



**Georgia Science and Technology
Strategic Plan Joint Study Commission Final Report**

January 9, 2012

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Letter from the Commission Co-Chairmen

It is an honor to present this report of the Georgia Science and Technology Strategic Plan Joint Study Commission. This commission, established by Senate Resolution 68 passed during the 2011 session of the General Assembly, was comprised of a cross section of state leaders, including members of the legislature, state government as well as leaders in the Science and Technology industry.

Our mission was to engage with science and technology related business and industry throughout the state in order to assist in the creation of a Science and Technology Strategic Plan for the State of Georgia. The Commission approached this mission with an open mind and a real spirit of cooperation between government and industry. Through numerous listening sessions conducted throughout the state, we were able to assess the needs of this crucial sector of our economy and identify key obstacles to growth and job development.

This report of our findings includes the strengths and weakness of our state in regards to the science and technology industry, as well as recommendations for legislative action and governmental policy changes.

Georgia is a world leader in Health Information Systems technology, a growing world leader in Hosted Data Centers, and every element of our society is impacted by Technology. It is imperative that the state look forward and institute legislation, policies and economic development programs that encourage and support the future growth of these industries.

I am honored to have served as co-chair of this commission, and I look forward to the bright future that these industries will bring to our wonderful state.

Sincerely,

Barry Loudermilk

State Senator, District 52

Barbara Sims

State Representative, District 119

Overview

Georgia’s Science and Technology Strategic Initiative Joint Study Commission (to be called “the Commission”) was established to explore the need for a strategic plan for science and technology in Georgia. Since its first meeting July 20, the Commission has:

- Conducted 7 public hearings in six cities around Georgia.
- Heard from over 70 panelists on science and technology topics such as health IT, commercial space, STEM education, agricultural technology, and data centers.
- Held over 10 subcommittee meetings and conference calls.
- Conducted an inventory of Georgia’s science and technology assets
- Reviewed and analyzed other states’ strategic plans for science and technology
- Received over 200 recommendations on how to build Georgia’s future in S&T policy.
- Selected approximately 70 recommendations for further action.

Introduction

The Georgia General Assembly created the Science and Technology Strategic Initiative Joint Study Commission in May 2011 in response to Georgia’s growing science and technology business communities’ desire for leadership towards a strategic future in these sectors as a source of sustainable economic development. The Commission was comprised of twelve members representing legislative, agency, and private sector perspectives¹. The appointees in order of statutory designation were as follows:

Figure 1: Commission Members

Appointing Entity	Commission Member Appointed
One member of the Georgia General Assembly Senate Science and Technology Committee	Barry Loudermilk (Co-Chairman) State Senator Georgia State Senate
One member of the Georgia General Assembly Senate Economic Development Committee	John Albers State Senator Georgia State Senate
One member of the Georgia General Assembly House Committee on Science and Technology	Charlice Byrd State Representative Georgia State House of Representatives
One member of the Georgia General Assembly House Committee on Economic Development	Barbara Sims (Co-Chairman) State Representative Georgia State House of Representatives
Governor’s private sector appointee	None
Lieutenant Governor’s private sector appointee	Tino Mantella, CEO & President Technology Association of Georgia

¹ Rep. Mike Dudgeon was not formally appointed as a member of the Commission, but he attended most of the hearings and actively participated in the discussions.

Speaker of the House's private sector appointee	Steve Dickinson VP Global Corporate Communications Merial Limited
Commissioner of Economic Development or his or her designee	Michael Cassidy President & CEO Georgia Research Alliance
Georgia Technology Authority Chief Information Officer or his or her designee	Calvin Rhodes Chief Information Officer & Executive Director Georgia Technology Authority
State School Superintendent or his or her designee	Dr. Gilda Lyon STEM Coordinator Georgia Department of Education
Chairperson of the Board of Regents or his or her designee	Dr. Steve E. Cross Executive Vice President for Research Georgia Institute of Technology
Chairperson of the State Board of Technical and Adult Education or his or her designee	Dean Alford Chairman Technical College System of Georgia

Charge of the Commission

According to Senate Resolution 68, the commission will:

- (1) Inventory Georgia's existing assets in the science and technology sectors to determine current strengths and capabilities;
- (2) Conduct review of state and national policies to discern best practices and lessons learned with regard to public policy that encourages advancement of the science and technology sectors;
- (3) Hold meetings around the state to solicit input from science and technology stakeholders, with a specific interest in identifying barriers to growth and progress; and
- (4) Develop specific recommendations with regard to the scope and content of a strategic plan for science and technology in Georgia. Such recommendations shall stipulate what the commission recommends should be excluded from such a plan.

Commission Process

After Governor Nathan Deal signed SR68 on May 13, 2011, the members of the Georgia Science and Technology Strategic Plan Joint Study Commission were appointed.

The Technology Association of Georgia (TAG) supported the Commission with meeting logistics, panelist invitations, and subcommittee assistance. The Office of Policy Analysis and Research (OPAR) at the Georgia Tech Research Institute supported the Commission with research tasks, panelist invitations, and subcommittee assistance. TAG and OPAR conducted a web-based survey of the business community to identify hearing topics.

The Senate and House Research Offices conducted the asset inventory (Appendix B). OPAR conducted the analysis of other states with strategic plans dedicated to science and technology (Appendix C).

Hearings generally allowed three hours for topical testimony, during which the Commission would hear from 8 to 12 witnesses. At the end of each hearing, a public comment session was offered. In addition, the Commission often had a tour of a local science and technology company. Finally, the Commission conducted brief private discussions at each the meetings to discuss the process and information being received. A list of all meeting dates, locations and panelists can be found in Appendix D.

Findings

Across the seven hearings, the following observations were made:

- Panelists reported on cross-cutting issues such as education, workforce development and access to capital more often than they focused on a specific domain such as health IT, renewable energy, or commercial space.
- Repeating themes included industry’s challenge in finding adequately trained workers, the need for access to capital, and the quality of education in general, and STEM education in particular.
- Testimony from panelists tended to be short-term tactical solutions to immediate challenges rather than long term strategies.
- While the Commission acknowledges the imperative of Georgia being able to compete globally, very few panelists commented on this dimension of their business. This would be an area for further discussion and study.
- Of 70 witnesses, the Commission heard from approximately ten women or minorities.

Commission Recommendations

The Commission received over 200 recommendations of which they are recommending approximately 70 for short, medium or long term action. A full list of all recommendations can be found in Appendix E.

Figure 2: Commission Recommendations

	Short-term (Within 12 months)	Mid-term (12-24 months)	Long-term (2-5 years)
Access to Capital			
<i>Tax credits</i>	Extend the Georgia Angel Investor Tax Credit for capital investments by high tech companies.	Implement a Georgia Capital Acceleration Fund program with a focus on developing a robust, statewide venture capital industry in order to help encourage the	Pass a "Technology Development Act" to further expand the state's technology sector by earmarking a portion of the state's investments.

		growth and continued viability of Georgia-based start-up companies through access to financing and local mentorship.	
<i>Alternative investments</i>	Pension reform to allow investment in alternative assets including venture capital.	Use a mixed approach between direct investment by the state and matching of SBIR grants	
<i>Other</i>		Study the impact and viability of the Georgia Seed Capital Fund	Pass a "Keep Our Business Leadership Act" that provides tax credits on capital gains over a certain threshold.
Administrative/ Strategic			
	Establish an Innovation Advisory Council made up of business, government, and community leaders to help guide strategic plan development and implementation	Develop a 20-year strategic plan for science, technology and innovation in Georgia	
	Add technology planning to existing local and regional planning process		
Aerospace			
	To enhance the labor pool for aerospace and aviation fields, expand and improve the curriculum offered at technical schools to meet the needs of Georgia's aviation companies.	Encourage UAV (Unmanned Aerial Vehicle) R&D through incentives and through encouraging venture capital groups to provide easy access to capital.	
Agriculture			
		Encourage the joining of agriculture & aerospace by providing a small pilot program of grant funding to facilitate the creation of a research program that explores the use of aerospace resources to assist	

		precision agriculture.	
Bioscience			
	Biotechnology investment tax credit – income tax credits for individuals, corporations and qualified Ga. venture capital firms that invest in Ga. biotechnology companies.	Capital gains tax exclusion for investments in advanced technology companies.	Clean room construction exemption – exempt sales and use tax on clean room construction and equipment.
Broadband			
	Develop a state capacity to lead and advocate for broadband strategic development and issues in Georgia.	Sales tax exemption for telecommunications equipment	Assist K-12 public education by setting a standard for bandwidth needed for a classroom to handle 21st century technology.
Commercial Space			
		Work with state and federal policymakers to build an understanding for importance of space sector to the state of Georgia	
Data Centers			
	Create an energy tax exemption for data centers.		
	Increase the number of hours that data centers can run generators and change the EPD “emergency” definition.		
		Promote investment in building and operating LEED certified data centers.	Give advantages to LEED certified data centers to attract customers.
Defense/ Military			
	Create a state consortium to promote the location of defense technology companies near Georgia bases.	Support development and sustainment of ISR (Intelligence, Surveillance and Reconnaissance) capabilities by establishing a collaborative consortium of high technology companies and	

		academic resources in close proximity to Warner Robins Air Logistics Center.	
Economic Gardening/ Entrepreneurship			
<i>Entrepreneurs</i>	Review the impact of Ga Tech's ATDC (Advanced Technology Development Center) and VentureLab models.	Modify investment terms and restore funding for the Georgia Seed Capital Fund	
<i>Intellectual Property</i>		Create a support system for commercialization of intellectual properties created by private companies.	
<i>Other</i>	Develop an S&T cluster strategy/Georgia Technology Cluster Initiative to drive innovation and economic development.	Create a Georgia Innovation Dashboard	
Education			
<i>Students (K-12)</i>	Support College and Career Academies, and other high school programs that provide curriculums that meet industry workforce needs and provide dual enrollment (post-secondary education credits) to their high school students.	Increase performance on K-12 science and math test indicators (CRCT, EOCT, SAT, ACT).	Integrate advanced technology into classroom instruction statewide and provide access to content for all Georgia students.
<i>Students (Post-secondary)</i>		Increase the number of secondary students enrolled in STEM pathways and/or matriculating to STEM post-secondary options.	Increase the number of STEM graduates from post-secondary institutions in Georgia (USG, TCSG and private).
<i>Teachers</i>		Increase the number of STEM certified teachers.	
<i>Industry</i>		Expand STEM Business/Education Partnerships statewide.	
<i>Other</i>		Develop and maintain a seamless K-20 articulation of STEM coursework with the creation of a Georgia STEM	Develop communication channels to educate Georgia citizens of the importance of STEM education so they recognize the role of STEM education to a vibrant economy and high quality life style.

