Federal Government's Role in Tech Transfer Innovation

J. Chris Ford, Ph.D.
Technical Advisor to the Director
Office of Economic Impact & Diversity
US Department of Energy
Chris.Ford@hq.doe.gov

NIST STEM Innovation and National Priorities & HBCUs

November 4, 2014

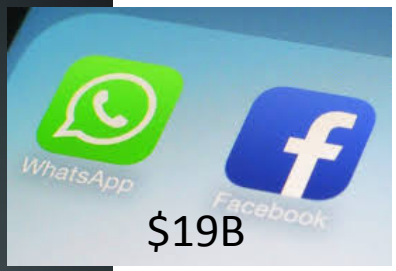
Agenda

- Relevant Tech Transfer Policy
- Dawn of a New Economic Era
- Culture and Innovation Ecosystems
- Market Intelligence and Gap Funding
- DOE-DOC Lab-to-Market Initiative

Relevant Tech Transfer Policy

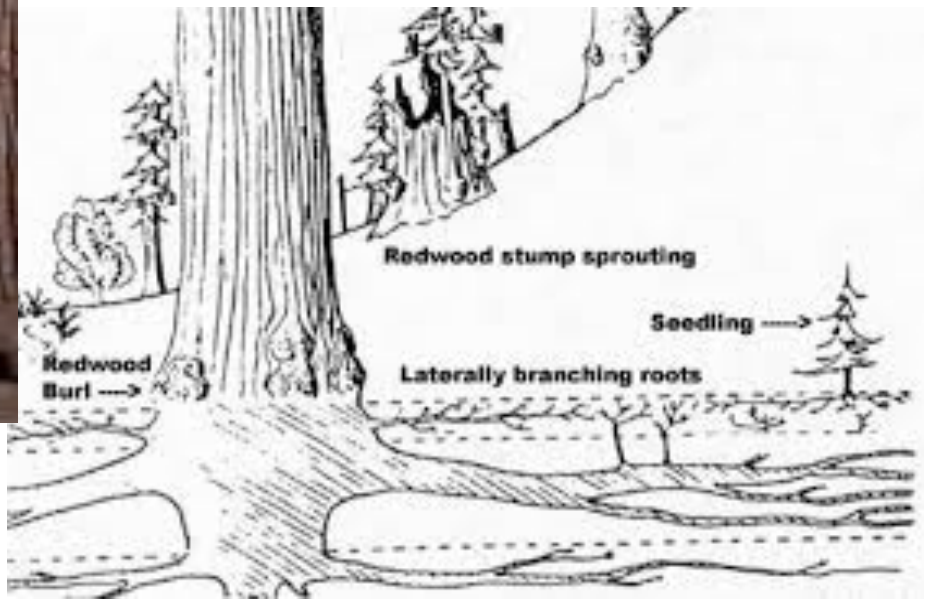
- **Stevenson-Wydler Technology Innovation Act of 1980** -- Purpose: "stimulating improved utilization of federally funded technology developments … by state and local governments and the private sector."
- **Federal Technology Transfer Act 1986** -- Technology transfer is a responsibility for all federal lab scientists and technology transfer activities are to be considered in employee performance evaluations.
- **Executive Order 12591, 1987** -- All agencies are required to "assist in the transfer of technology to the marketplace"
- **Energy Policy Act 2005** -- "The Secretary shall establish an Energy Technology Commercialization Fund, using 0.9 percent of the amount made available to the Department for applied energy research, development, demonstration, and commercial application for each fiscal year, to be used to provide matching funds with private partners to promote promising energy technologies for commercial purposes." (Section 1001)
- **Presidential Memorandum 2011** -- Accelerating Technology Transfer and Commercialization of Federal Research in Support of High-Growth Businesses.
  - Each executive department and agency that conducts R&D commits to improve the results from its technology transfer and commercialization activities. The aim is to increase the successful outcomes of these activities significantly over the next 5 years, while simultaneously achieving excellence in our basic and mission focused research activities.
  - Establish Goals and Measure Progress. Establishing performance goals, metrics, and evaluation methods, as well as implementing and tracking progress relative to those goals, is critical to improving the returns from Federal R&D investments.
  - Streamline the Federal Government's Technology Transfer and Commercialization Process. Streamlining licensing procedures, improving public availability of federally owned inventions from across the Federal Government, and improving the executive branch's Small Business Innovation Research (SBIR) and Small Business Technology Transfer (SBTT) programs based on best practices will accelerate technology transfer from Federal laboratories and other facilities and spur entrepreneurship.
  - Facilitate Commercialization through Local and Regional Partnerships. Agencies must take steps to enhance successful technology innovation networks by fostering increased Federal laboratory engagement with external partners, including universities, industry consortia, economic development entities, and State and local governments.

Dawn of a New Economic Era



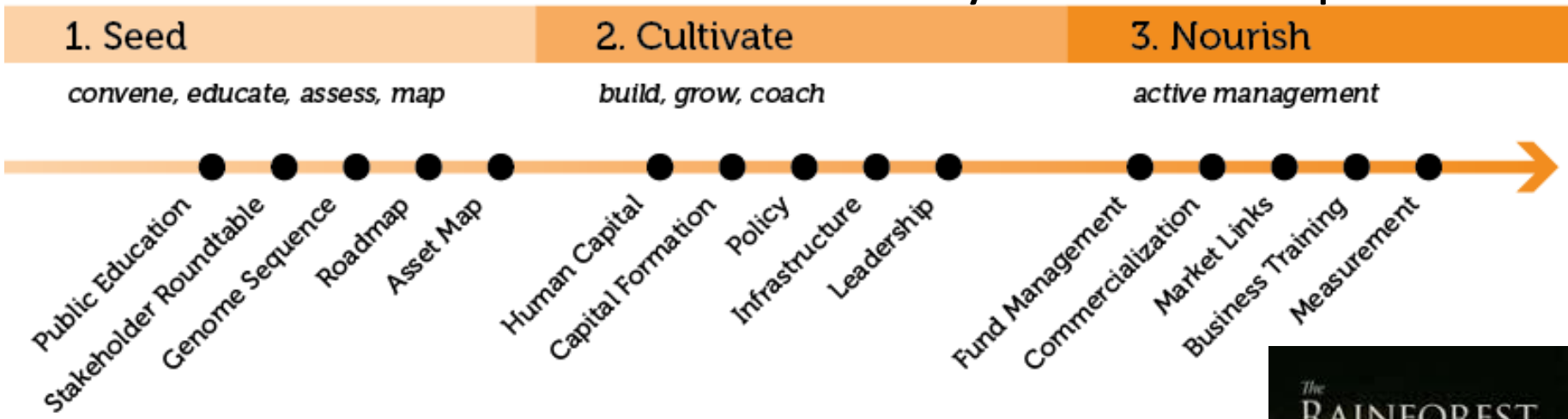
Culture and Innovation Ecosystems

A Redwood forest is highly sophisticated *ecosystem*. Each tree is a part of a *community* that shares resources which causes the entire ecosystem achieve unparalleled heights that could not be achieved alone.



Innovation Ecosystem

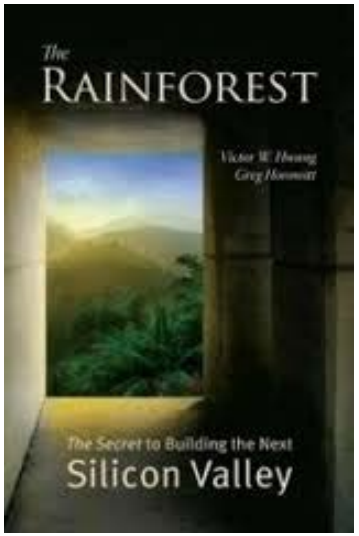
Rainforest model of Innovation Ecosystem Development



<u>Seed</u> a *culture* of innovation at Federal agencies and labs, minority businesses, minority serving institutions, large businesses, investment community, and stakeholder groups and agencies.

<u>Cultivate</u> *communities* that catalyze regional economic development.

