



## Understanding the Impact & Attraction of Emerging Technology Industries

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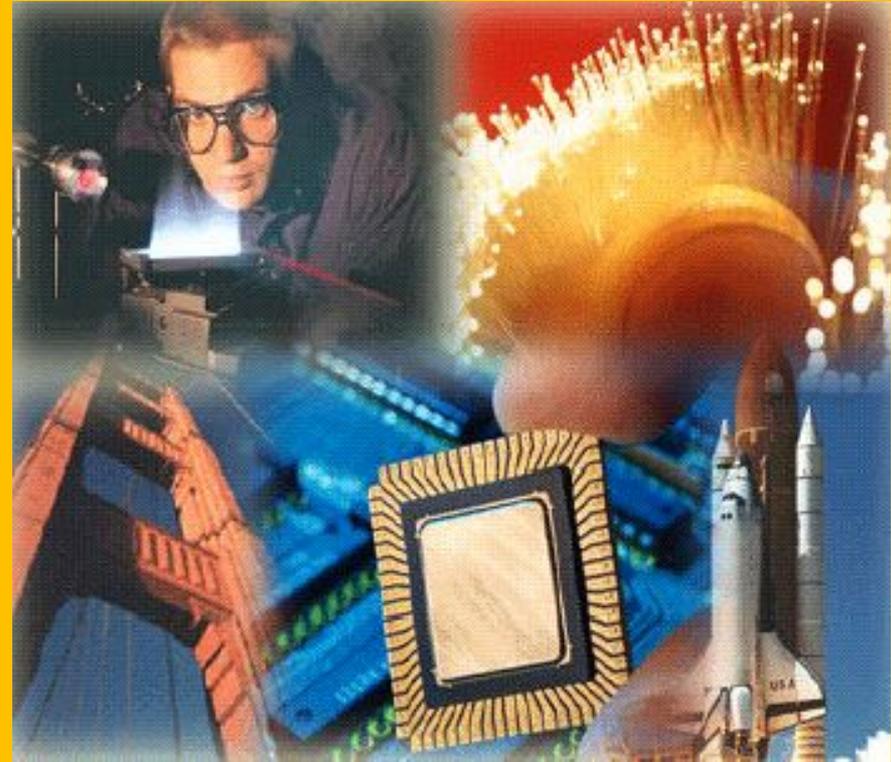
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ECONOMIC COUNCIL

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# AGENDA

1. What is “Emerging Technology” ?
2. ID and Value for emerging technology
3. Developing emerging technology value
  - Biotechnology & Lifescience (2)
  - Nanotechnology (1)
  - Solar (6)
4. Closing Thoughts



# What is “Emerging Technology” ?

... new technologies not yet fully exploited by businesses

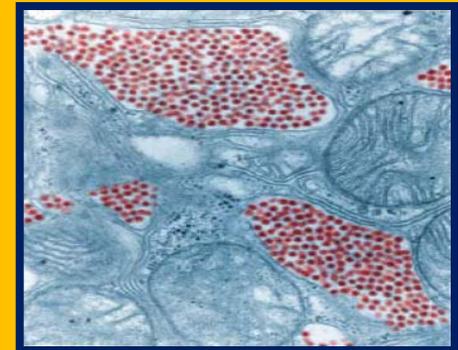
...including the ability to research and develop a nascent technology and create the necessary procedures and infrastructure for utilizing that technology.



The very nature of emerging technologies creates the potential for gaining a sustainable competitive advantage within an industry(s).

## **ARIZONA FOCUS:**

- Biotechnology & life sciences
- Information Technology & Software
- Aerospace & defense
- Advanced manufacturing
- Nanotechnology
- Solar / Energy



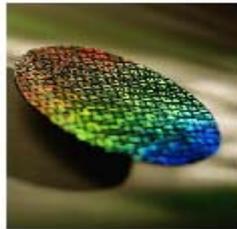
# Identification and Value for Emerging Technology

One-half of the **wealth creation** in the U.S. since World War II is the direct result of investment in **technology**.

(US Senate Study '04)

**Technology road mapping** is a valuable tool to define what needs to happen and ensure a plan of action to deliver success. With Internet-accessible information systems, it is possible to provide broad visibility into R&D, best practices, and emerging technologies. (InTech-Sep'03)

Studies show that **one innovation-based company forms for each \$77 million in R&D investment**.