		Learning Community that meets regularly to move Georgia's STEM agenda forward.	
Energy			
		Conduct pilot feasibility study of smart grid implementation.	
Geographic Information Systems			
	Implement GIS technologies and data visualization tools to help make more informed economic development decisions		
Health IT			
	Expand the state usage of the Ga. Partnership telehealth network for corrections, schools, public health depts., etc.	Identify one-time funding to purchase equipment to expand the number of telehealth sites.	
Information Technology			
		Consider incentives for companies to keep IT jobs in Georgia in lieu of outsourcing to lower cost nations	
International			
	Encourage federal visa reform to allow for innovation and world-class talent to start businesses in Georgia.		
Procurement			
		Encourage GTA to serve as a resource for state organizations that are smaller and/or have limited technology expertise in order to assist them in accomplishing their missions without the additional cost of staff that might not be fully utilized or might be utilized only on a project	

		basis	
R&D to Commercialization			
	Study the current R&D tax credit to determine if it can be made more effective, e.g. Allow Georgia's R&D tax credit to be saleable or exchangeable		
	Support GDEcD and GRA initiatives related to economic development		
	Support the Board of Regents "B" Budget		
		Reduce costs incurred by duplicate audits conducted by state and federal officials.	
Rural Development			
	Reinstate ICAPP program geographically to help grow technology skills outside Atlanta		
		State funding to encourage telecommunications/ broadband expansion in rural areas to supplement success-based capital investment rather than funding networks that overlap areas already served by private enterprises.	
Telecommunications			
<i>Broadband</i>	Develop a broadband access goal for all Georgians, inclusive of education and health care, and work with industry and government leaders to identify barriers and incentives to achieve the goal.		
<i>Regulation</i>	Encourage and facilitate uniform regulation across the state.		
<i>Other</i>	Strengthen existing metals theft statutes.	Study the benefits and detriments	

		associated with the Universal Access Fund.	
Traditional Industries			
		Include the traditional industries in the S&T plan, including manufacturing, forestry, agriculture, mining, logistics.	
		Georgia should prepare and execute a technology research roadmap to revitalize its rural employment engine and position itself for growth in advanced forest-based chemical, packaging and biofuel materials.	
		Policies should encourage highest and best use of raw materials and consider potential impacts on availability, sustainability and price of raw materials when establishing policies.	
			Support research in new applications from traditional materials in order to prevent the existing economic strength of many rural communities of falling into decline.
Workforce/Talent Development			
			Encourage the development of a workforce pipeline by supporting work based learning opportunities that provide both high school and post-secondary credit.
	Promote a statewide intern program for university students to work with high tech firms.		
	Provide a tax credit to encourage the development of a skilled advanced manufacturing and energy workforce through		

	apprenticeship training.		
	Continue Work Ready Program, including Talent Assessment (soft skills/work habits)		

Appendix A: SR 68

A RESOLUTION

1 Creating the Science and Technology Strategic Initiative Joint Study Commission; and for
2 other purposes.

3 WHEREAS, the field of science and technology is an important and growing sector of the
4 state economy; and

5 WHEREAS, it is imperative that the state develop policies to encourage and facilitate the
6 growth and vigor of this vital field; and

7 WHEREAS, the General Assembly is determined to study the best and most efficient path
8 to that goal.

9 NOW, THEREFORE, BE IT RESOLVED BY THE GENERAL ASSEMBLY OF
10 GEORGIA that there is created the Science and Technology Strategic Initiative Joint Study
11 Commission to be composed of 12 members as follows:

12 (1) One member of the Georgia General Assembly Senate Science and Technology
13 Committee and one member of the Georgia General Assembly Senate Economic
14 Development Committee appointed by the chairperson of the respective committee;

15 (2) One member of the Georgia General Assembly House Committee on Science and
16 Technology and one member of the Georgia General Assembly House Committee on
17 Economic Development appointed by the chairperson of the respective committee;

18 (3) Three individuals from the private sector with a background in science and
19 technology, with one such member each being appointed by the Governor, the President
20 of the Senate, and the Speaker of the House of Representatives;

21 (4) The commissioner of Economic Development or his or her designee;

22 (5) The Georgia Technology Authority Chief Information Officer or his or her designee;

23 (6) The State School Superintendent or his or her designee;

24 (7) The chairperson of the Board of Regents or his or her designee; and

25 (8) The chairperson of the State Board of Technical and Adult Education or his or her
26 designee.

27 The Speaker of the House of Representatives and the President of the Senate shall each
28 appoint a co-chair of the commission. The commission may establish various subcommittees
29 with subject matter expertise to advise the commission on specific matters, which shall be
30 chaired by a member of the study commission. Members of the subcommittees must be

31 experts from Georgia's science and technology community.

32 BE IT FURTHER RESOLVED that the commission shall:

33 (1) Inventory Georgia's existing assets in the science and technology sectors to determine
34 current strengths and capabilities;

35 (2) Conduct review of state and national policies to discern best practices and lessons
36 learned with regard to public policy that encourages advancement of the science and
37 technology sectors;

38 (3) Hold meetings around the state to solicit input from science and technology
39 stakeholders, with a specific interest in identifying barriers to growth and progress; and

40 (4) Develop specific recommendations with regard to the scope and content of a strategic
41 plan for science and technology in Georgia. Such recommendations shall stipulate what
42 the commission recommends should be excluded from such a plan.

43 BE IT FURTHER RESOLVED that all executive departments, agencies, boards, and
44 commissions and other divisions of the executive branch of state government shall fully
45 cooperate with the commission, and any nonprofit entities designated by the commission that
46 promote and support technology initiatives may assist the commission in the performance
47 of its duties and may provide staff assistance and any other assistance as requested.

48 BE IT FURTHER RESOLVED that the committee shall undertake a study of the conditions,
49 needs, issues, and problems mentioned above or related thereto and recommend any actions
50 or legislation that the committee deems necessary or appropriate. The committee may
51 conduct such meetings at such places and at such times as it may deem necessary or
52 convenient to enable it to exercise fully and effectively its powers, perform its duties, and
53 accomplish the objectives and purposes of this resolution. The legislative members of the
54 committee shall receive the allowances authorized for legislative members of interim
55 legislative committees. The members of the commission shall serve without compensation.
56 The funds necessary to carry out the provisions of this resolution shall come from the funds
57 appropriated to the Senate and the House of Representatives. No later than January 9, 2012,
58 the commission shall submit its recommendations for the development of a strategic plan to
59 the Governor, President of the Senate, and the Speaker of the House of Representatives. The
60 committee shall stand abolished on January 9, 2012.

Appendix B: Task 1 - Asset Inventory

Disclaimer: The Commission has made its best efforts to capture the science and technology assets our state has to offer. As this is a vibrant and robust industry, this list serves only as a snapshot of the whole. The Commission apologizes for anything omitted from this list in error.

- In 2011, CNBC ranked Georgia as the #4 state for business behind Virginia, Texas and North Carolina. The rankings were determined after measuring states on the cost of business, workforce, quality of life, economy, infrastructure and transportation, technology and innovation, education, business friendliness, access to capital, and cost of living.
- In 2010, a Valdosta State University study found that the cost of living for a middle management household in Georgia was 7.6% below the national average for the same group.
- Georgia is ranked among the top 10 states to do business.
- Georgia is number one in the nation for women-owned businesses.
- Georgia is home to 14 Fortune 500 companies:
 - Home Depot
 - UPS
 - Coca-Cola
 - Delta Airlines
 - Aflac
 - Southern Company
 - Genuine Parts
 - First Data
 - Sun Trust Banks
 - AGCO
 - Coca-Cola Enterprises
 - Newell Rubbermaid
 - Mohawk Industries
 - NCR

Access to Capital

- Georgia is one of only 13 states to hold an AAA bond rating.
- Georgia is one of only 13 states that currently uses Single Factor Apportionment to calculate the portion of a company's income subject to corporate income tax.
- Georgia offers an array of tax incentives to businesses from corporations to small business
 - Tax Credits
 - Investment Tax Credit
 - Optional Investment Tax Credit
 - Job Tax Credit
 - Quality Job Tax Credit
 - Retraining Tax Credit
 - Angel Investor Tax Credit
 - R & D Tax Credit
 - Mega Project Tax Credit
 - Port Tax Credit Bonus
 - Tax Exemptions
 - Sales and Use Tax Exemption
 - Inventory Tax Exemption

Aerospace

- Georgia Tech Guggenheim School of Aerospace Engineering is one of the top programs in the country.
- Georgia has more than 500 companies that provide all facets of aerospace design, testing, manufacturing, and operations.