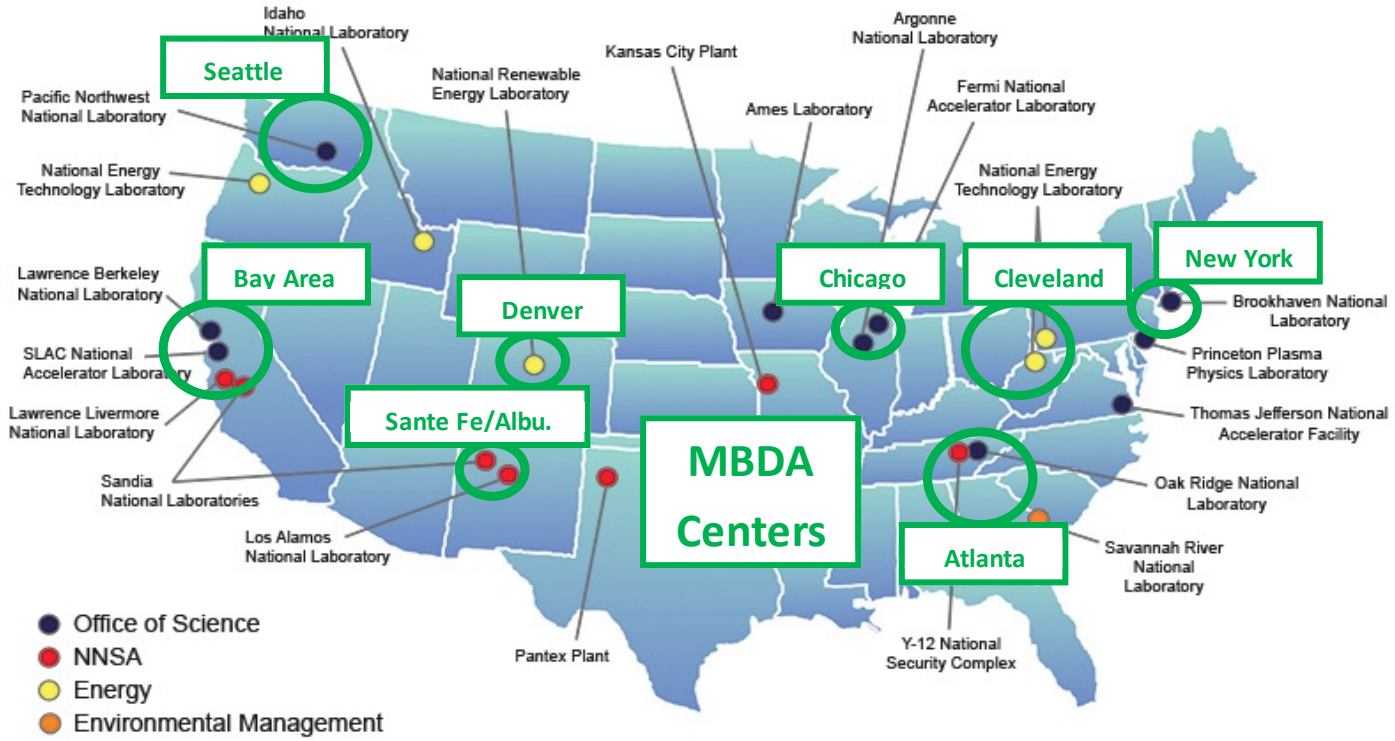
<u>Nourish</u> *regional economic development* with capital, technology commercialization, market verticals, and entrepreneurship training.



Economic Impact of Tech Transfer

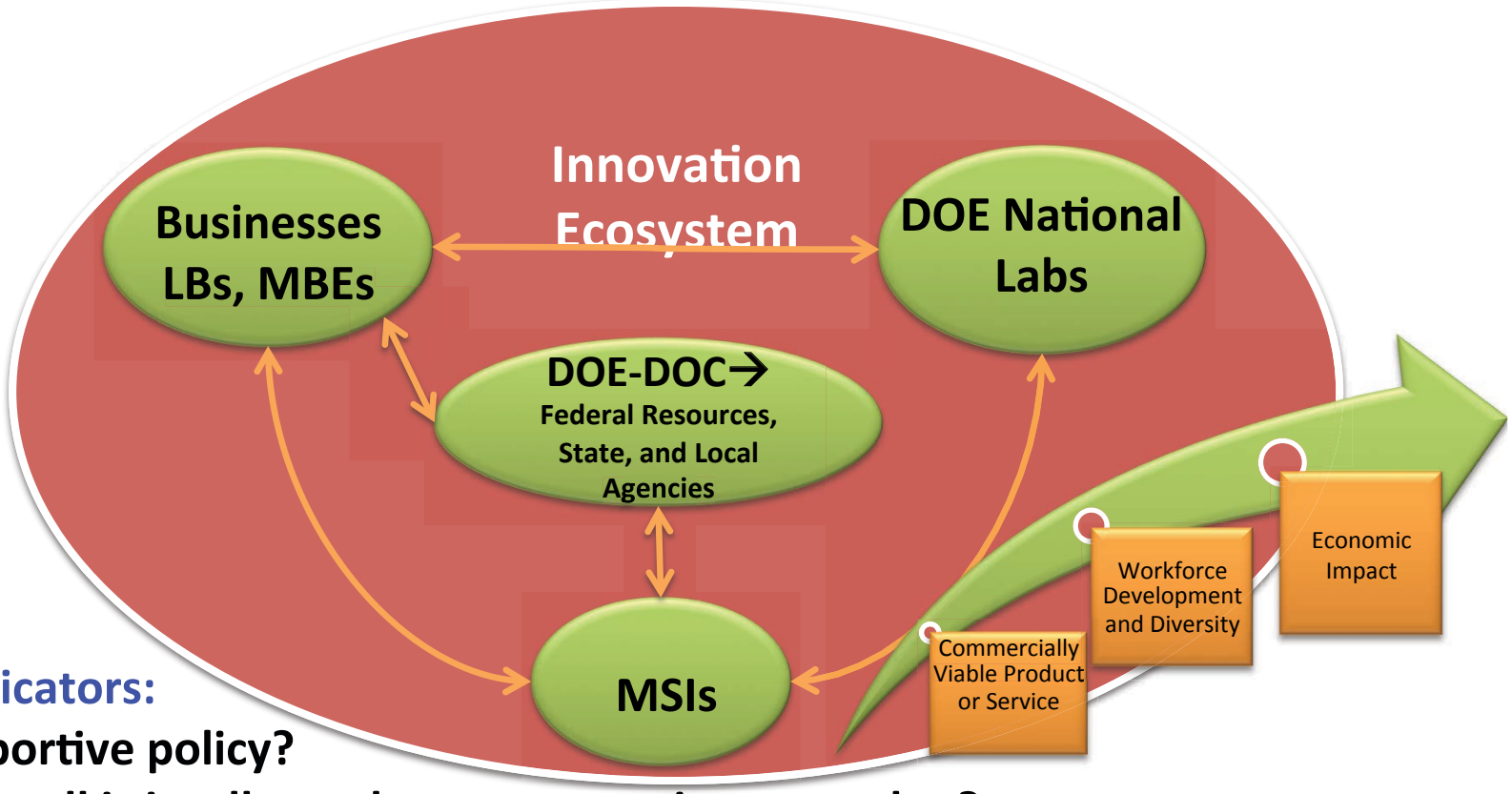
	TechLink Study of DoD	IBRC Study of Navy
Time Period	2000-2009	2005-2009
Types of **Tech Transfer Agreements** Considered	•44% R&D contracts •36% licenses •20% CRADAs	•25% licenses •75% CRADAs
Economic Impact *per Tech Transfer Agreement*	•$2.24MM •13 jobs created or retained	•$5.4MM •26 jobs created or retained
Average Job Compensation (for jobs attributable to direct sales)	$73,279	$79,300
Swearingen and Slaper, *Economic Impact of DoD Technology Transfer*, June 2012		

Lab-to-Market Initiative: DOE-DOC



Mission: To catalyze regional innovation ecosystems that stimulate job creation and business growth opportunities for minority business enterprises (MBEs) by leveraging the federal resources of the Department of Energy and its National Labs and the Department of Commerce

