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Market Street brings original insights and clarity to the evaluation and revitalization of the places where people live, work, and grow. Through honest and informed assessments, *Market Street* can equip you with the tools to create meaningful change. Our solutions successfully merge our experience and expertise with the economic and social realities of our clients. *Market Street's* community clients are successful at creating stronger programs, increasing operational budgets, and creating new jobs with competitive wages that improve the quality of life in their communities.

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OVERVIEW

The *Target Cluster Analysis* is the final step in the research phase of the **Strategic Initiative for Economic Growth** process spearheaded by the Missouri Department of Economic Development (DED). The State has retained *Market Street Services*, a national economic, community, and workforce development consulting firm based in Atlanta, Georgia, to facilitate the creation of a new strategy that will enhance the economic development activities and programs in Missouri. This process is overseen by a diverse **Steering Committee** of public and private sector leadership drawn from around the State. The components of this process are:

- **Demographic and Economic Analysis:** This research delivered at the first round of Regional Forums (September 22-24) presented a breadth of data to demonstrate the State of Missouri's position to accommodate visionary growth and development. A combination of factors that determine a State's strengths as a place to live, work, and do business were assessed, including indicators related to education and workforce development, infrastructure and land use, business costs, and quality of life. Key findings were presented to the Steering Committee on October 20 and will be provided in an appendix to the *Strategy*. For this presentation and throughout this process, *Market Street* leveraged data provided by the Missouri Economic Research and Information Center (MERIC).
- **Round One of Regional Forums:** This component of the process provided a critically important opportunity to get feedback from department staff, business leaders, education and training officials, regional organization representatives, and other local stakeholders on the challenges and opportunities facing the State of Missouri and its six regions. Through presentations and interactive surveying technologies, *Market Street* gathered input related to the State of Missouri's competitive prospects and strategic opportunities in a series of six Regional Forums held around the State on September 22-24. In addition, the DED solicited **White Papers** from stakeholders around the State on topics germane to visionary economic development. To date, 43 have been submitted. Findings from the Regional Forums as well as these White Papers can be accessed on the Strategic Initiative for Economic Growth website (<http://ded.mo.gov/Strategic.aspx>).
- **Marketing Analysis:** An analysis of the Missouri Partnership's economic development marketing efforts complements the *Target Cluster Analysis'* research and conclusions by confirming the viability of existing programs and identifying potential enhancements to future efforts. To that end, *Market Street* reviewed the Partnership's website (appearance, content, effectiveness, and utility), advertising and collateral materials,

inbound/outbound marketing events, public relations, trade shows, site selection professional visits, and branding and identity-building efforts. Key findings were presented to the Steering Committee on October 20, 2010, and will be provided in an appendix to the *Strategy*.

- **Target Cluster Analysis:** This report was delivered to the DED on January 14, 2011 and reflects target clusters and niches approved by the Steering Committee on November 30, 2010. Building on the extensive input gathered to date and quantitative data provided by MERIC, the *Target Cluster Analysis* is a blend of quantitative and qualitative research with significant technical information including location quotients, economic base analysis, and industry-by-occupation employment data. This deliverable provides a list of clearly defined target sectors and the opportunities and challenges involved in effectively growing them. Targets identified for the State of Missouri to pursue will lead to specific growth recommendations in the *Legislative Initiatives* and the *Strategic Economic Development Plan*.
- **Legislative Initiatives:** After gaining the perspectives of the Steering Committee, recommended *Legislative Initiatives* to support economic development statewide were drafted and submitted on December 1, 2010 to Governor Jeremiah W. (Jay) Nixon for consideration. The initiatives will eventually be presented as bills for approval in the Missouri Legislature's 2011 session.
- **Round Two of Regional Forums:** Similar in format to Round One, this second round of Regional Forums will seek input on tactical plans to be included for consideration under the *Strategic Economic Development Plan's* eight approved principal strategies. These are scheduled to be held in the same six regions around the State on January 10-14, 2010.
- **Strategic Economic Development Plan:** The *Strategic Plan* will represent the culmination of all research completed and will present action items geared toward addressing challenges and capitalizing on opportunities for visionary growth. The *Strategy* will serve as a tool to unify the State of Missouri's public and private leadership behind a consensus blueprint for Missouri's economic future. The final *Plan* will be delivered at the end of March and will include best practices as well as benchmarks and performance measures.

STEERING COMMITTEE: STRATEGIC INITIATIVE FOR ECONOMIC GROWTH, 2010-2011

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INTRODUCTION

The *Target Cluster Analysis* identifies priority areas for statewide economic development efforts managed by the Missouri Department of Economic Development, the Missouri Partnership and state and local partner entities. This is a “living document” that should be amended and updated over time to best position the State of Missouri to maximize new economic opportunities or respond to changing market dynamics.

The economic development strategy of targeting certain “clusters” of economic activity has become increasingly widespread over the years as regional economies attempt to capitalize on their strengths and competitive advantages. Such target groupings create external economies of scale for these businesses as they share common labor pools, infrastructure, and other resources while reducing costs through proximity to upstream (suppliers) and downstream (buyers) linkages. These advantages, coupled with the network effects that exist within broader sectors, often result in comparatively high potential for employment growth and wealth creation.