Agriculture

- Georgia has 24.8 million acres of forestland with more than 22 million acres of privately owned timberland.
- Georgia has 10 million acres of agricultural land.
- Agricultural Experiment Stations (Athens, Tifton and Griffin)
- Center for Food Safety

Bioscience

- Georgia BioBusiness Center (GBBC)
- UGA School of Veterinary Medicine
- Georgia is home to more than 300 life science companies.

Broadband

- Metro Atlanta is frequently ranked as “America’s Most Wired City”.
- Georgia has more than 500,000 fiber optic lines across the state.
- 93.6% of Georgia’s population is covered by DSL technology. The national average for the same coverage is only 88%.
- 98.2% of Georgia’s population is covered by wireless technology compared to 97.6% of the nation.

Data Centers

- Georgia is home to more than 50 major data centers and is one of the fastest growing markets in the US for data center space.

Defense

- Georgia is home to thirteen military bases.
- The Center for Disease Control and Prevention is headquartered in Atlanta.

Economic Gardening/Entrepreneurship

- Georgia is 1st in the nation for entrepreneurial activity, with more than 500 new companies established in Georgia each month.
- Georgia ranks 5th nationally for patents issued.
- The Georgia Department of Economic Development is home to the Centers of Innovation. There are 6 industry specific centers of innovation:
 - Aerospace
 - Agribusiness
 - Energy
 - Life Science
 - Logistics
 - Manufacturing
- Advanced Technology Development Center (ATDC)
- Flashpoint
- Georgia Medical Center Authority

Education

- Georgia ranks 5th in the nation for university research expenditures. In 2009, Georgia public colleges and universities spent more than \$1 billion in research and development.
- 35 universities and colleges under the Board of Regents
 - 7 research universities
 - 4 public (Georgia State University, University of Georgia, Georgia Institute of Technology, and Georgia Health Sciences University)
 - 3 private (Emory University, Mercer University, Morehouse College)
- 23 technical colleges and 31 satellite campuses under the Technical College System of Georgia (TCSG)
- 14 Georgia College and Career Academies
 - These academies operate as a collaborative education and career-building partnership between local school systems, TCSG and area businesses and industry to integrate academics and career-based learning.
- Georgia Tech Research Institute (GRTI)
- Center for Education Integrating Science, Mathematics, and Computing (CEISM) is a partnership between Georgia Tech, educational groups, schools, corporations and state leaders that work together to improve and enhance STEM education in Georgia’s K-12 schools.

Energy

- The average price of energy in Georgia is 8.64¢/kWh. This is 8.5% below the national average.
- Georgia operates two nuclear power plants

- Hatch in Appling County
- Vogtle in Burke County
 - Units 3 and 4 at Plant Vogtle are currently under construction and will be the first new nuclear power plant units in the US in more than thirty years.
- The University Center of Excellence for Photovoltaics Research and Education (UCEP) at Georgia Tech is one of only two such centers established by the US Department of Energy in the country.

Financial Technology

- Georgia ranks 3rd nationally in financial technology.
- Georgia is home to more than 90 financial technology providers that specialize in card processing/POS, electronic billing and presentment, retail banking solutions, capital markets, prepaid/loyalty points, gateways/alternative payments.
- Four of the top 20 American Banker FinTech 100 companies are headquartered in Georgia.

Geographic Information Systems (GIS)

- Center for Geographic Information Systems at Georgia Tech
- GVU Center at Georgia Tech
- Center for Geospatial Research at UGA
- Petit Science Center Visualization Wall at Georgia State University
- Georgia's research universities provide specialized programs of study at the graduate level in GIS areas.

Health IT

- Georgia is the nation's Health IT capital with more than 200 Health IT companies operating in the states.
- Eight Georgia Companies are on the HCI-100 List, including number one, McKesson Technology Solutions.
- There are more than 16,000 Health IT employees working in Georgia.
- Georgia universities and colleges offer 40 degree programs supporting Health IT talent.
 - The Healthcare Information and Management Systems Society, the world's largest Health IT organization, originated at Georgia Tech.

Information Technology

- Software and IT Services represent 27% of Georgia's technology employment sector
- Georgia has more than 10,000 network and computer systems engineers.
- Georgia Technology Authority
- Georgia is home to more than 120 information security companies.
 - More than 25% of the worldwide security revenue market share is generated by Georgia companies.

Logistics

- Georgia is home to almost 11,000 providers of logistic services including, cores transportations and facilities, third-party logistics, and software providers
- Ranks 5th nationally as largest overall logistics employer.
- Four of the top ten warehouse providers in North America are headquartered in Georgia.
- 90% of the top 25 global third-party logistics providers have operations in GA
- 86 four-year colleges, universities, and technical colleges offer more than 100 logistics-related courses
 - Georgia Tech's Supply Chain & Logistics Institute is the world's largest logistics-related research and education enterprise.
- Air
 - Georgia is home to the Atlanta's Hartsfield-Jackson International Airport, the world's busiest airport.
 - 80% of the US market can be reached from GA in 2 days by ground or 2 hours by air transit
 - All contiguous states in the US market can be reached from GA in 4 to 5 days by ground and 4 hours by air transit
 - Hartsfield-Jackson has the 11th largest air cargo hub.
 - In addition to Hartsfield-Jackson, Georgia is home to more than 140 public and private airports.
- Ports

- Georgia is home to the fastest growing seaport.
- The Georgia Port Authority oversees operations at 4 ports across the state:
 - Savannah
 - Brunswick
 - Bainbridge
 - Columbus
- Highways
 - Georgia has more than 1,200 miles of interstate.
 - Georgia has more than 20,000 miles of federal and state highways.
- Rail
 - Georgia has more than 4,700 miles of rail.
 - CSX and Norfolk Southern, both class-one railroads operate in Georgia.
 - Twenty-four short-line companies also operate in Georgia.

R&D to Commercialization

- Georgia Research Alliance (GRA), is a public/private partnership that brings together the state's academic, industry and government leaders to grow Georgia's economy through scientific discovery. GRA has three key programs which focus on building and leveraging the innovation capacity of Georgia's research universities.
 - GRA VentureLab is the lead program for commercializing university R&D. VentureLab identifies and assumes the commercial potential of university-based discoveries for provides human and financial resources to build new companies from research results.
 - GRA Venture Fund, LLC. is a private investment fund established to provide investment capital to VenturLab companies.
 - GRA Eminent Scholars recruits top scientists from around the world to lead R&D programs at Georgia's research universities that have high potential for significant economic and human return on investment.
 - Georgia Cancer Coalition (GCC) is a targeted initiative focused on strengthening cancer prevention, research and treatment in Georgia.
- Enterprise Innovation Institute (E12)

Telecommunications

- Georgia ranks 3rd nationally for the most telecom companies on the Inc. 5000.
- Georgia ranks in the top 5 nationally for internet and telecom employment.
- Georgia ranks 5th nationally for communication services, with more than 100 companies contributing to the industry.
- Technology Association of Georgia

Workforce/Talent Development

- Georgia is a right-to-work state. The relatively low union presence in the state makes our workforce attractive to employers.
- Quickstart (TCSG)
 - Biotech/Healthcare
 - Warehousing/Distribution
 - Automotive
 - Advanced Manufacturing
 - Food/Agribusiness
 - Service
- Georgia College and Career Academies
- Georgia Work Ready Program
- International Capital Partnership Program (ICAPP)

Appendix C: Task 2 - Best practices; List of states with strategic plans focused on science, technology and innovation

The following states have strategic plans that are focused on science and technology. Due to the relatively recent publication dates, there is little data available on progress except in North Carolina and Oregon. These two states have had previous plans and included comments on accomplishments in the most recent plan.

Year	State	Strategic Plan for STI
2000	North Carolina	Vision 2030: Science and Technology - Driving North Carolina into the New Economy
2004	Idaho	Moving Forward: Accelerating Idaho's Innovation Economy (updated from 2000)
2005	West Virginia	Vision 2015: The West Virginia Science and Technology Strategic Plan
2007	Oklahoma	Oklahoma's Strategic Plan for Science and Technology
2008	Nebraska	Digital Nebraska: Envisioning our Future
2009	Oregon	Innovation Plan 2.0 (updated from 2007, new release in 2011)
2009	Alabama	Alabama Science and Technology Roadmap
2010	Maine	2010 Science and Technology Action Plan: A Bold Approach to Stimulate Maine's Economy
2011	Iowa	Iowa Innovation Council Strategic Plan

Appendix D: Task 3 - List of Hearing Dates and Panelists

Georgia’s Science and Technology Strategic Initiative Joint Study Commission extends their thanks to each of these individuals and their organizations for allowing their participation in the hearings.