DOE-DOC: Ecosystem and Indicators

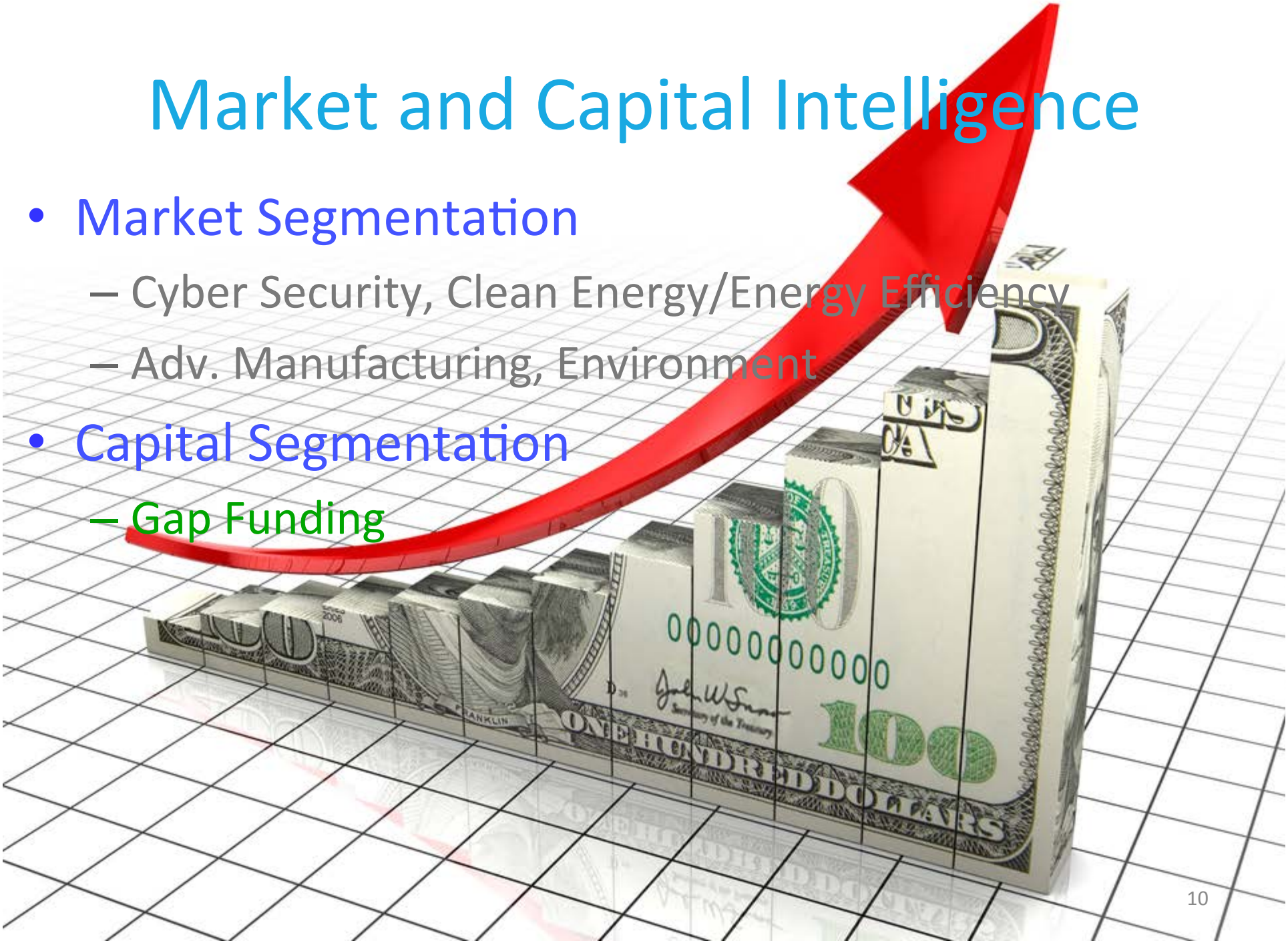


Ecosystem Indicators:

- **Policy: Supportive policy?**
- **Ideas: How well is intellectual property getting to market?**
- **People: MBE participation? MSI Participation?**
- **Community: Collaborative environment?**
- **Capital: Continuum inclusive of gap funding?**

Market and Capital Intelligence

- Market Segmentation
  - Cyber Security, Clean Energy/Energy Efficiency
  - Adv. Manufacturing, Environment
- Capital Segmentation
  - Gap Funding



