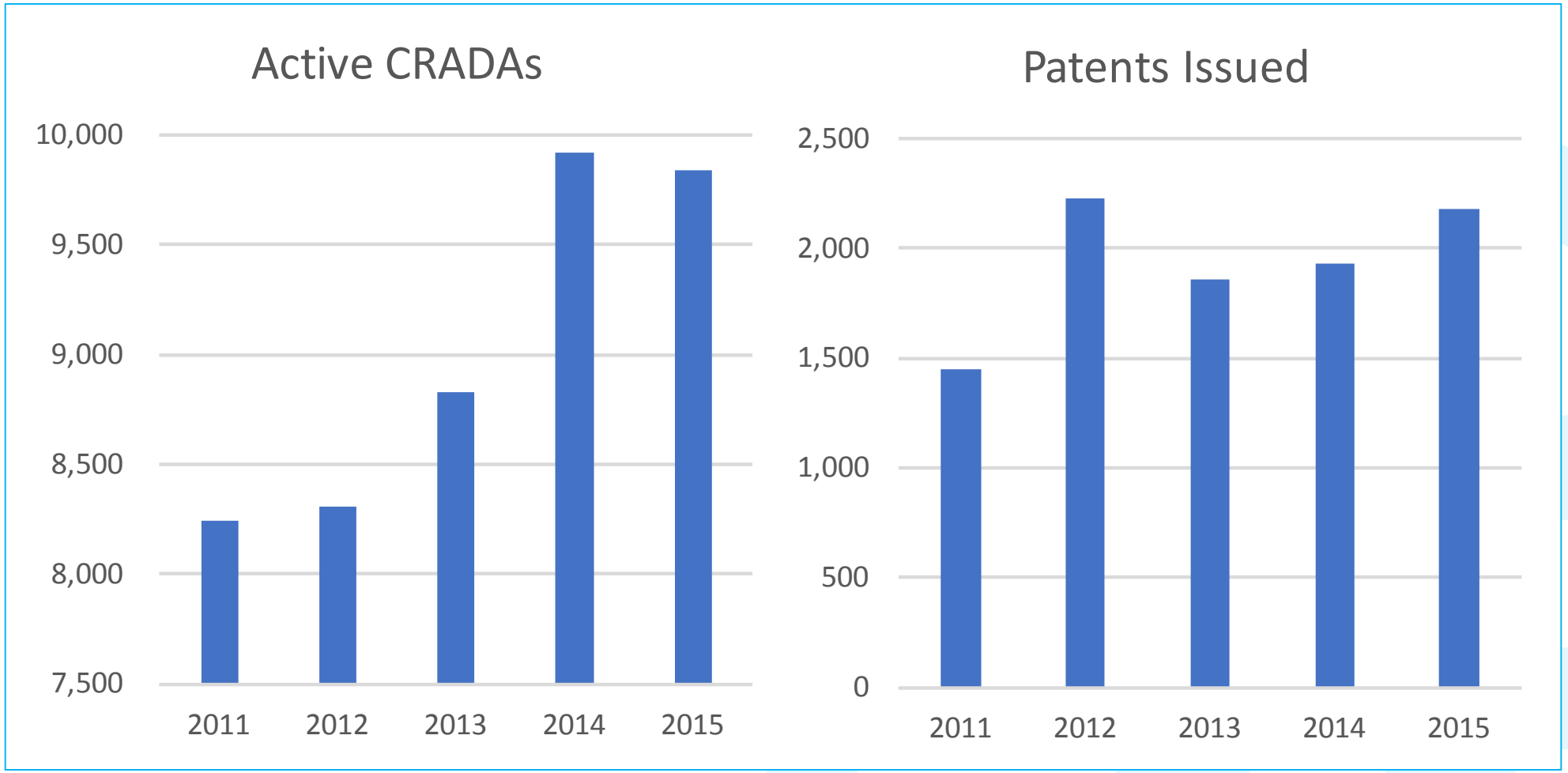
Public Sector

- Basic Science vs. Applied Research
- Intramural vs. Extramural Projects
- Invention vs. Innovation
- Market vs. Non-market Mechanisms
- Return on Investment: Mission Statement, Agency Objectives

Trend Assessment



US Lab Patent and CRADA Trends



Inventions: an Integral Part of NIST Research

MML: Adam Fleisher; David Long; Joe Hodges

Invention: Spectrometer capable of carbon 14 quantitative analysis
(biological v. geological origin of fuel source)
Large, but not as large as existing facilities elsewhere.