Location:	Panel Topics:	Panelists:
Cisco Atlanta	Education	Kelly McCutchen, Georgia Public Policy Foundation
		Rodney Patterson, Microsoft
		Sam Lim, CISCO
	Data Centers	Michael Robertson, Technology Association of Georgia
		Butch Goldi, Quality Technology Services
		Mark Metz, Corus 360
	Emerging Growth Companies	Matt Searfoss, Peak 10
		Andy Monin, Vendormate
Jim Denny, Navicure		
		Val Rahmani, Damballa
Georgia State Capitol	Access to Capital	Allen Moseley, Noro-Moseley Partners
		Michael Price, CEO Ventures
		Sigmund Mosley, Imlay Investments
	High Growth Potential	Eric Cooney, Internap
		Jeff Cashman, Manhattan Associates
		Craig Marmon, Slalom Consulting
	Health IT	Paula Guy, GA Tele Health
		Robert Hendricks, McKesson
		Rick Voight, SoloHealth
Herty, Savannah	Logistics	Bill Sutton, Georgia Ports Authority
		Chad Barrow, Coastal Logistics Group
		H. Donald Ratliff, Georgia Tech
		George Powers, iTech
	International Marketplace	Michael Stolarczyk, Kontane Logistics
		Steve Weathers, Savannah Economic Development Authority
		Todd Gerken, US Export Assistance Center
	Workforce Development	David Frost, Georgia Tech Savannah
Nick Gant, Meddin Studios		
		Steve Weathers, Savannah Economic Development Authority
Tellus Science Museum, Cartersville	Infrastructure	Jim Hendrickson, Georgia Public Web
		Joe Patton, Fiberlight
		John Scoville, PeachNet
	Rural Development	Bruce Abraham, North Georgia Networks
		Hank Blackwood, Dalton Utilities
		Jim Kortum, Windstream Coporation
	Educational Topics	Marshall Chambers, Direct to Discovery
		Ashley Hopkins, Technology Student Association
		Irene Munn, Office of Lt. Governor
Mercer University, Macon	Traditional Industries	Dan Floyd, Renmatix
		Norman Marsolan, Institute of Paper Science and Technology
		Randy McRae, Jr, Senior Regional Government Relations
		J. Philip E. Jones, New Ventures & Disruptive Technologies

	Aerospace/Military	R. Steven Justice, Georgia Center for Innovation
		Joseph Marks, TIMCO
		David Garrison, Delta Airlines
	Higher Education	Jon Sizemore, University System of Georgia
		Dr. Richard Mendola, Emory University
		Dr. Scott Davis, Mercer University
		Han Reichgelt, Southern Polytechnic State University

Georgia Health Sciences University	Communication Services/Telecom Panel	Kevin Curtin, AT&T
		Chris Jones, Verizon
		Bill Weber, CBeyond
		Lee Connor, South Georgia Regional Information Technology Authority
	R&D and Commercialization Panel	Mike Cassidy, Georgia Research Alliance
		Dr. Mark Hamrick, Georgia Health Sciences University
		Dr. Steve Cross, Georgia Institute of Technology
		Lee Herron, Georgia Research Alliance
	Bio/Life Science Panel	Dr. Stacy Williams Shuker, Center of Innovation for Life Sciences;
		Beata Kochut, UGA Selig Center for Economic Growth
		Stan DeHoff, Georgia Medical Center Authority
		Seth Millican, Brock Clay

TSYS, Columbus	Financial Technology	Ryland Harrison, TSYS
		Brenda Potter, Fiserv
	Information Security	Charles Kaminski, LexisNexis
		Vijay Bahl, PinDrop Security
	Economic Gardening	Stephen Fleming, Enterprise Innovation Institute
		James Marlow, Radiance Solar
	Agricultural Technology	Dr. Bob Shulstad, UGA College of Agriculture and Environmental Science
	Commercial Space	Mr. Bob Scaringe, AVG Communication
Dr. Bobby Braun, Georgia Tech Space Systems Design Laboratory		

GTRI, Atlanta		Public Meeting
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Appendix E: Task 4 - List of all recommendations made to the Commission

This list of recommendations has been compiled from panelist testimony, individual Commission members, and Subcommittee reports. It is organized alphabetically by topic. Many of the recommendations are not exclusive to one topic, but at this time, have not been intentionally captured in multiple categories. Very often recommendations have been abbreviated for space. Supporting information regarding risks and benefits was often included by the panelist to explain the recommendation further, but that may have been omitted in this list.

Access to Capital

1. Extend the Georgia Angel Investor Tax Credit for capital investments by high tech companies.
2. Evaluate as planned and extend the Georgia Angel Investor Tax Credit.
3. Create a venture fund for Georgia companies.
4. Study the impact and viability of the Georgia Seed Capital Fund, which leverages private sector investments, in light of current budget considerations.
 - a. Study the potential impact of a new matching state fund program for federal SBIR/STTR awards, similar to neighboring states.
 - b. Study the investment ratio (currently limited to 1:3) to optimize investments and increase likelihood of successful startups
5. Allow Georgia state employee/teacher pension funds to invest in alternative investments (rebrand the proposal to avoid calling it "alternative").
6. Pension reform to allow investment in alternative assets including venture capital. Some portion of this allocated investment would be earmarked for investment in the state of Georgia similar to what Florida has done with the Florida Growth Fund and North Carolina with the NC Innovation Fund.
7. Improve angel and early stage funding climate in the state
8. Some type of state tax credit program to help fund venture capital funds that view Georgia as strategic and invest in early stage companies. Similar programs have been funded with success in South Carolina and Arkansas.
9. Pass a "Technology Development Act" to further expand the state's technology sector by earmarking a portion of the state's investments. Georgia should invest in the companies that invest in Georgia, creating higher paying jobs and a more skilled workforce. The many results by other States which is readily available have proven that this is highly effective policy which drives both good returns for the many State that have done it and drives the right kinds of new jobs we want in Georgia.
10. Pass a "Keep Our Business Leadership Act" that provides tax credits on capital gains over a certain threshold.
11. Develop strategic incentives to attract technology companies, above the normal industrial incentives. Suggest talk to technology companies, existing in Georgia and far afield, get first-hand what would attract them to Georgia. There is talk now about reducing sales tax on electricity for tech companies, who are heavy users of electricity, such as data centers. Suggest we look at regional incentives where a region demonstrates a competence to attract certain industries, as opposed to state-wide. Develop tech incentives where there is broadband; agricultural incentives where ag is common; poultry where there is poultry, etc. Target incentives where there is a workforce and local capacity to support such industries.

Administrative

1. Based on results of this Study Commission, develop a 20-year strategic plan for science, technology and innovation in Georgia
2. Establish an Innovation Advisory Council made up of business, government, and community leaders to help guide strategic plan development and implementation

Aerospace

1. Providing qualified workers, and strengthening the workforce with affordable and ubiquitous opportunities for education can enhance Georgia's aerospace sector. Fostering the creation of an integrated and 'virtual' campus that integrates the considerable resources across Georgia into a cohesive delivery system would provide relevance to the units of the University System of Georgia (USG) and Technical College System of Georgia (TCSG) to provide expanded value to companies in the state. The legislature should encourage a task force/commission to analyze the policy and financial impediments that may exist and provide specific recommendations to facilitate the establishment of this education resource.
2. Study barriers and incentives for development of the aerospace industry in Georgia.

3. Encourage companies to invest in aerospace skills training through tax credits, cost sharing or cooperative arrangements with units of the USG, such as use of student internships, training at subsidized rates, etc, to deliver high quality training and sustain a globally competitive workforce. A successful example to emulate would be Ohio's Third Frontier Internship Program. (<http://thirdfrontierintern.ohio.gov>)
4. Encourage and explore funding to support aerospace related K-12 STEM education through leveraging the programs at the Aviation Museum at Warner Robins, GA, the Mighty 8th Air Force Museum in the Savannah area, and other aviation related resources throughout the state. Providing stipends for math and science teachers to attend specialized training at museums, schools such as Middle Georgia College, and the technical schools teaching FAR Part 147 A&P courses would enable schools too distant for 'hands on' visits to gain some benefit from such teacher training. In addition, the legislature should sponsor and fund a series of industry/education forums to fully clarify and identify the STEM skills needed across their entire workforce – not just for engineering.
5. Unmanned Aerial Vehicle research is the next frontier in aerospace. In order to remain competitive, the legislature should be acting to encourage UAV R&D through incentives and through encouraging venture capital groups to provide easy access to capital. The State should also coordinate the activities of several stake-holding agencies via the Center of Innovation – Aerospace, to ensure that Georgia receives the designation as an FAA regional UAV R&D center. The legislature should seek to determine the resources these agencies need to be successful and provide those resources.
6. Develop an aggressive proactive approach to engage high school age technical students to pursue a career in aviation. Within the Warner Robbins and Macon community there are over 25,000 aviation employees many of whom are approaching retirement age. If our industry doesn't act soon to develop skilled technicians to fill those openings, the aviation community in Georgia will be forced to relocate this work to where technicians are available.
7. Currently the curriculum taught in Technical Schools does not meet all requirements for the commercial aviation industry. Only the FAA can approve a more advanced curriculum which when enacted will take time to implement. Aviation is one of the few industries still growing in a down U.S. economy, and in an international environment where competition thrives; some foreign countries provide funding and training for aviation technicians. Overcoming these obstacles is essential in keeping aviation jobs in Georgia and the USA. The MRO employer is limited in the amount of funding they can provide for training. Private and public funding sources will be required to bring new well trained aviation technicians into the industry. On the job training after Technical School for qualified applicants is an option. Funding could be provided by Georgia Work Ready in conjunction with matching funds by the employer.
8. Enhance the Labor Pool - Due to the skilled labor force required to maintain a fleet of aircraft and its engines and components, Delta and its maintenance organization must continue to have a reliable pipeline of trained and certified aviation maintenance technicians

Agriculture

1. Agriculture is vital to the economy of Georgia. Methods to improve crop quality at lower cost, known as 'precision agriculture' can benefit from the use of aerospace related technology, such as unmanned aerial vehicles (UAVs), to monitor soil and crop conditions. The legislature should encourage the joining of these two areas of study (agriculture & aerospace) by providing a small pilot program of grant funding to facilitate the creation of a research program that explores the use of aerospace resources to assist precision agriculture.