Capital Segmentation & University Gap Funding

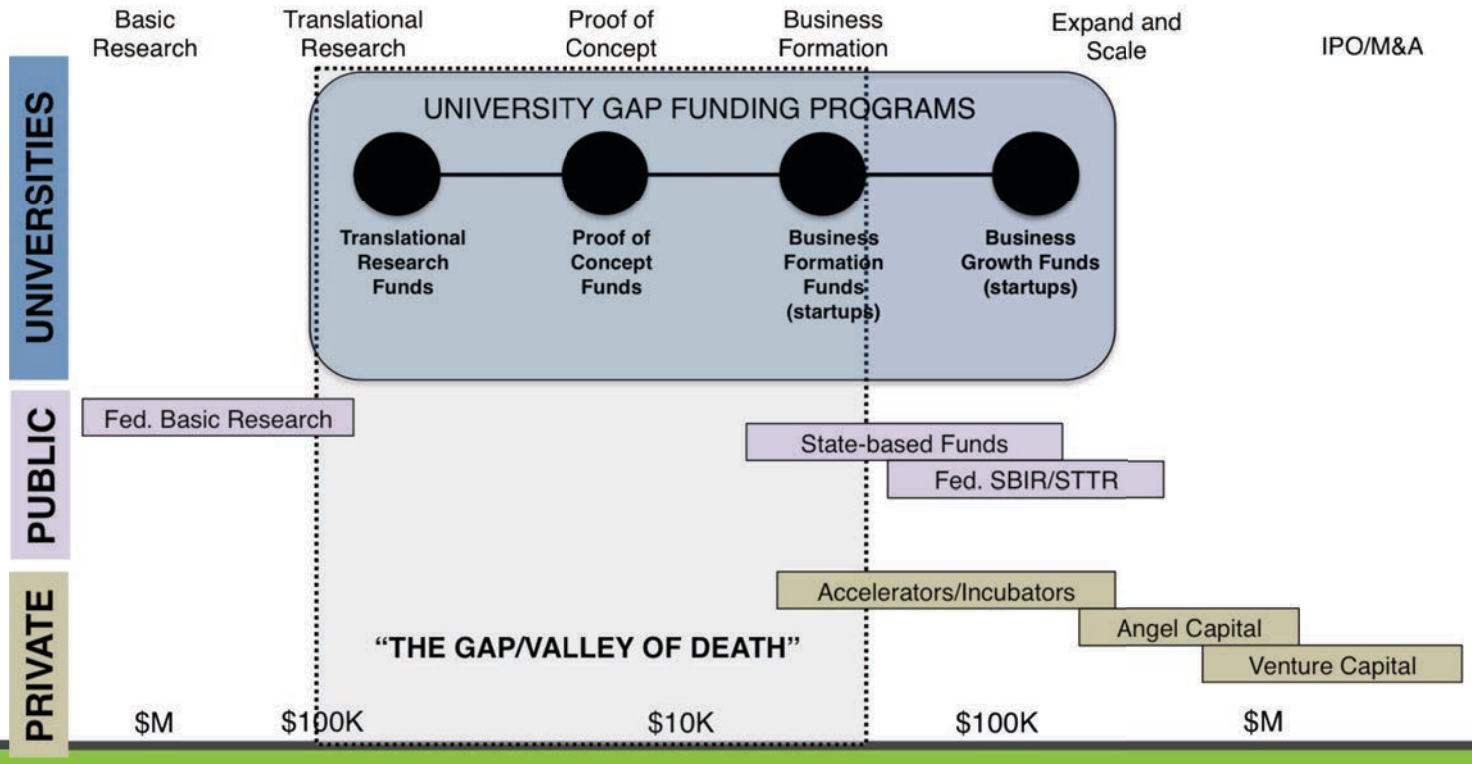
www.gapfunding.org

GAP FUNDING OVERVIEW

The Role of Gap Funding in the new capital continuum

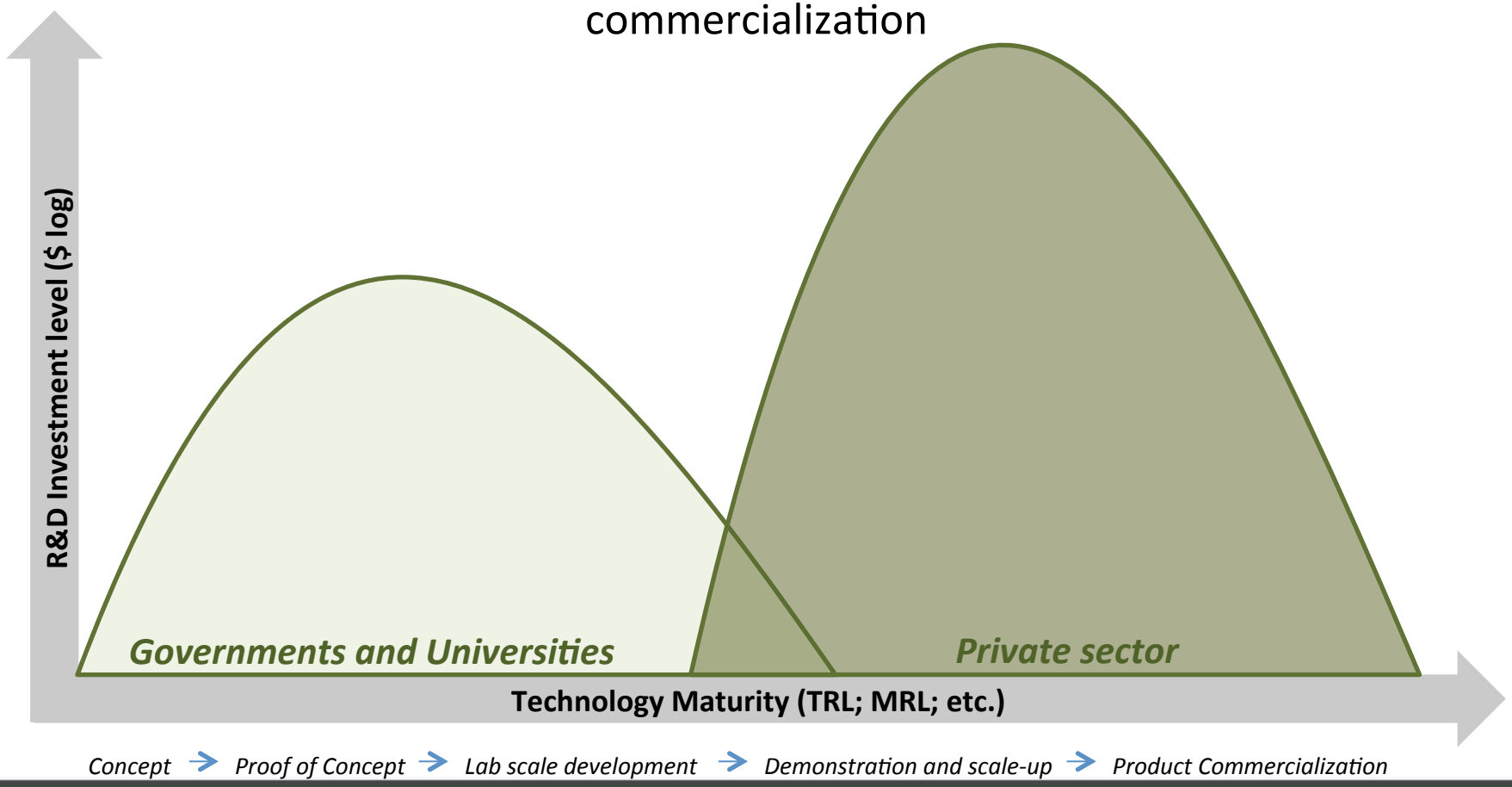
With fleeting sources of early-stage capital in the commercialization pathway, a "valley of death" or "gap" emerges that threatens the development of university technologies and start-ups. Universities utilize gap funding as a solution to this barrier to innovation.

COMMERCIALIZATION PATHWAY



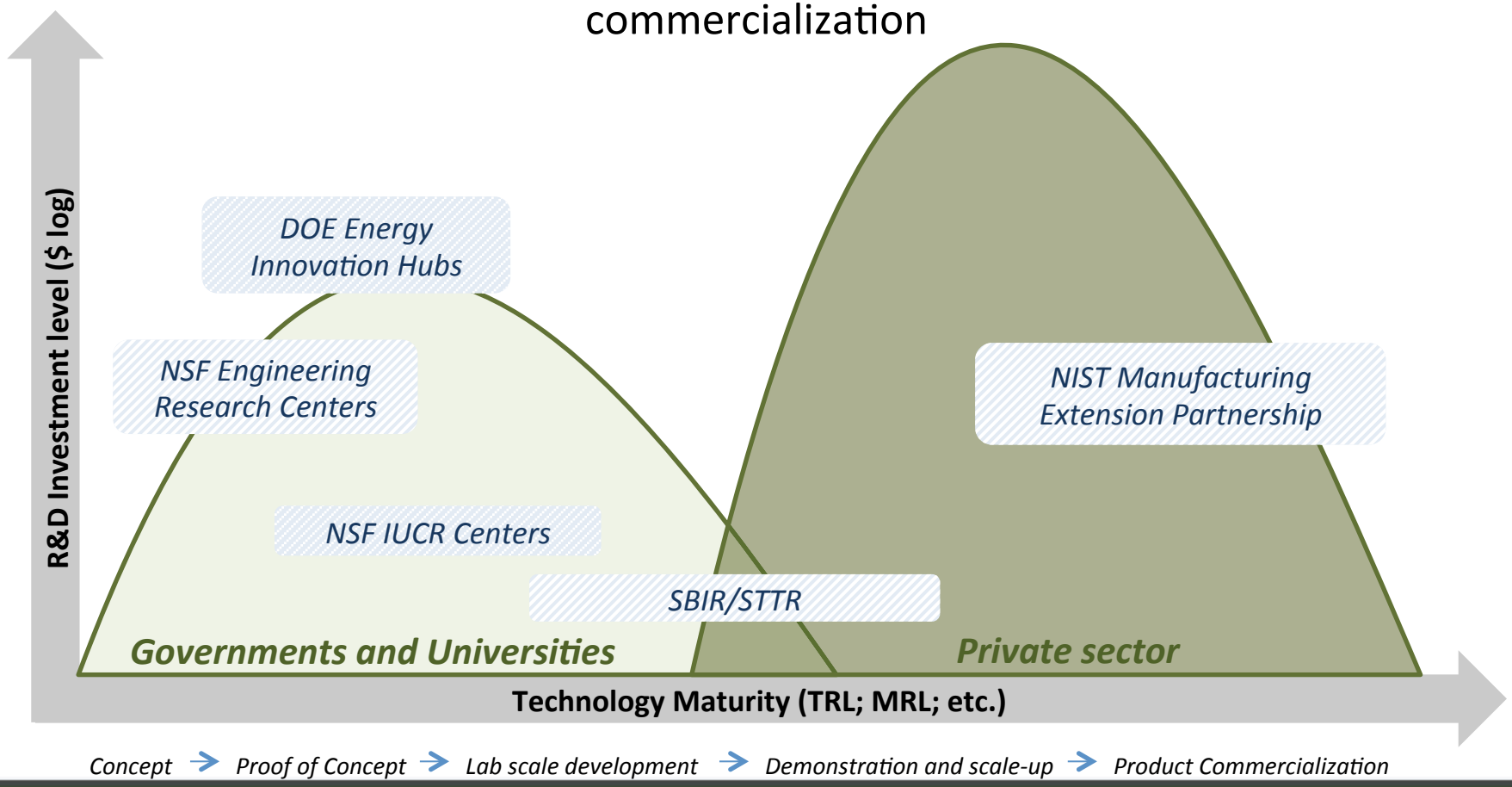
Federal Gap Funding: Adv. Manufacturing Hubs

Advanced Manufacturing Hub Investments leverage strong Federal support of basic research by partnering with the private sector to accelerate commercialization