Invention disclosed to NIST; NIST files patent application

Company seeks NIST to reduce size, ruggedize instrument.
$2M proposed CRADA with research license; exclusive commercial license

PML: Jay Hendricks, Greg Strouse, Jacob Ricker, Doug Olson, Greg Scace, et al.

Invention: Photonic Pressure Sensor. Can replace existing pressure calibration devices, and provide high-accuracy laboratory measurements

Invention disclosed to NIST; NIST obtains patent

Company seeks to reduce size and cost.
$150k proposed CRADA with research license; commercial license under negotiation

Companies Working with NIST in FY 2016

	Small Companies[(a)]	StartupCompanies[(b)]	Other[(c)]	Total[(d)]
NIST Licenses	14	3	33	50
Traditional CRADAs	58	18	19	95
Non Traditional CRADAs				
Calibrations	205	18	419	642
NVLAP	588	0	0	588
MTA	12	2	5	19
SBIR Phase I	12	--	--	12
SBIR Phase II	7	--	--	7
NIST Labs				
CNST	2	2		4
PML	17	7	3	27
Facility Users				
CNST				2,856
NCNR				2,536
Standard Reference Data				13,494
Standard Reference Materials				31,983
Total	915	50	479	52,313

(a) Small companies (less than 500 employees) that have been in existence for more than 5 years.
(b) Startup or Young companies that have been in existence for less than five years.
(c) Includes large companies, foreign companies, government enterprises, and academic institutions.
(d) In progress.

Return on Investment: Measuring Performance

Microeconomic Approach – Performance at the Project Level

- Costs vs Benefits
- Performance Measures: Discounted Cash Flow, Net Present Value, Internal Rate of Return, Cost/Benefit Ratios

Summary of NIST Impact Studies

	SRR	BCR
Number of Studies Reporting	13	16
Min	27%	4
Max	1056%	249
Mean	254%	46
Std Dev	327%	69
Median	154%	9

SRR = Social Rate of Return
BCR = Benefit to Cost Ratio

Return on Investment: Measuring Performance

Macroeconomic Approach – Performance at the Agency Level

Models: Simulation Models, Input/Output Models,

Performance Measures: Changes in Revenues, Output, Productivity, Employment, etc.

	DoD Licenses Study	DoD CRADAs and Licenses Study	Navy CRADAs and Licenses Study
Year(s) covered	2000-2011	2000-2011	2009
Companies Surveyed	483	361	101
Output ($ million)	$36,300	$2,935,000	$545
Value added ($ million)	$17,400	$1,553,000	n.a
Employment	163,067	17,818	2,630
Labor Income ($ million)	$10,600	$1,049,000	n.a
Tax revenue ($ million)	$3,700	$331,000	$62

