Florida Cluster Strategy

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Enterprise Florida

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Key challenges for Florida’s Future

• Quality of economic growth
  – high wage, high skill, high productivity

• Leadership in an increasingly knowledge-based economy – Innovation Economy

• High Performance Clusters and Talent as engines of innovation
  – Clusters are dynamic with emerging technologies
  – Strategic intelligence for the long view
Targeted Clusters

- Life Sciences
- Aviation/aerospace/space
- Homeland security/defense
- Information Technology
  - computer systems and software, microelectronics, telecommunications, MS&T, photonics/optics, digital media
- Financial and Professional Services
- Clean Energy – new
- Strategic Challenges
  - R&D, corporate HQ, manufacturing
Life Sciences

- Biotechnology
- Pharmaceuticals
- Medical Devices
- Health Care

- $800+ billion combined 2006 global revenues
- Driven by scientific advancement – R&D
- Talent key: world class scholars to high skill technician base

Technology convergence:
- Biotech supplementing pharma pipeline
- Biotech/pharma, biotech/med dev, biotech/ IT tools and products
- Genomic advances on diagnostics, therapeutics

Emerging Technologies
- personalized/molecular medicine
- RNAi therapies (gene silencers)

<table>
<thead>
<tr>
<th>Current Market Size</th>
<th>Strong Growth Projection</th>
<th>Florida Industry Strength</th>
<th>Florida Research Strength</th>
<th>Florida Opportunity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular Therapeutics &amp; Devices</td>
<td>$53 bil.</td>
<td>☑</td>
<td>☑</td>
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</tr>
<tr>
<td>Central Nervous System Disorders</td>
<td>$46 bil.</td>
<td>☑</td>
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<tr>
<td>In Vitro Diagnostics / Molecular Diagnostics</td>
<td>$32 bil.</td>
<td>☑</td>
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<tr>
<td>Infectious Disease</td>
<td>-</td>
<td>☑</td>
<td>☑</td>
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<tr>
<td>Oncologics</td>
<td>$35 bil.</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Ophthalmology/Therapeutics &amp; Devices</td>
<td>-</td>
<td>☑</td>
<td>☑</td>
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<tr>
<td>Orthopedics</td>
<td>$16 bil.</td>
<td>☑</td>
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<tr>
<td>Regenerative Medicine</td>
<td>-</td>
<td>☑</td>
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</tbody>
</table>

selected from 16 identified life sciences market segments
Aviation & Aerospace

- Aviation
- Aerospace
- Space

- $1.3 trillion combined global revenues
- Drivers; R&D and Talent (aerospace engineering)

- **NextGen Aircraft**
  - composite materials, nanotechnology

- **Space – beyond launch**
  - R&D, manufacturing, commercial applications and tourism

- **Emerging Technologies:**
  - Advanced avionics
  - Composite/advanced materials
  - Alternative fuels and power sources
  - Space technologies

<table>
<thead>
<tr>
<th>Services</th>
<th>Strong Growth Projection</th>
<th>Florida Industry Strength</th>
<th>Florida Research Strength</th>
<th>Florida Opportunity</th>
</tr>
</thead>
<tbody>
<tr>
<td>NextGen Aircraft Systems</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Avionics</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Modifications, Conversions, &amp; Retrofitting</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Missile Guidance &amp; Air Defense Systems</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Space Technologies</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Launch Services</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
Homeland Security

- Information Analysis & Security
- Threat Detection & Prevention
- Emergency Preparedness, Response, & Recovery

A composite industry:
- Photonics, MS&T, computer systems, aerospace, defense, life sciences

Emerging technologies:
- CBRNE sensors (handheld and remote devices)
- Cargo security / screening technologies
- Counter IED (explosives) technologies
- Predictive analytics, information sharing
- Secure wireless communications
- People screening technologies/biometrics

- $55.6 billion global market in 2006
- Defined by application - rapidly maturing industry

<table>
<thead>
<tr>
<th>Market Segment</th>
<th>Projected Market Value 2006-2010</th>
<th>Florida Industry Strength</th>
<th>Florida Research Strength</th>
<th>Florida Opportunity</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBRNE Detection (chem, bio, rad, nuclear, explosives)</td>
<td>$20 bil.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Aviation Security</td>
<td>$10 bil.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Port Security</td>
<td>$8 bil.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Cybersecurity / Information Security</td>
<td>$11 bil.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Domestic &amp; Foreign Intelligence</td>
<td>$30 bil.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Emergency Preparedness &amp; Response</td>
<td>$16 bil.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