Bioscience

1. Technology business tax certificate transfer program – companies may sell unused net operating losses to unrelated profitable companies.
2. Biotechnology investment tax credit – income tax credits for individuals, corporations and qualified Ga. venture capital firms that invest in Ga. biotechnology companies.
3. Capital gains tax exclusion for investments in advanced technology companies.
4. Georgia innovation venture capital fund – proposed to allocate \$200 million in tax credits, modeled after Tennessee's TNInvestco.
5. Refundable R&D tax credit (with added incentive for university spin-outs) – income tax credits for individuals and businesses for qualified R&D expenses.
6. SBIR/STTR incentive funds program – reimburses qualified Ga. businesses for a portion of the costs of proposals for federal SBIR and STTR grants. Also, provide state matching grants up to \$1 million.
7. Clean room construction exemption – exempt sales and use tax on clean room construction and equipment.
8. Georgia innovation facilities fund – \$25 million in state bonds to provide upfront costs of construction in exchange for rent for Ga. bioscience companies.
9. Energy sales tax exemption - for energy used in manufacturing.

10. As life sciences is acknowledged to be a vital subset of the science and technology footprint we hope to establish and enhance for Georgia. The Science & Technology Joint Strategic Study Commission recommends that the State of Georgia endorse biotechnology research and development, and support federal regulations governing biotechnology research and technology applications. The Commission cautions the General Assembly and Governor against implementing legislative measures that restrict federally approved and regulated research, and that place Georgia at a competitive disadvantage in attracting 21st century science and technology development.

By endorsing support for science-based approach to regulating bioscience research and development, the Commission recommends that we foster a regulatory environment in Georgia that enables scientists at its universities and companies to compete with the rest of the world in pursuing the promise of biotechnology to improve the health and well-being of people, animals and the environment. This declares to the nation and world that Georgia is a pro-science and technology state, an essential element of attracting bioscience industry development.

Biotechnology is all around us and essential to our lives, providing breakthrough products to cure disease, protect against bio-terrorism, feed the hungry, and clean our environment. In fact, biotechnology presents some of the most promising opportunities for helping policymakers achieve their goals of supporting innovation in health care, agriculture, renewable energy, and green technologies.

However, in this global economy, nearly every competitor has access to big breakthroughs in technology and to the equipment and capital to produce standardized products. Those states and nations that possess this human capital, insights, competencies, and experience will have the competitive advantage. Attracting and retaining educated scientists and technically skilled workers and providing a regulatory environment that supports their research efforts are essential to a state aspiring to enhance bioscience industry presence and to identify itself as a global center of 21st century science and technology innovation.

Broadband

1. Develop a state capacity, perhaps a specialized agency, to lead and advocate for broadband strategic development and issues in Georgia. OneGA does some funding now, GTA does broadband mapping and government office connections, but there is currently no home for broadband/technology growth industries/issues/strategy in the state.
2. Develop internet commuting for employees that can work remotely through a good broadband connection. Develop workforce plans for companies as how to train and enable employees to work remotely, provide incentives for employer as well as employee to do so. We can communicate anywhere in the world with a high speed connection, so why can't we free up our highways and office space to let people work remotely. We cannot build enough highways to keep up with the growth in metro areas, so plan around the emerging broadband highway. This could be worked on through the agency recommended in #1 above .
3. The industry assists k-12 public education by setting a standard for bandwidth needed for a classroom to handle 21st century technology.
4. Sales tax exemption for Equipment: Not only do wireless services benefit the communications sector but the spillover effects in Georgia are profound. Broadband investment incentives benefit more than communications providers and their customers. Broadband increases productivity for all businesses and industries and is in itself a tax multiplier. Broadband allows businesses to grow, bringing additional income, sales and use and property tax revenues.

Commercial Space

1. Work with state and federal policymakers to build an understanding for importance of space sector to the state of Georgia
2. Grow space systems at Georgia Tech
3. Build an alliance with either Alabama and/or Florida
4. Build a GA space industry: State incentives

Data Centers:

1. Create an energy tax exemption for data centers.
2. Increase the number of hours that data centers can run generators.

3. Provide data center property tax exemptions and sales tax exemption for data center construction, equipment (lower the exemption from current \$15M).
4. Create incentives to rehab old buildings into data centers.
5. Elimination of state tax
6. EPD “emergency” definition change
7. Elimination of emergency generator usage and increased generator maintenance
8. Deregulate electrical power industry
9. Property / Business tax relief for customers that make investments in Georgia
10. Promote investment in building and operating LEED certified datacenters. Part of LEED is having labor and supplies provided by Georgia companies. However, this is often a much more expensive solution. So, to help incent this investment, tax incentives should be given for all revenues associated with a LEED datacenter (perhaps some percentage of revenues as a direct credit.
11. Give advantages to LEED certified datacenters to attract customers. Again, this being a more expensive solution to build, these businesses need help to be competitive. I would suggest zero sales tax for companies buying equipment going in a LEED certified datacenter.
12. Better incentives for training technology employees. To keep our college grads in the state, companies should have dollar for dollar incentives for a period of time to hire and train new technology employees

Defense

1. Create a state consortium to promote the location of defense technology companies near Georgia bases.
2. ISR is the term used by the military to describe the capability to observe, identify and track any targets of interest to the war fighter. The Warner Robins Air Logistics Center (WR-ACL) has a major role in the development and sustainment of ISR capabilities and is seeking to establish a collaborative consortium of high technology companies and academic resources in close proximity to WR-ALC. The Georgia Tech Research Institute (GTRI) has significant expertise in this capability as well. The Legislature should identify ways to encourage high technology companies to establish their operations in Georgia, including possible tax incentives for R&D and supporting local economic development efforts to recruit companies to the area.

Economic gardening:

1. Review the impact of Ga Tech’s ATDC (Advanced Technology Development Center) and VentureLab models.
 - a. Review the impact of the current organizational model
 - b. Study the possibility of replicating ATDC at other research schools.
2. Create a support system for commercialization of intellectual properties created by private companies.
3. Develop a S&T cluster strategy/Georgia Technology Cluster Initiative to drive innovation and economic development.
4. Study the model of the Georgia Medical Center Authority, a business accelerator center which uses bonding capacity to advance bio and life science companies.
5. Study the current R&D tax credit to determine if it can be made more effective.
6. Expand Innovation Center funding to allow matching of external grants to bridge the gap between development and commercialization.
7. Create a new Georgia SBIR Matching Fund program
8. Restore funding for the Georgia Seed Capital Fund
9. Modify investment terms of Georgia Seed Capital Fund
10. Create the Georgia Venture Capital Program
11. Create a new Georgia Independent Inventors Commercialization Program
12. Create a Georgia Innovation Dashboard;
13. Allow Georgia’s R&D tax credit to be saleable or exchangeable

Education:

TARGET 1 - Increase performance on K-12 science and math test indicators (CRCT, EOCT, SAT, ACT).

RECOMMENDATIONS

1. Increase efforts to ensure that all regions of the state have access to high quality STEM professional development for teachers/administrators.
2. Adopt the Next Generation Science Standards that more closely align to national and international expectations in science. (Georgia is a pilot state for those standards).

- a. Executive and Legislative support for DOE and pilot schools/programs to develop useful/sustainable standards
 - b. Shift resources to integrate the Next Generation Science Standards to ensure successful implementation within K-12.
- 3. Develop a stronger STEM curriculum using GA Virtual High School that is aligned to Next Generation Science Standards and the mathematics common core.
 - a. Identify and assemble best in class STEM instructors across the state to create a pool of reliable & technologically proficient virtual teachers who can reach untapped student populations, especially minorities and females in rural and urban areas.
 - b. Identify a diversity of school systems ready and able to promote and support access to GA Virtual High School, perhaps adjacent to innovation industry clusters.
- 4. Fund K-12 laboratories and laboratory equipment beyond regular school budgets and cap science and technology classes at 24 students.
- 5. Reinstate the science mentor program in Georgia that allowed 16 extraordinary science teachers to work with teachers in science classrooms of failing school systems. Replicate the program for math.

TARGET 2 - Increase the number of secondary students enrolled in STEM pathways and/or matriculating to STEM post-secondary options.

RECOMMENDATIONS

- 1. Formalize the collaboration between the Georgia Department of Education (GaDOE), the University System of Georgia (USG), and the Technical College System of Georgia (TCSG) in order to develop and maintain a seamless K-20 articulation of STEM coursework with the creation of a Georgia STEM Learning Community that meets regularly to move Georgia's STEM agenda forward. The STEM Learning Community should provide a network for STEM teachers to learn innovative best practices with an increase in the number of Innovation Fund grants to promote dialog between business, industry, higher education and the public schools. Special attention needs to be given to identify opportunities for teachers and students to gain experience with STEM related work experiences.
- 2. Revise the standards for appropriate Career, Technical, and Agricultural Education courses to ensure they are rigorous and therefore will be counted as a 4th science course for admission to a USG institution.
- 3. Increase the number of STEM industry certifications in high school to encourage STEM career development at the post-secondary level.
- 4. Provide funding through competitive grants for STEM competitions such as Science Olympiad, Math Team, Science Team, Robotics Team, STEM summer camps, etc. Reward faculty members involved in these activities through allocations similar to athletic coaches and recognize their contribution to STEM education.