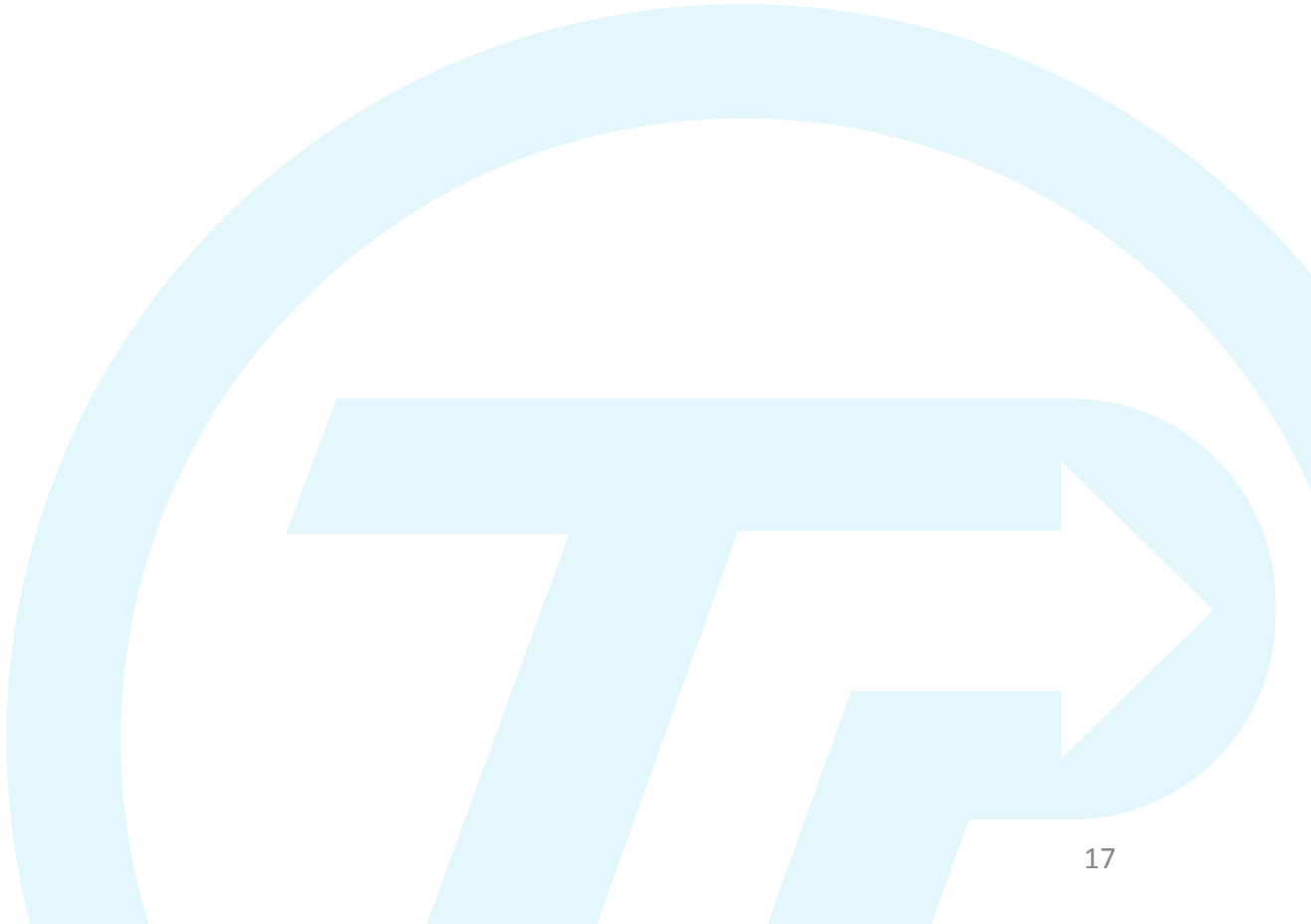
Return on Investment: Measuring Performance

Problems in Measuring Performance

- Data Availability – especially proprietary data on economic and social benefits
- Timing of Impact – Impacts that happen outside of the government may take years to develop
- Isolating the economic value of Federal contributions to collaborative research: CRADAs involving both extramural and intramural research.
- Costly Research

Summary

- Technology transfer remains grounded in economic competitiveness
- NIST has a significant role in technology transfer through the Department of Commerce
- It is an evolving process
- Measuring success is difficult but important



Completed Economic Studies

- FY16 DOC Tech Transfer Report (Sept 2017)
- FY14 Federal Tech Transfer Report (Oct 2016)
- Construction Grants Assessment (Aug 2016)
- Advanced Manufacturing Opportunities (Oct 2016)
- 1790 Patent Analysis (Oct 2016)
- FY17 NIST Footprint Study (Oct 2017)

Ongoing Economic Studies

Grants/Contracts

- Materials Genome Study (3/18)
- Federal Tech Transfer Study (7/18)
- GPS Study (8/18)
- Advanced Encryption Standard Study (8/18)

TPO Effort

- NIST Customer Demographics: CRADA, License, Calibrations (11/17)
- NIST High Impact Patents (1/18)
- NIST Post-Doc Study (2/18)
- Federal ORTA/TTO Study (4/18)
- SBIR Economic Analysis (12/18)