**ADVANCED  
MATERIALS**



**COMMUNICATIONS**



**ENERGY**



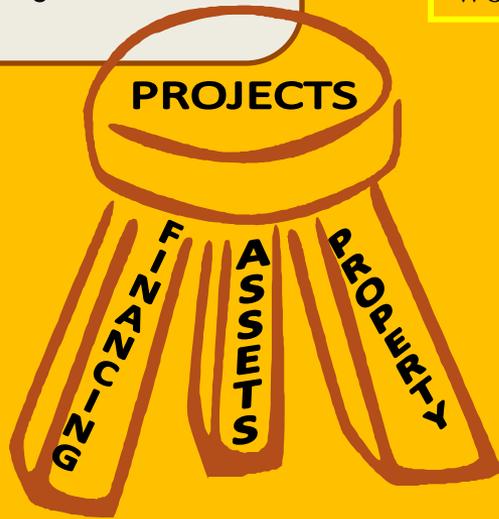
**MANUFACTURING**



**MEDICAL**

# Developing Emerging Technology Value

The three-legged stool illustrates the relationship among the key entities. All three are essential to achieving sustainable growth in emerging technologies.



**Finance/Capital** – SFAz, R&D Tax credit, Private Equity, VCs, ...

**Assets** – TGen, ASU Biodesign, PTL, Flinn Foundation, ...

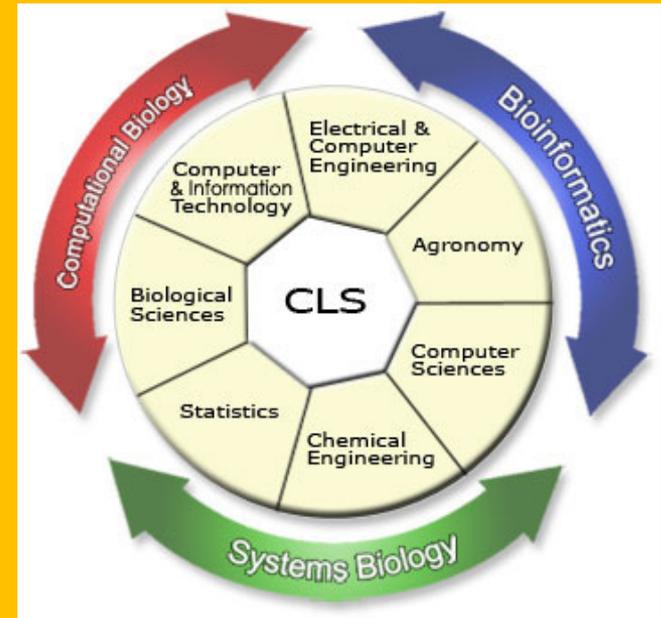
**Property/Community** – Technology Parks, Special Properties, workforce development, ...

**Projects / Portfolio** – Startups, Spinouts, Tech Transfer, Innovation, ...

*“GPEC, as a regional economic development authority, represents nearly 4 million people living in 18 cities – of those 18 cities, 5 have been named in the past few years as the fastest growing cities in the US”*

# Emerging Technologies – Biotechnology & Life Sciences

Barrow Neurological Institute  
 Sun Health Research Institute  
 International Genomics Consortium (IGC)  
 Translational Genomics Research Institute (TGen)  
 Southwest Autism Research & Resource Center  
 The Biodesign Institute (ASU)  
 The Flinn Foundation



**Table 2: Arizona Bioscience Industry Employment, 2001-2005**

Bioscience Industry Subsector	Employment, 2001	Employment, 2005	AZ % Change	U.S. % Change
Total Biosciences	66,546	77,267	16.1%	6.5%
• Hospitals	55,695	64,602	16.0%	7.3%
• Research, Testing, & Medical Labs	5,007	6,627	32.3%	12.5%
• Medical Devices & Equipment	4,007	4,502	12.4%	-2.5%

Source: Battelle analysis of BLS, QCEW data from IMPLAN.

# Emerging Technologies – Biotechnology & Life Sciences

## Arizona's bioscience roadmap

- Arizona's long-term plan is to bring its bioscience sector up to national competitiveness
- Driven by an extensive collaboration among statewide leaders in science, business, and policy
- Research and facilitation provided by Battelle commissioned and coordinated by the Flinn Foundation
- Translational research component co-sponsored by Arizona Biomedical Research Commission

...see additional Bioscience Roadmap details at [www.flinn.org](http://www.flinn.org)

The *Phoenix Biomedical Campus* is anticipated to generate \$77.1 million in overall economic impact with TGEN, ASU and UA programs in operation; By 2025, the campus is expected to rank among Arizona's leading economic engines, generating upwards of \$2B in annual economic impact for the state of Arizona