TARGET 3- Increase the number of STEM certified teachers.

RECOMMENDATIONS

- 1. Improve the quality of presently practicing uncertified math and science teachers by using such vehicles as:
 - a. Provide funding for summer STEM Institutes to certify all out-of-field teachers while improving their STEM content and pedagogical skills.
 - b. Require continuing education credits (PLUs or college credit) for STEM teacher certification renewal which will support the induction and professional development of STEM teachers.
 - c. Create awareness campaign for all STEM related teacher education tracts with endorsements (CS, K-5 science, K-5 math).
- 2. Increase the number of new certified STEM teachers.
 - a. Develop a means to incentivize institutions of higher education to make STEM teacher preparation a major priority. Reward those who have already spent a lot of time, energy and resources to push the envelope in STEM teacher preparation. Encourage them to continue to ramp up quantity and quality while sharing their expertise with other preparation programs.
 - b. Increase scholarship opportunities for students choosing STEM teacher preparation, particularly for minorities or those willing to work in high needs schools for a specific period of time, or those identified as talented teachers in K-12 schools.
 - c. Sustain and increase existing STEM II funding by the state that supports Academy for Future Teachers and the FOCUS (Fostering our Community's Understanding of Science) course.
 - d. Provide scholarships for undergraduate degrees and fund a program for 2 year teaching fellows leading to a Master's degree in teaching science, math and/or technology.

- e. Create awareness campaign to recruit and develop new STEM teachers focusing on minorities and females to broaden the STEM teaching pipeline.
- f. Support and expand programs like UTeach and similar programs that recruit and attract science and math majors into STEM teaching.
- g. Expand Teach for Georgia concept (modeled after Teach for America).
- h. Develop/expand program that allows business/industry professionals to teach STEM related courses on a part time or intermittent basis. Presently only one individual is taking advantage of this route. More marketing needs to be done.
- i. Develop/expand/market the Troops for Teachers program.
- j. Explore qualification criteria for teaching the closely related STEM core courses and STEM CTAE courses/pathways – explore loosening the requirements in order to allow more teachers across multiple disciplines to qualify to teach.

TARGET 4- Expand STEM Business/Education Partnerships statewide.

RECOMMENDATIONS

1. Expand the GIFT program or similar research internship programs for STEM teachers and their students, especially for females and minorities.
2. Expand apprenticeship grant programs funded via the state legislature for high school students interested in STEM areas during both the academic year and the summer.
3. Encourage partnerships with business/industry and school districts to have business/industry professionals serve as Subject Matter Experts (SME's) to substitute for teachers during the school year to bring thoughtful value-added experiences to the classroom while teachers are conducting their research & development for new curriculum.

TARGET 5: Develop communication channels to educate Georgia Citizens of the importance of STEM education so they recognize the role of STEM education to a vibrant economy and high quality life style.

RECOMMENDATIONS

1. More attention needs to be given towards marketing the importance of STEM on personal and state economic development. Georgia has successes in STEM Education that need to be publicized to counterbalance negative publicity about Georgia's education. Establish dialog and research on STEM education and community and international economic development.
2. Continue to promote public and private programs, such as the STEM Festivals, STEM Summer Camps, FIRST Robotics, Real World Design Challenge and TAG Education Collaborative WEBChallenge, that expose students to STEM topics with relevant and exciting hands-on programs.
3. Input from business/industry to the STEM academic community is needed to ensure the necessary technical skills are developed that will allow students to enter the workforce as seamlessly as possible.

TARGET 6 - Integrate advanced technology into classroom instruction statewide and provide access to content for all Georgia students.

RECOMMENDATIONS

1. Allow changes to the QBE funding formula to allow for schools to make technology investments. Include an equalization clause to make sure poorer districts have technology funds, also. Provide supplemental QBE funding for technology so current funds don't have to be redirected.
2. Provide funding for professional learning for teachers and administrators in technology use and expanding the classroom globally.
3. Explore alternative technology assessment methods and systems (problem solving, critical thinking, etc.) to measure student achievement and teacher effectiveness.
4. Invest in advanced broadband connection and WiFi infrastructure to support Bring Your Own Technology (BYOT) whereby students are allowed to use their own technology in the classroom. This should be a high priority for rural school systems. Support development of curriculum and supporting materials based on a BYOT or mobile device environment.
5. Encourage and support innovative blended learning models.

6. Develop or expand repositories to identify best practice in integrating global technology into instructional practices.
7. Change incentives so that students are encouraged to move ahead as quickly as they are able. Match QBE funding to support online classes that allow a student to move ahead at their own pace – not based on seat time.
8. The use of technology is important in education because the technology should build on the goals of the educational project under consideration. The technological aspects of education need to include rubrics and metrics about successful completion of goals.

DRAFT TARGET 7- Increase the number of STEM graduates from post-secondary institutions in Georgia (USG, TCSG and private).

RECOMMENDATIONS

1. Encourage university and colleges in Georgia to allow freshman and sophomore involvement to participate in research projects under the supervision of research faculty.
2. Create smaller classes in core science and mathematics freshman courses and/or additional support to students (i.e. student mentors, expanded small group lab time) to improve retention of students in STEM fields.
3. Provide additional funding to the USG STEM Initiative in order to increase the number of participating institutions. The USG STEM initiative seeks to increase the:
 - a. number of K-12 students who prepare for and are interested in majoring in a STEM field
 - b. success rates and number of students in college who pursue STEM disciplines
 - c. number of teachers who are prepared in science and mathematics which will lead to an increase in the number of K-12 students prepared to enter a STEM field.
4. Encourage programs that focus on minorities and females in STEM fields to broaden the STEM pipeline.

Other- Education

1. Enhance public-private partnerships for education, identifying ways to incentivize technology companies to replicate the Gwinnett-Cisco model.
2. Update and clarify the prohibition against using mobile devices in schools to allow digital learning and new devices which aide education.
3. Require school systems to include classes on computers/technology in the curriculum.
4. Better align curriculum and courses with employment needs of the technology industry.
5. Protect and expand the GRA Eminent Scholars program.
6. Promote personalized digital learning.
7. Georgia should ensure that teachers have professional development or training to better utilize technology and before teaching an online or blended learning course.
8. Funding should follow the student to the school or course of their choice.
9. Georgia's digital learning funding model should pay providers in installments that incentivize completion and achievement.
10. Georgia should allow for rolling enrollment in online classes year round.
11. Georgia should not restrict access to high quality digital content, online courses and virtual schools with policies such as class size ratios and caps on enrollment or budget.
12. Georgia should ensure that teachers have professional development or training to better utilize technology and before teaching an online or blended learning course.
13. Funding should follow the student to the school or course of their choice.
14. Georgia's digital learning funding model should pay providers in installments that incentivize completion and achievement.
15. Georgia should allow for rolling enrollment in online classes year round.
16. Georgia should not restrict access to high quality digital content, online courses and virtual schools with policies such as class size ratios and caps on enrollment or budget.
17. Vocational/Technical training schools need to teach theory and application. In the utility industry, it has been our experience and opinion that the most successful hires come from backgrounds where they were trained a requisite task on the job or in the military. Technical applicants from vo-tech schools usually have hands on experience with a specific device or brand of equipment, yet they do not fully grasp the underlying conceptual theory. In many instances, the "craft" must be trained on the job taking months to evaluate the performance of a new hire.

18. Commission support College and Career Academies, and other high school programs that provide curriculums that meet industry workforce needs and provide dual enrollment (post-secondary education credits) to their high school students.
19. the most important way to do so is to restore full formula funding. As indicated, although distance education has the potential to significantly growth the S&T workforce in Georgia, high quality distance education is not cheap, and a restoration of formula funding would allow the USG institutions to (a) acquire the technology that our students demand and deserve, and (b) attract and retain the faculty required to deliver high quality distance courses.
20. the State is considering changing the formula used for formula funding so that it is no longer based solely on student numbers but also considers graduation. This is right: Universities do not exist to have students; they exist to have graduates. However, I would urge us not to rely exclusively on the traditional definition of graduation rate as the percentage of full-time first-time freshmen who graduate from the same institution within four or six years. While this may be appropriate for universities that cater primarily to traditional students, it is inappropriate for institutions such as SPSU that cater more heavily to non-traditional students. Indeed, our TCSG articulation programs, which I would argue are good for the State, are designed to produce graduates who would not show up in the traditional graduation rate. I would therefore urge the consideration of more creative ways of measuring graduation.
21. Third, the State should consider making more needs-based financial aid available. For many at SPSU, one of the highlights in the last budget cycle was the inclusion of some needs-based aid. Even relatively small amounts of aid often make the difference between the student being successful and the student failing. As one recipient at a recent SPSU scholarship banquet put it, "It is not just the money that is important; it is the fact that you know you do not have to worry about your rent and your other bills so that you can concentrate on your studies." Again, I applaud the legislature for making a first move in this direction last year, and I would urge it to do more.