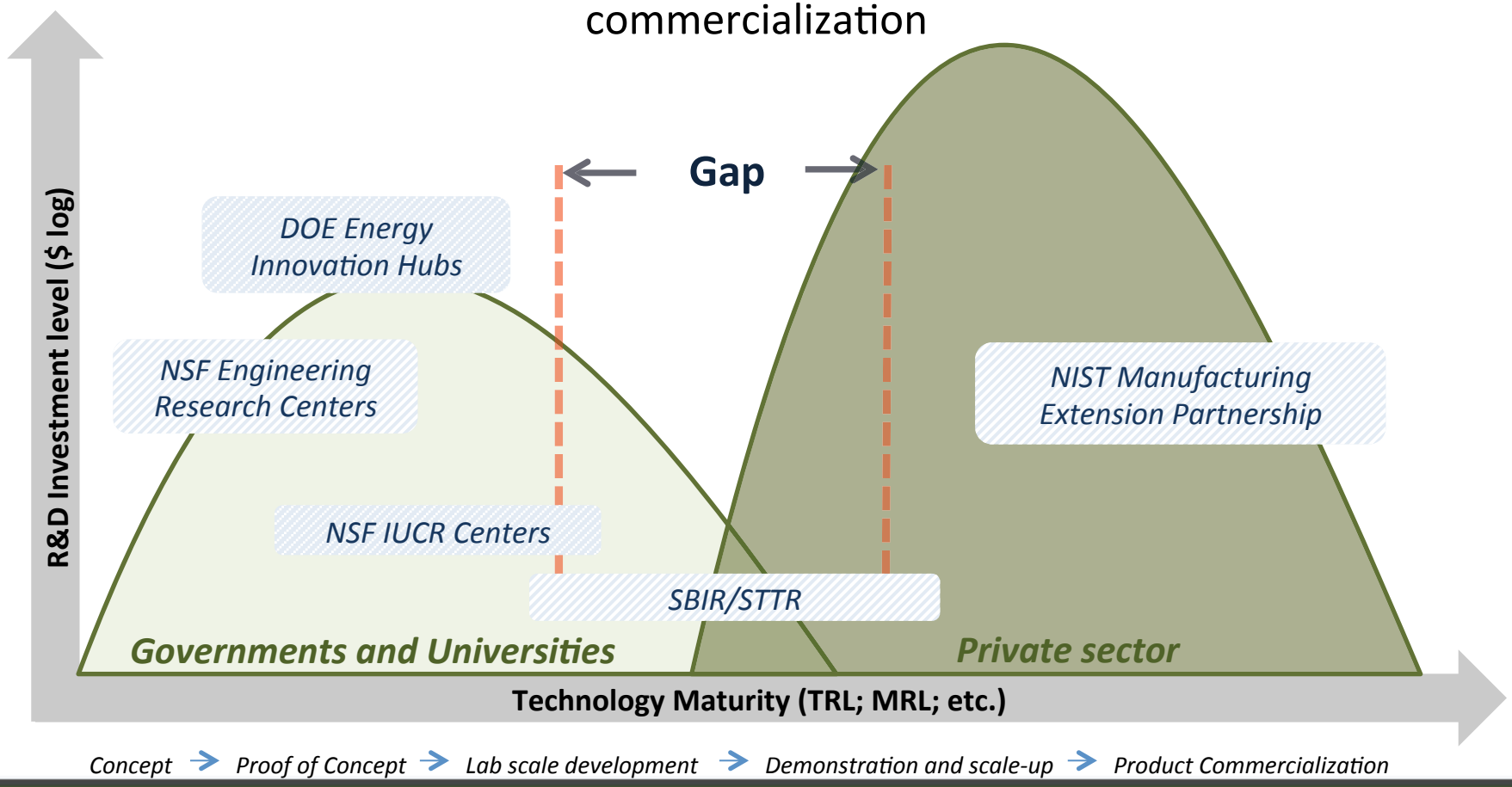
Advanced Manufacturing Hubs : Bridging the Gap

Advanced Manufacturing Hub Investments leverage strong Federal support of basic research by partnering with the private sector to accelerate commercialization



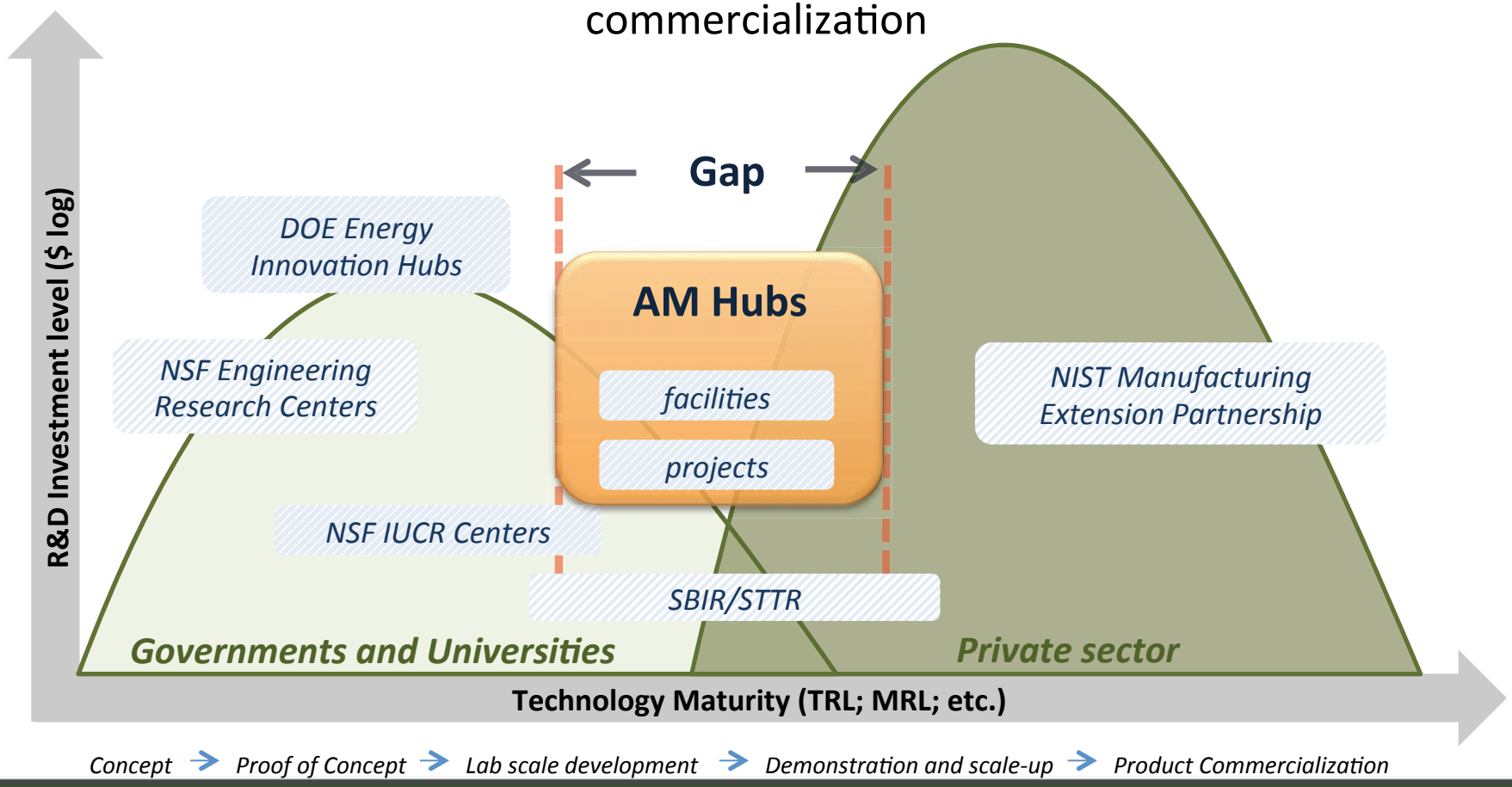
Advanced Manufacturing Hubs : Bridging the Gap

Advanced Manufacturing Hub Investments leverage strong Federal support of basic research by partnering with the private sector to accelerate commercialization



Advanced Manufacturing Hubs: Bridging the Gap

Advanced Manufacturing Hub Investments leverage strong Federal support of basic research by partnering with the private sector to accelerate commercialization