*In Biotechnology and life sciences over the past ~5 years (years may vary):*

**Jobs are up 16%**

**Businesses / firms are up 8%**

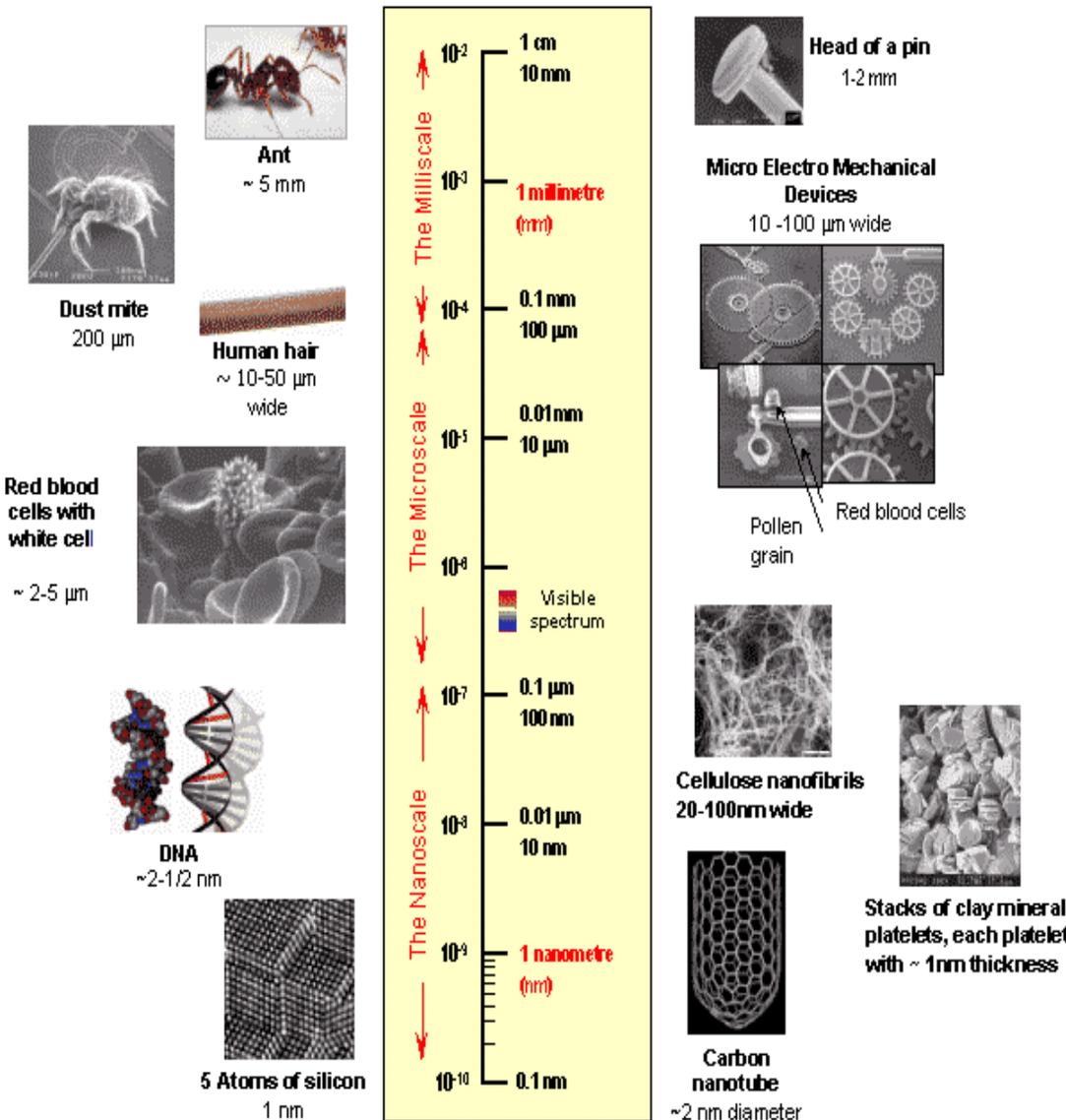
Arizona's universities **increased R&D to 23%** besting the 20% average of the top-10 states

**NIH grants increased 30%** compared to just 21% for the top-10 states, with our total NIH funding growing by 10%, vs. 3% for the nation.

**Non-hospital bioscience employment is up 17%** vs. national average of <4%

**Wages: Up 13%, compared** to a 3% real wage gain for the overall state private sector. Bioscience workers in Arizona earn an annual salary of \$45,182, on average, compared to \$37,709 for all industries.