Energy

1. Provide consistent state tax credits and incentives for solar projects. Expand and improve the current state tax incentive program to \$ 25 million per year for the next five years.
2. Improve the net metering law in GA to remove the 10 and 100 kW project size caps from solar project developments and allow for true net metering of solar energy in the statutes at the GA State Legislature.
3. Remove the cloud of uncertainty of 3rd party ownership of renewable energy systems to allow for Power Purchase Agreements (PPA)s in GA.

Entertainment

1. Reexamine and adjust the film/TV entertainment tax credit to be more inclusive of interactive entertainment and other types of software development.

Geographic Information Systems

1. Leverage GIS technologies and data visualization to help make more informed public policy decisions

Health IT/Telehealth

1. Expand the number of CPT codes for which payers are mandated to pay.
2. Expand the state usage of the Ga. Partnership telehealth network for corrections, schools, public health depts., etc.
3. Identify one-time funding to purchase equipment to expand the number of telehealth sites.
4. Invest in Healthcare strategies and solutions
5. Invest in information gathering, maintaining, and utilizing healthcare data
6. Encourage collaboration between the government and business to invest in tomorrow's solutions

Information Technology

1. Consider specific tax incentives/reductions for IT services providers in State of Georgia – Sales tax relief on datacenter build/expansions; tax credits for technology jobs creation; temporary storage tax relief; property tax relief for datacenter property.
2. Pass legislation that provides incentives for companies to keep IT jobs in Georgia in lieu of outsourcing to lower cost nations. Incentives can be based upon lowering dependence on outsourcing and increasing headcount locally. Keeping jobs in the State, but providing incentives for companies to lower costs makes sense.

International/Global

1. World markets are rapidly expanding and, if Georgia chooses not to act, Brazil and China will eventually fill the need.
2. Encourage federal visa reform to allow for innovation and world-class talent to start businesses in Georgia.

Logistics

1. Develop focused funding programs for the development of science and technology focused on increasing exports using the Atlanta – Savannah corridor.

Procurement

1. Observe a level playing field for all technology companies, small, medium, large. In procurement activities, consider the burdens placed on the vendors in order to mitigate all risk for the state. Especially if consideration is made for Georgia-based companies, then a shared risk model should not be untenable.
2. Place a premium on cost savings. Most technology vendors have skills, capabilities, and services that obviate duplication on the state level. Further, flexibility in solutions that accomplish the goals of procurement can frequently achieve tremendous savings. Thinking out of the box and avoiding the “buying what we know” syndrome can further add to potential savings. Successful companies are generally successful because they are good at what they do – harness those resources.
3. GTA should be a resource, not a reseller; one-size does not fit all. GTA would excel as a consultative resource in procurements, both pre-RFP and during the decision process. They are also necessary to provide a consistent baseline during purchasing and contract negotiations. GTA should also serve as a resource for state organizations that are smaller and/or have limited technology expertise in order to assist them in accomplishing their missions without the additional cost of staff that might not be fully utilized or might be utilized only on a project basis
4. Statewide purchasing guidelines should allow for local community providers. Local service providers by default contract language are often not eligible for statewide telecom contracts. In many cases, the cost to deliver service to local offices of state agencies is significantly cheaper than a statewide provider but local providers are unable to participate - even with local state employees asking for local service.
5. State agencies need to look to regional or local providers for communication services instead of just relying on exclusive Statewide contracts.

Regulation

1. Encourage and facilitate uniform regulation across the state. This helps us determine the cost of doing business as we move into new areas. Drawn out processes for these type agreements not only impact our cost of doing business, but our ability to timely expand our network and offer services to customers. Examples: franchise agreements by local/county municipalities, pole attachment agreements
2. Regulatory environment – level playing field. Municipals must have the same operating requirements/obligations as the private sector, but private industry has no incentive to build in the small market where muni’s do. However, the Georgia Open Records Act requires a level of transparency in municipal operations that allows the private sector access to competitive information by request.

R&D to Commercialization

1. Facilitate formation of entrepreneurial support and advisory programs
2. Alignment and balance of state-wide efforts:
3. Support GDEcD and GRA initiatives related to economic development
4. Support for the B Budget
5. Reduce costs incurred by duplicate audits

Rural Development

1. Reinstate ICAPP program geographically to help grow technology skills outside Atlanta. Today we are required to relocate approximately half of our technology hires to our Columbus market. This additional expense could be avoided. In addition, retention of relocated employees versus local applicants is much more difficult.

2. Subsidize intern programs. In today's economic environment companies can't afford to hire interns. Provide a stipend in second tier markets to expose students to opportunities outside Atlanta. These potential hires can get a double benefit (real time work experience and exposure to companies like TSYS, Aflac, etc.)
3. Establish a business/educational partnership with universities and technical schools to help develop computer sciences, network engineering curriculums that will improve work readiness of graduates. Provide individual state tax credits to individuals who accept technology jobs in specific counties outside of Atlanta.
4. Fully fund the Georgia Automated Environmental Monitoring Network – a resource for commercial and small farmers and gardeners.
5. Develop centers of excellence in rural areas with low cost of living, but have excellent high schools and two-year colleges. Pass legislation that requires State IT projects to utilize these centers for the types of work that they are capable of providing. Work would include database administration, reporting and business intelligence, application maintenance, and ETL.
6. State funding to encourage technological growth in rural areas should be used to supplement success-based capital investment rather than funding networks that overlap areas already served by private enterprises. The goal should be to expand technology in rural areas that don't have access to the latest technology.
7. Georgia should support initiatives like NPT2 to create the technologically advanced workforce to expand and enhance rural employment opportunities.
8. Develop centers of excellence in rural areas and require state IT projects to utilize these centers (ie: database administration, business intelligence, application maintenance, ETL, etc.)

Telecommunications:

1. Develop a broadband access goal for all Georgians, inclusive of education and health care, and work with industry and government leaders to identify barriers and incentives to achieve the goal.
 - a. Ensure Georgia's regulatory framework encourages broadband competition.
 - b. Consider reinstating the One Georgia BRIDGE grants for rural broadband infrastructure.
2. Study the benefits and detriments associated with the Universal Access Fund. Should it be eliminated, reduced, redirected?
3. Develop the state capacity to lead and advocate for broadband strategic development.
4. Target government-funded network investments in areas of need, not to overlap with private enterprises. (Kortum)
5. Explore public-private partnerships for network connectivity projects where warranted.
6. Enact a flat tax for Georgia telecommunications, eliminating different tax rates for cable, internet and wire-line.
7. Encourage and facilitate uniform telecomm regulation across the state. (Ex: local franchise agreements, pole attachment agreements, etc.) (Kortum)
8. Create uniform rules for fiber operators to be allowed into a building – common point demarcation and equal access to tenants. (Patton)
9. Create uniform rules for review and approval of fiber construction in the public ROW.
10. Provide a tax incentive package to businesses to bring fiber-based services into their facilities.
11. Enact the Communications Flat Tax (Including the Elimination of Double Tax on Investment)
12. Enact Government Owned Networks Legislation
13. Strengthen Existing Metals Theft Statutes. The telecommunications industry is still plagued by theft of copper and other precious metals that are utilized at cellsites and related technical facilities. Some surrounding states have begun strengthening those initial statutes passed a few years ago to make it harder to illegally sell these metals.
14. Eliminate Any Remaining Barriers to Moving to "All-IP" Networks in Future
15. Clarify Digital Technology in Education. Georgia Law that allowed local school boards to determine whether or not mobile phones could be used at school mistakenly prohibited the use of wireless devices during curriculum instruction hours. This code section should be updated to reflect digital learning and new devices that aide student learning.
16. Allow telecommunications providers to pass through the Georgia Universal Access Fund (UAF) cost to their end users. The Georgia UAF is designed to subsidize the cost of providing telephone service to high-cost customers, and the vast majority of states (and the federal government) allow telecom companies to pass this cost through to their customers and thereby preserve capital for innovation and investment. Georgia should do the same.
17. Eliminate the Georgia UAF entirely. It is no longer appropriate to maintain the Georgia UAF at all. As mentioned above, this fund is designed to subsidized old-style telephone networks, and it is no longer necessary or appropriate for Georgia to be doing this. Virtually all the costs of the narrow-band telephone network were fully depreciated years ago, and Georgia should examine the cost to keep the existing, paid-for network in a "steady state" with no deterioration but no new construction.

18. Stop tinkering with the authority of the Georgia Public Service Commission. Businesses and investors value certainty and predictability.
19. Re-capitalize the OneGeorgia Authority BRIDGE Grant program

Traditional Industries

1. Include the traditional industries in the S&T plan, including manufacturing, forestry, agriculture, mining, logistics.
2. Georgia must create an attractive climate for venture capital, and become more competitive with other states; Georgia offers world-class technology and abundant raw material supply, and should be able to compete with other states for these major job-creation opportunities in rural areas
3. Georgia's investment priorities should reflect the value of the forest industry, and other established manufacturing industries, and their critical role in maintaining a healthy economy in Georgia. The manufacturing base must be maintained and nurtured to protect and expand rural employment
4. Georgia should prepare and execute a technology research roadmap to revitalize its rural employment engine and position itself for growth in advanced forest-based chemical, packaging and biofuel materials.
5. Policies should encourage highest and best use of raw materials and consider potential impacts on availability, sustainability and price of raw materials when establishing policies.
6. A level playing field on the price of fiber is essential for the existing pulp, paper, and forest products industry. Government should not select winners and losers on the price of fiber. No incentives should advantage one user of fiber over another.
7. Georgia is blessed with vast, but not unlimited timber resources. These resources must be properly managed to insure that both existing and new fiber dependent industries have adequate raw material supply for the future.
8. The state should fund a state of the art timber inventory study to obtain accurate and up to date information on the state's standing timber resources. We must know the sustainability of the timber inventory as decision are made concerning the expansion of the use of the resource.
9. The state should insure a stable and affordable timberland ad valorem tax structure to foster the sustainability, retention, and expansion of our timber resources.
10. Georgia's strategic advantages of abundant, high quality kaolin deposits, an existing infrastructure, and a capable rural workforce position it to become the world center for light-weight mineral nanocomposites
11. Georgia must seize the initiative by supporting research in the fundamentals needed to expand understanding of these materials. Its research priorities should reflect the strategic promise of new applications from traditional materials. Otherwise, the existing economic strength of many rural communities will fall into decline.