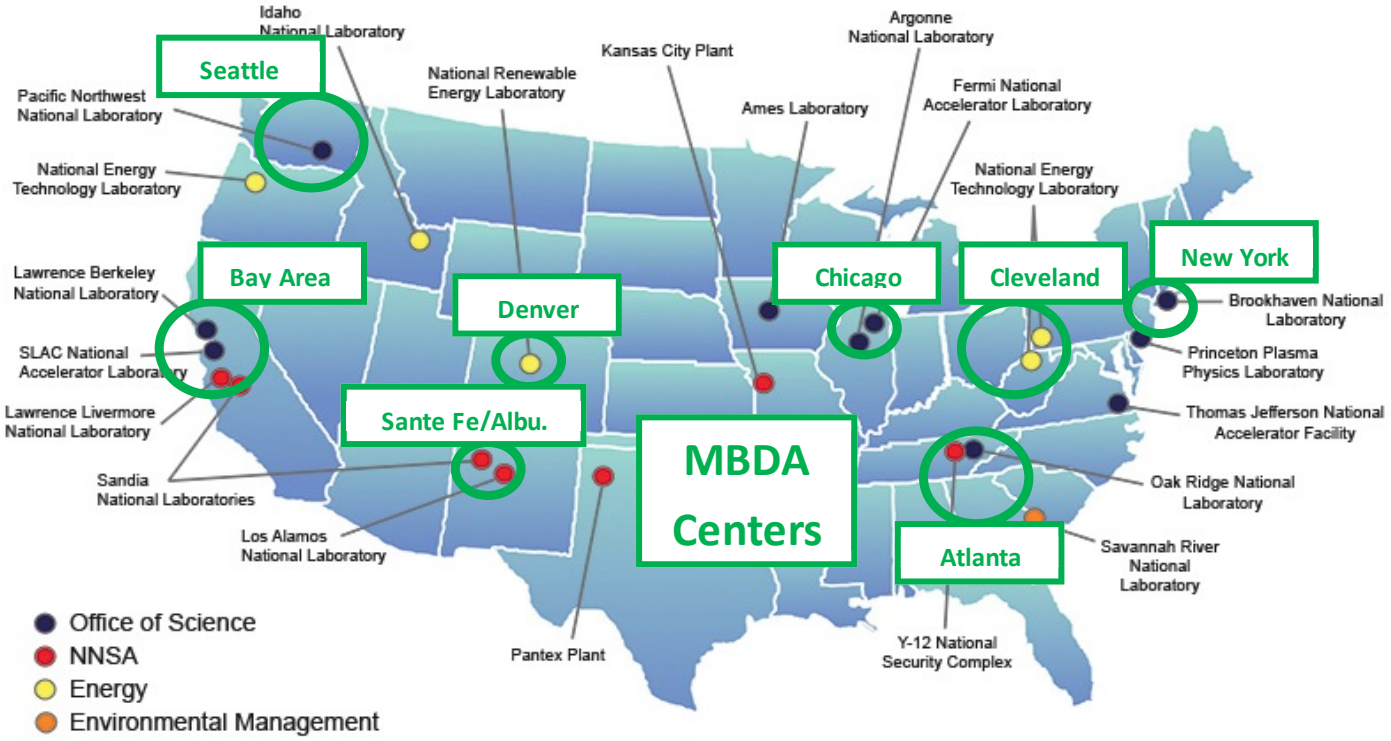
Ecosystem Needs/Opportunities

- **Funds for Technology Maturation**: To effectively leverage the ideas, talent, and resources at DOE's National Labs, gap funding is needed in the ecosystem.
- **Ecosystem Staff:** Thriving innovation ecosystems need diverse experts in technology transfer and commercialization, intellectual property portfolio management, marketing, integrators, manufacturing, and other related personnel.
- **Talent Development:** Training and developing the requisite entrepreneurial talent in technology transfer, commercialization, and STEM entrepreneurship is a vital need.
- **Leveraging of Information Technology:** Better information technology tools that can democratize access to innovation, information, and individuals.

Summary

- U.S. Government role is to foster innovation ecosystem to catalyze economic growth.
- Federal policy and convening authority is critical to seeding communities of innovation ecosystems.
- HBCUs/MSIs & MBEs can play vital roles in the innovation ecosystem.
- A public private partnership model that uses both market “pull” and market “push” tactics to tech transfer.

Thank You



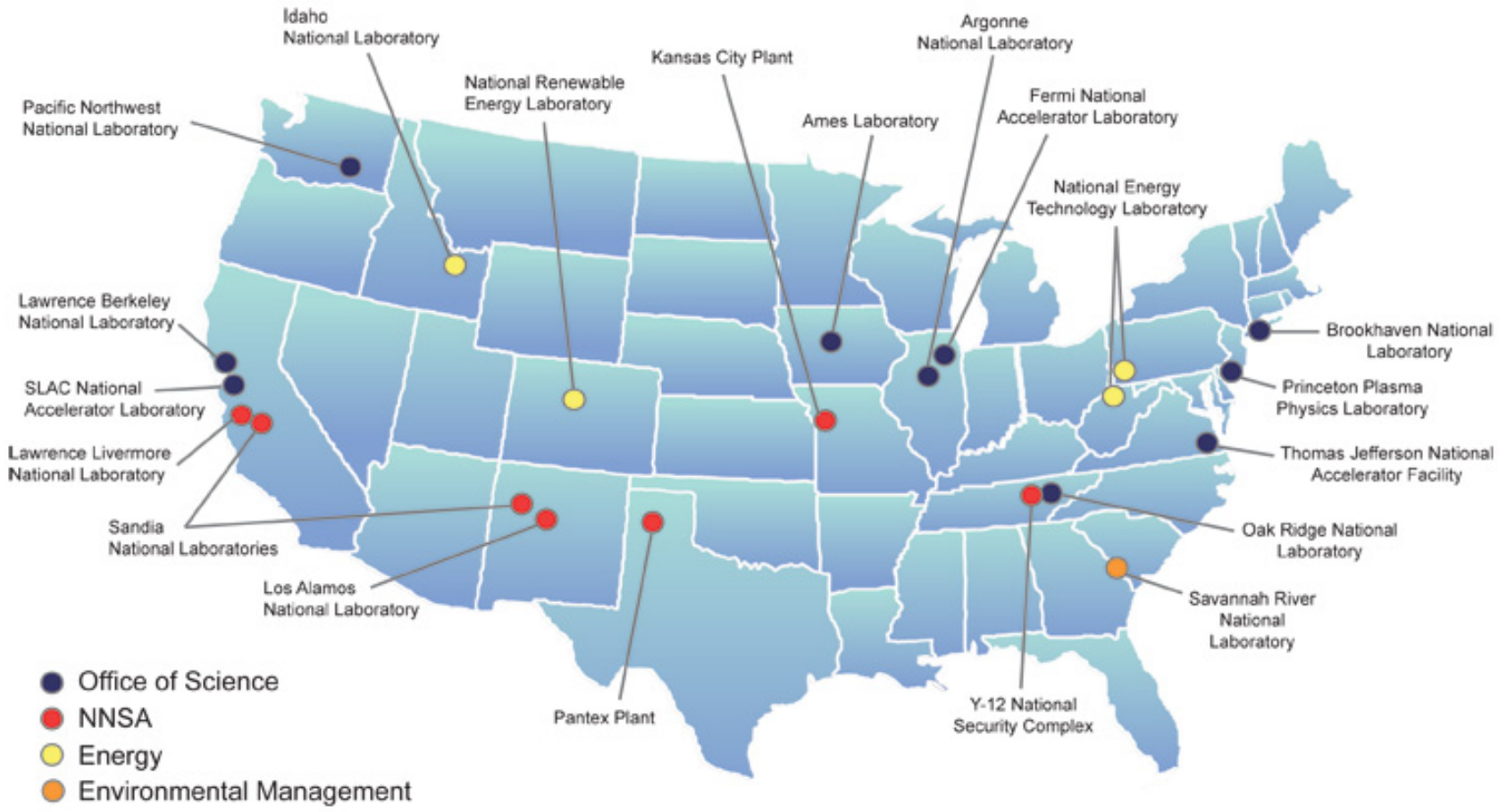
J. Chris Ford, Ph.D.
Technical Advisor to the Director
Office of Economic Impact & Diversity
US Department of Energy
Chris.Ford@hq.doe.gov

Websites:

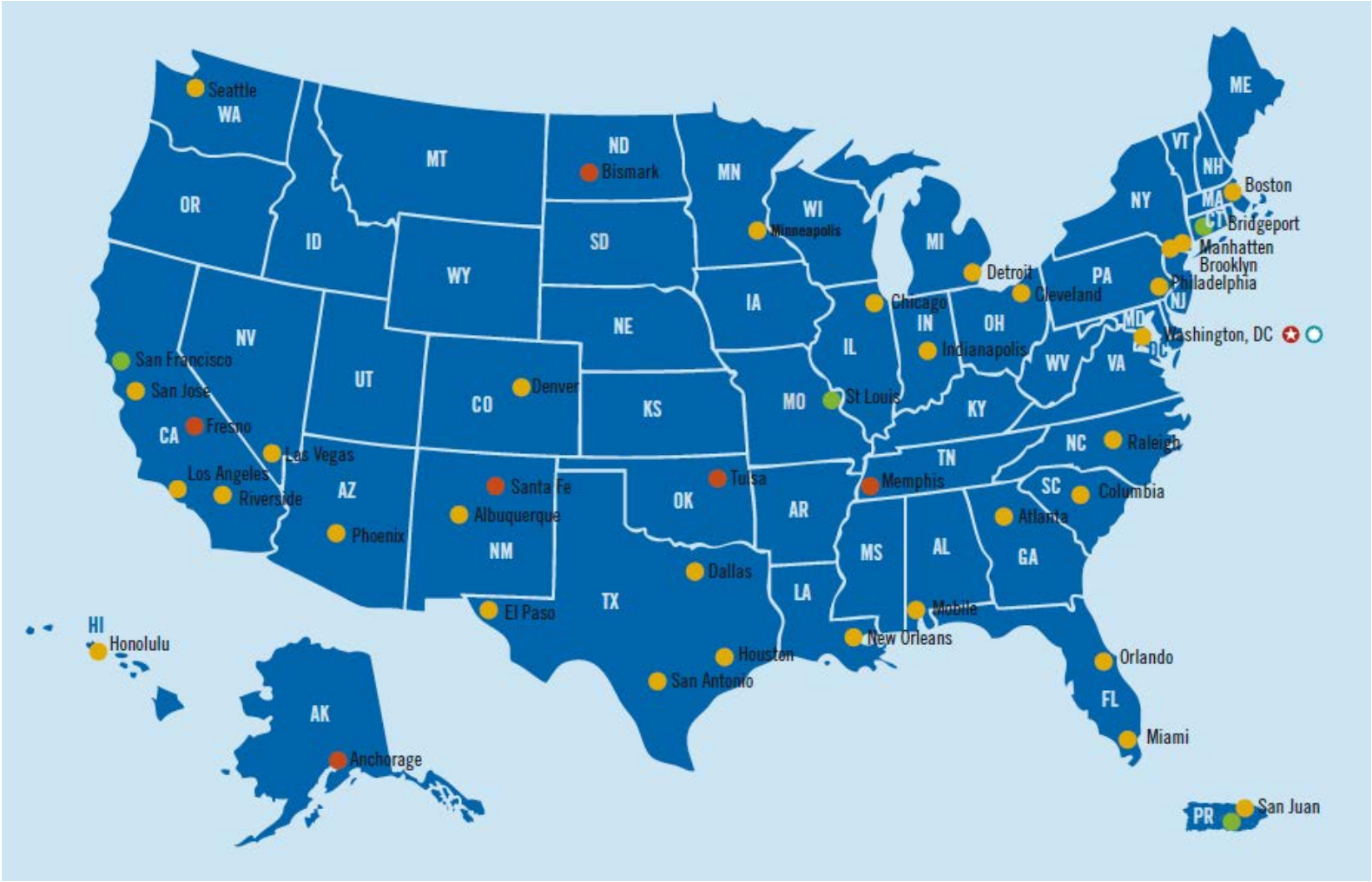
- ***Mbda.gov; NIST.gov/mep***
- ***TechTransfer.Energy.gov***
- ***Diversity.Energy.gov***

Back Up Slides

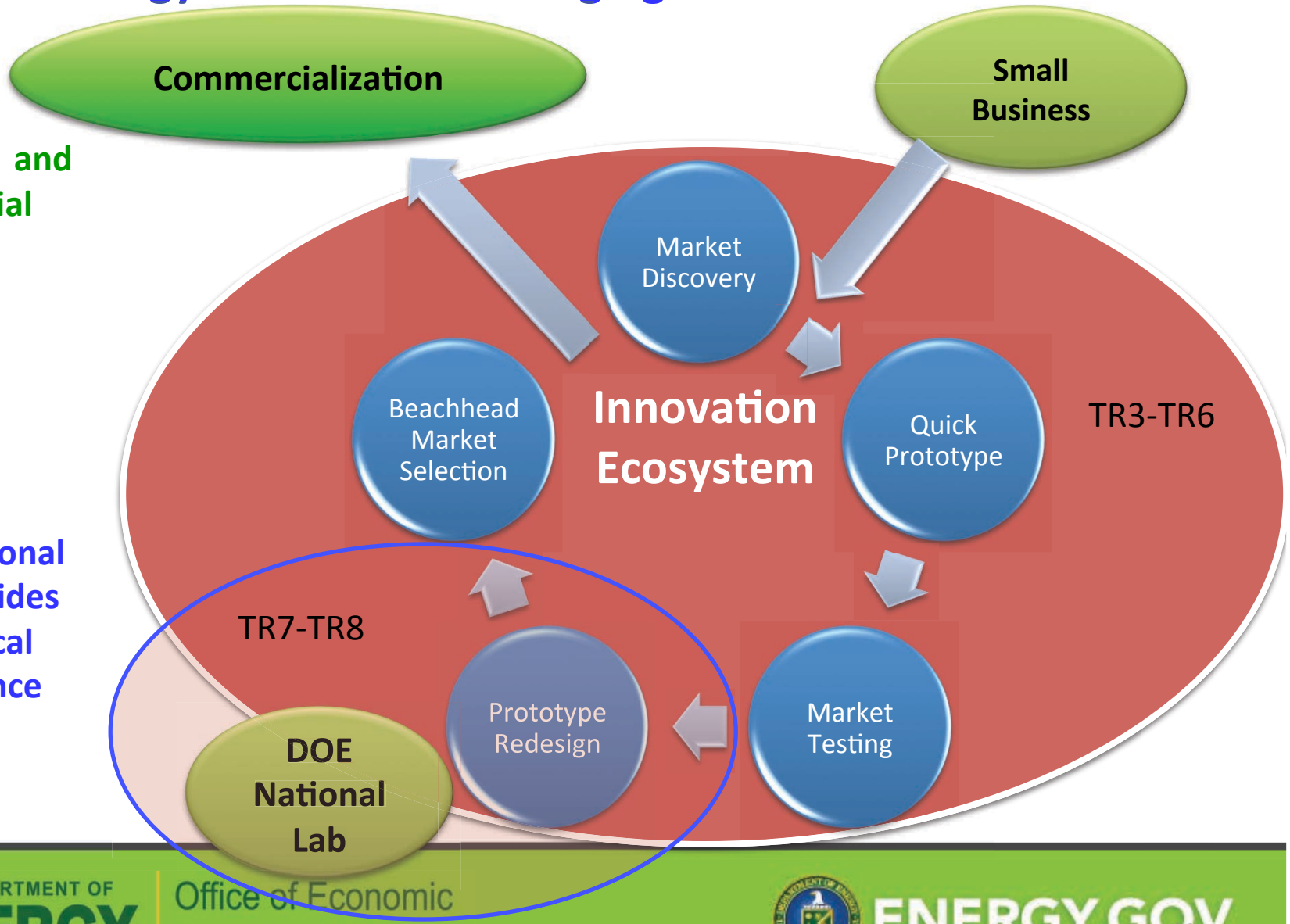
DOE Labs


Idaho
National Laboratory
Pacific Northwest
National Laboratory
National Renewable
Energy Laboratory
Kansas City Plant
Ames Laboratory
Argonne
National Laboratory
Fermi National
Accelerator Laboratory
National Energy
Technology Laboratory
Lawrence Berkeley
National Laboratory
SLAC National
Accelerator Laboratory
Lawrence Livermore
National Laboratory
Sandia
National Laboratories
Los Alamos
National Laboratory
Brookhaven National
Laboratory
Princeton Plasma
Physics Laboratory
Thomas Jefferson National
Accelerator Facility
Oak Ridge National
Laboratory
Savannah River
National
Laboratory
Pantex Plant
Y-12 National
Security Complex
Office of Science
NNSA
Energy
Environmental Management