# Emerging Technologies - Nanotechnology



The number of consumer products using nanotechnology has more than doubled, from 212 to 475, in the past 14 months.

Clothing, & cosmetics top the inventory at 75 products each, but the list of nanotechnology products also includes bedding, jewelry, sporting goods, nutritional and personal care items.

[www.nanotechproject.org/consumerproducts](http://www.nanotechproject.org/consumerproducts)

In 2005 nanotech was used in more than \$30 billion worth of mfg'd products. By 2014, Lux Research estimates \$2.6 trillion in goods will be available.

# Solar Power Segmentation

## Photovoltaic

- Directly converts light to electricity.
- Uses silicon manufacturing and electronic assembly techniques.

## Solar Thermal

- Indirectly converts light to energy.
- Uses glass mirrors to reflect light onto a pipeline of thermal fluid; uses the hot fluid to power a generator.
- Economical
- Used for generating power to large areas.



Photovoltaic Panels



**Parabolic trough**  
Power tower  
Dish  
Fresnel

# Solar Market Growth & Opportunity

## Solar Power

- **Solar is about 1% of the total renewable energy sources** in the US
- World market for **solar photovoltaics in 2006 is \$10B** and growing.
- Germany is the largest market for solar photovoltaics with about 55% of market \$'s in 2006.
- Japan tops the list of producing countries producing about 40% of the 2.0 GW of solar energy produced in 2006.
- In the US, early volume efforts worldwide appear to be concentrated in the building industry where solar panels on buildings
- Solar power conversion efficiency >30% is needed to compete with hydroelectric power generation; average today is 18%. **Experimental technologies are pushing 30%**
- The State has mandated 15% renewable energy by 2020; **6% must be solar.**

### Links of Interest

1. [DOE Government Report](#)
2. [Renewable Energy Report](#)
3. [SolarBuzz](#)
4. [Photovoltaics](#)
5. [Solar Thermal Energy](#)
6. [Technology: Renewable Energy](#)
7. [ASU's PV Test Center](#)
8. [Pratt&Whitney-Solar](#)
9. [SolarCell Scaling](#)
10. [SolarPower Conference 2007](#)

# Alternative and Sustainable Technologies

## Arizona and Greater Phoenix: Prime Location for Solar Power Generation

- Technical potential for concentrating solar power is nearly 2.5 TW in Arizona.

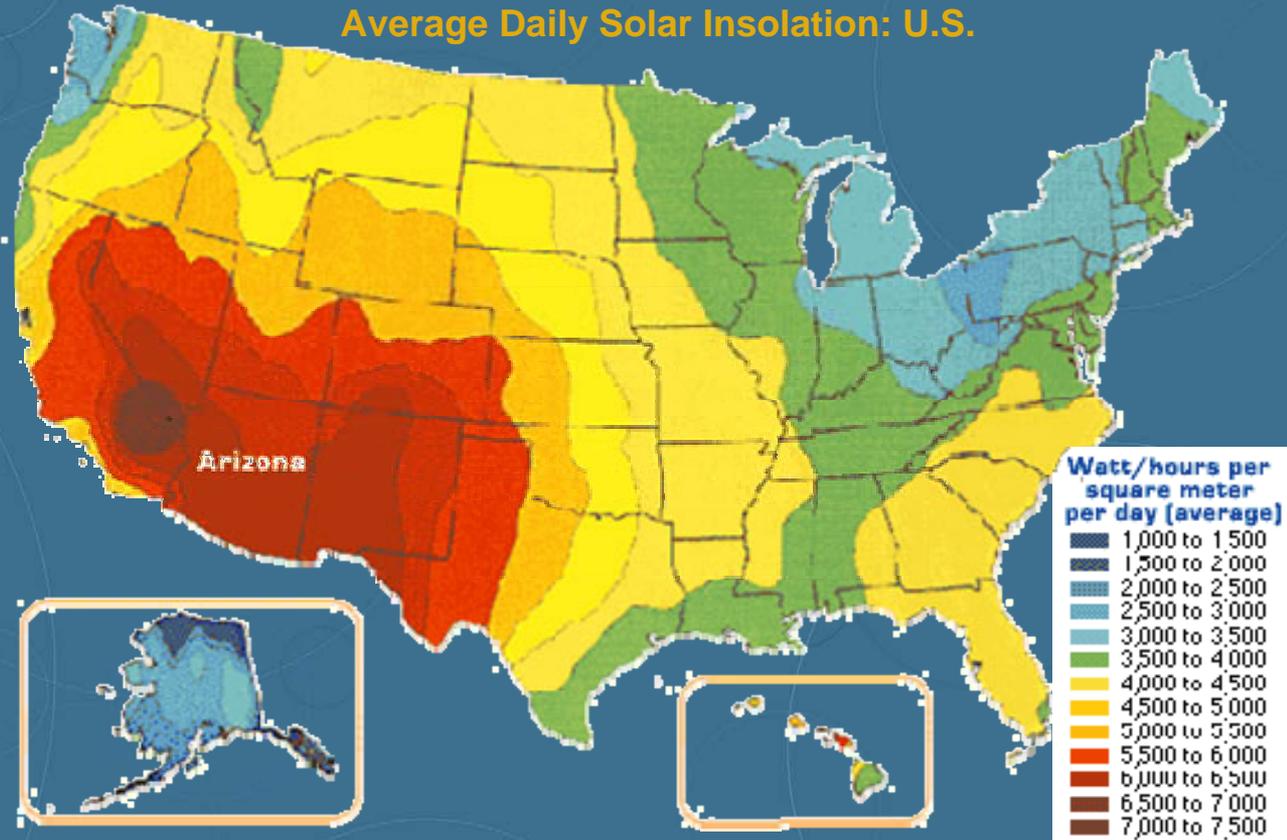
*Source: National Renewable Energy Laboratory*