Workforce/Talent Development

1. Encourage educators and business partners to continue to work together in creating career pathways and the development of soft skills.
2. Restore/fund/strengthen ICAPP (Intellectual Capital Partnership Program) or a similar program to provide training incentives and training opportunities to meet the needs of growing companies.
3. Create/promote a statewide intern program for university students to work with high tech firms.
4. Create/promote a mentoring program to partner high tech startups with established Georgia companies.
5. Research and consider how to incentivize local talent to stay in Georgia. Focus on recent graduates?
6. Provide incentives for local talent from universities like Georgia Tech to continue staying in Georgia
7. Encourage the development of a workforce pipeline by supporting work based learning opportunities that provide both high school and post-secondary credit. This means support from the industry to provide the programs and support from the high school to place students and provide for the education credits.

From Subcommittee

8. To provide a tax credit to encourage the development of a skilled advanced manufacturing and energy workforce through apprenticeship training. This credit is in response to the current and projected shortage of skilled labor in the manufacturing industry.
9. Continue Work Ready Program, including Talent Assessment (soft skills/work habits)

General/Miscellaneous

1. Promote the retention of business leaders by providing tax credits on capital gains over a certain threshold.
2. Focus on quality of life issues - transportation especially. Traffic issues need to be addressed.
3. Explore regionally-targeted tax incentives that play to the strengths of a region instead of blanket statewide incentives.
4. Develop and encourage telework.
5. Seek ways to enhance the participation of smaller Georgia-based businesses in state procurement.
6. Do more to promote Georgia as a technology state
7. Develop a consistent marketing message about Georgia's science and technology strengths: academic facilities, infrastructure, business climate, cost of living, workforce, utilities, etc.
8. Require Regional Commissions to incorporate technology planning into their regional master plans.
9. Add technology planning to existing regional planning process
10. Metro-Atlanta transportation – improve infrastructure and reduce gridlock. Average Atlanta commuting times exceed one hour, resulting in one of the highest commuting times in the country for major markets. Expansion of MARTA into the Northern part of the city (i.e. Gwinnett and N Fulton counties) to alleviate commute times into downtown.
11. Collaboration of academia and industry to improve competitiveness should be leveraged and incentivized. Collaboration could exist through regional/state councils consisting of representatives from industry and academia.

Appendix F: Results from 12/15/11 Public Meeting

The below recommendations were prioritized by the attendees at the final Commission hearing (12/15/11) via four breakout sessions. Items in italics were reported out of more than one group.

	Breakout Group 1	Breakout Group 2	Breakout Group 3	Breakout Group 4
Access to Capital				
	Focus on the entire ecosystem of investing from research to commercialization to late stage	Extend the Georgia Angel Investor Tax Credit for capital investments by high tech companies.	<i>Pension reform to allow investment in alternative assets including venture capital.</i>	<i>Pension reform to allow investment in alternative assets including venture capital.</i>
	Use a mixed approach between direct investment by the state and matching of SBIR grants	Pass a "Technology Development Act" to further expand the state's technology sector by earmarking a portion of the state's investments.		
STEM Education				
	Pre K-20	Align the collaboration between the Georgia Department of Education (GaDOE), the University System of Georgia (USG), and the Technical College System of Georgia (TCSG) in order to develop and maintain a seamless <i>K-20 articulation of STEM coursework with the creation of a Georgia STEM Learning Community</i> that meets regularly to move Georgia's STEM agenda forward. The STEM Learning Community should provide a network for STEM teachers to learn innovative best practices with an increase in the	<i>K-20 articulation of STEM and STEM Learning Community</i>	See below in Workforce development

		number of Innovation Fund grants to promote dialog between business, industry, higher education and the public schools.		
	More engagement between students, companies, Hope Recipients	Market the importance of STEM on personal and state economic development. Establish dialogue and research on STEM education and community and international economic development.		
	Virtual learning			
Workforce/ Talent Development				
	<i>Restore/fund/strengthen ICAPP (Intellectual Capital Partnership Program) or a similar program to provide training incentives and training opportunities to meet the needs of growing companies.</i>	<i>Restore/fund/strengthen ICAPP (Intellectual Capital Partnership Program) or a similar program to provide training incentives and training opportunities to meet the needs of growing companies.</i>	<i>Support College and Career Academies, and other high school programs that provide curriculums that meet industry workforce needs and provide dual enrollment (post-secondary education credits) to their high school students.</i>	<i>Support College and Career Academies, and other high school programs that provide curriculums that meet industry workforce needs and provide dual enrollment (post-secondary education credits) to their high school students. Include industry to help develop curriculum.</i>
		<i>Create/promote a statewide intern program for university students to work with high tech firms.</i>		<i>Create/promote a statewide intern program for university students to work with high tech S&T or STEM firms.</i>
		Encourage the development of a workforce pipeline by supporting work based learning opportunities that provide both high		

		school and post-secondary credit.		
Business and Industry				
	Hands on working with technology, partnering those with centers of technology.	Exempt the sales tax on energy used in data centers that will encourage and support the sustainment of existing businesses and attract new businesses to the state of Georgia.	<i>Develop a strategic plan, establish innovation advisory council, leverage GIS technologies, include traditional industries in S&T plan.</i>	<i>Draft a 10-20 year strategic plan, with an advisory council to oversee the development and implementation of the plan, using technologies like GIS and data viz to help measure/document progress.</i>
	Access to infrastructure.			

Appendix G: Subcommittees and Acknowledgments

Georgia's Science and Technology Strategic Initiative Joint Study Commission would like to acknowledge the following organizations for their roles in supporting the execution of the Commission hearings and other activities.

STEM Education Subcommittee – Members

Dr. Gilda Lyon, Chairwoman

- Kenneth (Kenny) Adkins, Industrial Technologies Curriculum Specialist, Technical College System of Georgia
- Dr. Juan Carlos Aguilar, Science Program Manager, Georgia Department of Education
- Sheila Jones, Executive Director of Innovation and Policy, Office of Educator Preparation, Innovation and Research, University System of Georgia
- Dr. Adrian Epps, Associate Dean of the College of Science and Mathematics, Kennesaw State University Director, The A.T.O.M.S. Center, Assistant Professor, Educational Leadership
- Sam Lim, Vice President & General Manager Cisco Systems, Inc.
- Dr. Richard Millman, Director of the Center for Excellence in Science, Math, and Computing, Georgia Institute of Technology
- Jessica Pater, Associate Director of the Foundations for the Future at Georgia Tech Research Institute.
- Susan Reinhardt, Program Manager, K-12 Outreach, University of Georgia
- Tim Roberts, Parent
- Michael Robertson, Technology Association of Georgia
- Robert Shults, Public Sector Program Manager Government & Education, Intel
- Dr. Tiffany Stark, Director, Center for Advanced Studies in Science, Math, and Technology at Wheeler High School, Marietta, GA
- Steven Walker, CEO of Tech High School, Atlanta, GA
- Dr. Brent Williams, Director, iTeach Center, Kennesaw State University

Capital Subcommittee – Members

Senator John Albers, Chairman

- Marc Herdegen, Vice President for Acquisitions, I-Group
- Knox Massey, Managing Partner, Keith-Massey Family Investments
- Sig Mosley, President, Imlay Investments
- Michael Price, General Partner, CEO Ventures
- Alan Taetle, General Partner, Noro-Mosley

Workforce Development - Members

Rep. Charlice Byrd, Chairwoman

- Ann Sechrist, Director of Economic Development, Gwinnett Technical College
- Dr. Dominique Halaby, Director of the Bureau of Business Research and Economic Development, Georgia Southern University
- Robert Hendricks, CTO, McKesson
- David Murray, Cisco Systems, Inc

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- Center of Innovation for Aerospace
- Clayton State University
- Georgia Chamber of Commerce
- Georgia General Assembly, House Research Office
- Georgia General Assembly, Senate Research Office
- Georgia Health Sciences University
- Georgia Ports Authority
- Georgia Technology Authority
- Georgia Tech Office of Government and Community Relations
- Georgia Tech Research Institute, Office of Policy Analysis and Research
- Georgia Tech School of Public Policy
- Gulfstream
- Gwinnett Technical College
- Herty Advanced Materials Development Center
- Imerys
- Lee Hughes Public Affairs
- Metro Atlanta Chamber of Commerce
- Mercer University
- Office of the Lieutenant Governor
- Savannah Economic Development Authority
- Technology Association of Georgia
- Tellus Science Museum
- TSYS