(selected from 10 identified homeland security market segments)
Clean Energy

- Solar
- Biomass Energy & Biofuels
- Hydrogen & Fuel Cells
- Ocean
- “More than Renewables”

$47+ billion global market 2007 for just solar, biofuels, and fuel cells

- Technology innovation/R&D a key driver

Clean energy industry offers more than environmental benefits:
- Opportunity to establish technology leadership – become “Silicon Valley” of clean energy industry

Emerging Technologies
- thin films, coatings, and other advanced materials for solar
- cellulosic ethanol / biodiesel enzymes and catalysts
- fuel cell materials, membranes, and related technologies
- underwater turbines, coatings/materials

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<tr>
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<th>Florida Research Strength</th>
<th>Florida Opportunity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar Materials &amp; Electronics</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Biofuels</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Biomass Energy Technologies / Processes</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Fuel Cells</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Hydrogen Technologies</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Ocean Energy Technologies</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Clean Fossil Energy (Turbines, Materials, sim.)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
Environmental Technology (preliminary findings)

Key Market Segments
- Energy efficiency/Green design
- Recycling and Waste
- Water, Wastewater
- Air/Environment

Emerging Technologies
- Membrane technologies (water, air)
- Bioremediation
- Desalination
- Enzymes/catalysts for mfg/industrial processing

- $652 billion global revenues in 2005
- Florida ranks 4th in U.S. in environmental industry revenues ($14+ billion) and employment (83,000)

Environmental industry showing solid growth, especially in more high tech segments
- Resource / commodity prices, demand for “green” goods, and policy driving markets
- Some sectors have high R&D intensity (e.g. monitoring, instrumentation, water equipment)—new technologies crucial to growth
Nanotechnology

Nanotechnology - a disruptive, enabling technology for future competitiveness

- biotech
  - nano-biosensors
  - nano-coatings for therapeutics
  - nanoparticles to carry genes, drugs, biologics

- aerospace
  - nanomaterials with enhanced strength-to-weight ratios, embedded sensors
  - nanocoatings that are stronger and lighter
  - nanoelectronics / nano-engineered display technologies

- Homeland Security
  - nanosensors for CBRNE detection
  - nano-enabled sensing, and electronics / communications systems
  - nanomaterials for first responder clothing and equipment, stronger building materials

- clean energy
  - nanomaterials for thin films, fuel cells, batteries
  - nanoengineered catalysts for biofuel production

- environmental technologies
  - nanomaterials for membranes and films
  - nanocoatings for insulation, wiring, glass
  - nanoparticles for bioremediation


- Manufacturing: High performance / nanostructured materials and processes..................340 billion
- Electronics Semiconductors and integrated circuits............................$300 billion
- Biotechnology/Pharmaceuticals Nano-enabled treatments..................$180 billion
- Chemical Plants/Refineries Nanostructured catalysts for chemical and petroleum processing...........$100 billion
- Aerospace Lighter, faster, safer nano-enabled products for vehicles, components, etc........$70 billion

Roco and Bainbridge (NSF), "Societal Implications of Nanoscience and Nanotechnology", March 2001

SIZE OF SELECT FLORIDA INDUSTRIES TO BE IMPACTED BY NANOTECHNOLOGY

<table>
<thead>
<tr>
<th>Florida Industry</th>
<th>Companies</th>
<th>2005 Employment</th>
<th>Total Wages ($Billions)</th>
<th>Average Pay</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Tech Manufacturing*</td>
<td>836</td>
<td>51,046</td>
<td>$3.305</td>
<td>$64,746</td>
</tr>
<tr>
<td>Aerospace Manufacturing</td>
<td>200</td>
<td>17,814</td>
<td>$1.157</td>
<td>$64,955</td>
</tr>
<tr>
<td>Biotechnology, Pharmaceuticals, and Medical Device Manufacturing</td>
<td>488</td>
<td>24,571</td>
<td>$1.250</td>
<td>$50,859</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1524</td>
<td>93,431</td>
<td>$5.712</td>
<td>$61,134</td>
</tr>
</tbody>
</table>
Florida’s leadership for the 21st Century Innovation Economy will depend upon the critical economic development / education connection

- R&D for emerging technologies, competitive clusters of the future
- Talent Pipeline