- Arizona is well-positioned to generate solar power for export to high-cost markets like California to meet peak demand and RPS requirements.

- Frito-Lay's new 201-KW system is made of 1,000 Kyocera 200-watt PV modules; the largest business-owned PV system in Arizona.

- ASU has RFP for 7MW

- APS/SRP has RFP for 250MW



# Alternative and Sustainable Technologies

Next-Generation Solutions from Arizona State University



**ASU has launched the first School of Sustainability in the U.S.**



**Photovoltaics Testing Laboratory** at ASU Polytechnic is one of three in the world and the only certified-testing facility in the U.S.

**Global Institute of Sustainability (GIOS)** catalyzes and advances interdisciplinary research on environmental, economic and social sustainability. GIOS offers research programs along the solar supply chain.

**Flexible Display Center** is developing future generation photovoltaics that are flexible. Opportunities exist to partner on long-term research for 3<sup>rd</sup> and 4<sup>th</sup> generation solar products.

# Solar Assets and Companies

Knowledge-based Regional Assets and Firms

**Arizona Global Network**

**Arizona State University**  
*(Polytechnic, SkySong, GIOS,  
Flexible Display Center)*

**University of Arizona**

**Maricopa Community Colleges**

**Northern Arizona University**

**Thunderbird School of Global Management**

Kyocera

First Solar

Solon

Global Solar

American Solar Electric

Green Ideas Inc.

ETA Engineering

**SEIA** - Solar Energy  
Industries Association

**SEPA** - Solar Electric  
Power Association

# Economic Development

Asset and Community Readiness

- Goal:**  
Attract companies  
from the  
Solar Value Chain
- Silicon Materials
    - Solar Cells
      - Solar Panels
        - Electronics / Software
          - Installers
            - Utility Inf.
              - Trans & Log

- Goal:**  
Proactive Sales  
& Mkt'g response
- 90-Day Certification
    - Shovel Ready Program
      - Technology Training
        - Workforce Development
          - Suitable / Purposed Buildings
            - Incentives
              - Assets

## Closing Thoughts...

The Struggle for economic parity and self-sufficiency today is underpinned by the **formation, growth, and expansion of technology-based companies.**

The ability to form, grow, and retain such companies and create self-contained **industry clusters will determine which regions of the US will emerge as economic centers** of new jobs and economic wealth.

Business and firms are now linked in a global marketplace, and governments are challenged to achieve the **new efficiencies that are highly valued in a technology-based world.**

In the new marketplace, not cities and not states, but **metropolitan regions** are the engines of the global economy.

*Where We Stand* – Strategic Assessment of the St. Louis Region '96

## Closing Thoughts...

“The Texas Enterprise Fund has been an unparalleled success,” Gov. Perry said. “In just 18 months, we have allocated more than \$180 million from the Fund to close deals with employers who are creating more than 15,000 new jobs and pumping nearly \$6 billion into our economy.”

“Those who doubt the effectiveness of the Enterprise Fund should consider this: While other states were losing jobs in 2003, Texas doubled its share of job creation announcements,”

*Texas Governor Rick Perry '05*

*Thank You!*

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