MBDA Centers



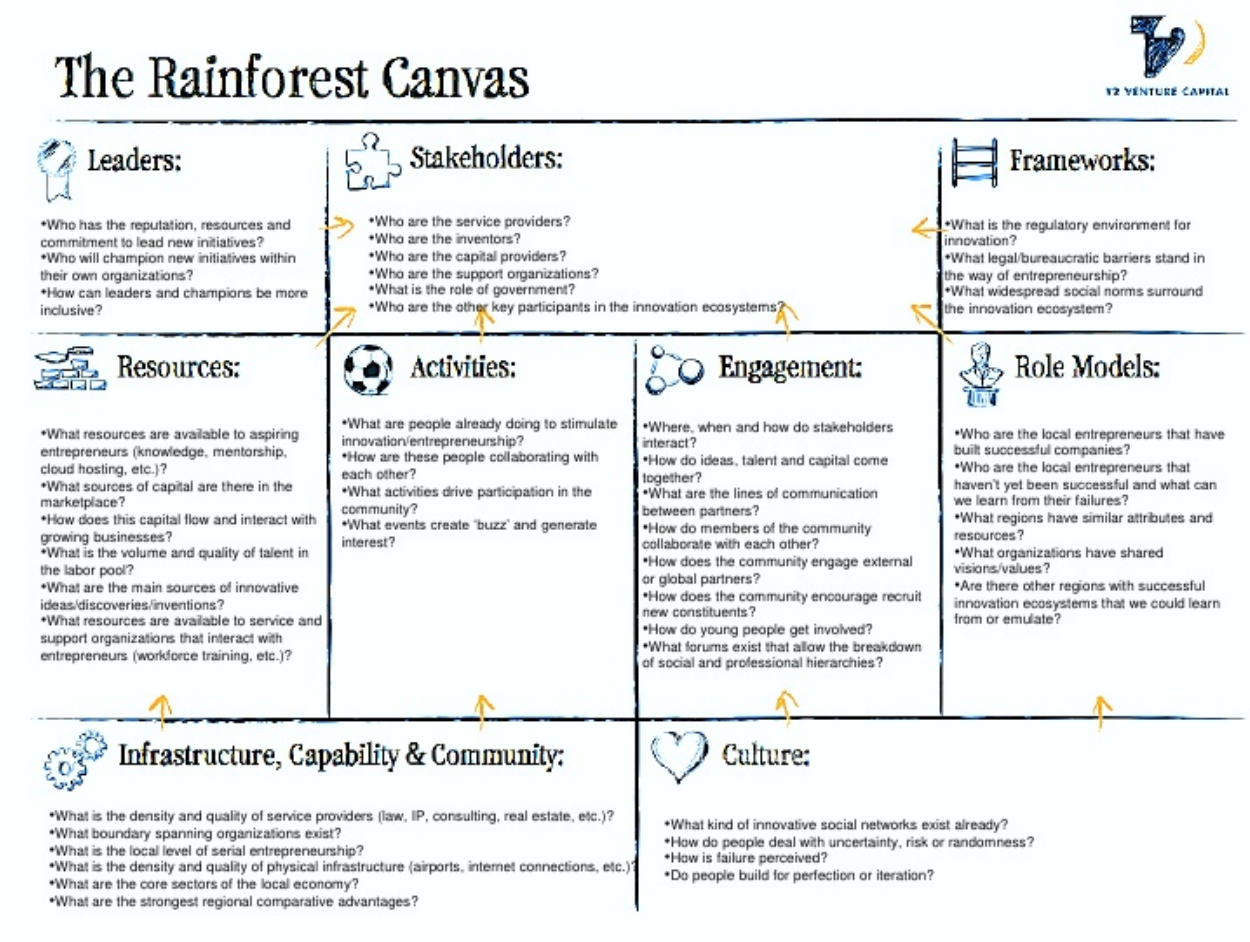
Technology Incubation Leveraging a DOE National Lab



Technology Readiness Level

Phase	Technology Readiness Level	Description
Prototype Development	TRL 1	Basic Research is translated to Applied Research
	TRL 2	Invention begins - Once basic principles are observed, practical applications can be invented. Applications are speculative and there may be no proof or detailed analysis to support the assumptions. Examples are limited to analytic studies.
	TRL 3	Active R&D is initiated - Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.
	TRL 4	Basic technological components are integrated - Basic technological components are integrated to establish that the pieces will work together.
Prototype Testing	TRL 5	Fidelity of breadboard technology improves significantly - The basic technological components are integrated with reasonably realistic supporting elements so it can be tested in a simulated environment. Examples include "high fidelity" laboratory integration of components.
	TRL 6	Model/prototype is tested in relevant environment - Representative model or prototype system, which is well beyond that of TRL 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high-fidelity laboratory environment or in simulated operational environment.
Product Development	TRL 7	Prototype near or at planned operational system - Represents a major step up from TRL 6, requiring demonstration of an actual system prototype in an operational environment.
	TRL 8	Technology is proven to work - Actual technology completed and qualified through test and demonstration.
	TRL 9	Actual application of technology is in its final form - Technology proven through successful operations.

Create a Rainforest Canvas-Genome Sequencing of Your Ecosystem



Ecosystem Indicators

Ecosystem Indicator	Guiding Questions	Metrics
Policy	Are the State, Local, and Lab policies supportive of technology transfer and commercialization, economic development, and entrepreneurship?	Number of policies that incentivizes tech transfer/ commercialization, economic development, and entrepreneurship
Ideas	How well is Intellectual Property (IP) (DOE or others) being translated to the entrepreneurs, universities, and investors? What's the economic impact of the IP?	DOE IP Utilization, MSI IP Utilization, Jobs Created, Revenue Generated (MBE and non MBE)
People	Does the ecosystem have the needed competent players such as Innovators, Integrators, Entrepreneurs, Leaders, and Role Models? Is the ecosystem developing the requisite talent to spur economic growth? How are minorities, MBEs, and MSIs being utilized?	Minority Business Utilization and created, Minority Serving Institution Utilization, Number of Entrepreneurs trained (Minority, non Minority)
Community	Has the region developed a collaborative environment with local universities, businesses, city and state officials, and investors?	The number of events and public private partnerships with academic, public, and private leaders focused on innovation, entrepreneurship, or economic development
Capital	Are gap funds and technology maturation dollars available and active for ecosystem? Is there continuum of capital available for entrepreneurs? In what capacity? How much capital is utilized by MBE and MSI participation?	Amount of technology maturation funds invested by source for DOE Lab IP and non DOE IP. Leverage of federal dollars (additional matching private funds). Capital utilized by MBEs and MSIs

Ecosystem Needs

- **Funds for Technology Maturation**: In conferring tech transfer officials at DOE Head Quarters, National Labs, and members of DOE's Tech Transfer Working Group, one of the key issues is funds for technology maturation or proof of concept. Also, noted from the Interagency Working Group on Tech Transfer, Proof of concept funds are a part of a gap funding continuum needed to successfully nurture the commercialization of technology. Currently, the DOE has not appropriated funds for technology maturation. Such funds are left to the private companies managing and operating the lab(i.e. M&O contractors) to set aside their own funds. To effectively leverage the ideas, talent, and resources at DOE's National Labs, gap funding is needed in the ecosystem.
- **Ecosystem Staff:** Due to decreased funding for technology transfer, Tech transfer offices at DOE labs are typically underfunded and understaffed. Tech transfer is left to discretionary funds of the M&O contractor and is not a line budget item. Thriving innovation ecosystems need diverse experts in technology transfer and commercialization, intellectual property portfolio management, marketing, and other related personnel.
- **Talent Development:** Training and developing the requisite entrepreneurial talent in technology transfer, commercialization, and entrepreneur is a vital need. Across many sectors, especially clean energy, there is a dearth of entrepreneurial talent to commercialize technology. Oftentimes good IP and business ideas are not commercialized due to a lack of available entrepreneurial talent.
- **Leveraging of Information Technology:** Better information technology tools that can democratize access to innovation, information, and individuals. The velocity of information is a critical element to catalyzing innovation ecosystems. DOE has funded the creation of the Innovation portal.