In the field of economic development, there are many methods used to identify target clusters. *Market Street’s* analysis is *holistic* and will present target recommendations and explain competitive advantages and concerns in the areas of **People** (occupational dynamics), **Prosperity** (business sector dynamics), and **Place** (Missouri’s competitive dynamics in terms of infrastructure, regulatory and tax environment, research assets, etc.) for each target cluster.

Recommended targets were selected based on comprehensive quantitative and qualitative research (as further explained in the Methodology section of this report) including job and wealth generation potential (wages and GDP), relevant support services, educational opportunities, research activity, recent developments, infrastructure, success with current targets, regional target activities, and stakeholder input. In addition to the Regional Forums that generated widespread input, the State received over **40 topic-specific white papers** from public and private sector leaders throughout the State, which were carefully reviewed and considered in developing target recommendations.

Existing Targets (2007)

Targets currently being pursued by DED and the Missouri Partnership are:

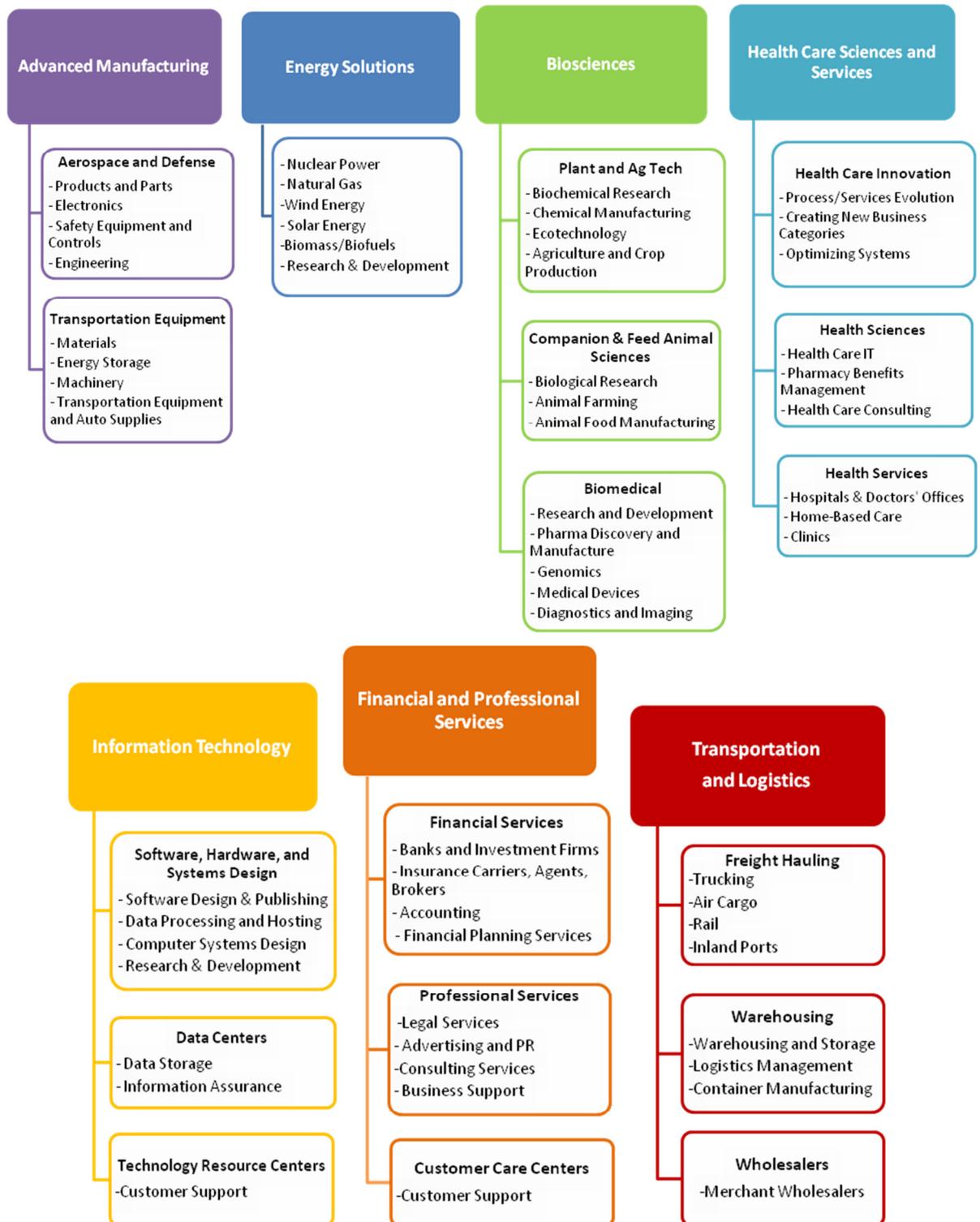
- Agribusiness
- Automotive
- Defense/Homeland Security
- Energy
- Finance
- Information Technology
- Life Sciences
- Transportation/Logistics

Feedback received in the first round of regional meetings suggests that stakeholders feel there are too many targets which are too broad or vague. In the State's existing target definitions, there are an excessive number of subsectors, many of which do not have a clear relationship to their applied targets or were misapplied. Targeting at the state level must be pursued in a way that supports multiple, varied regional economies but is still focused enough so that effective marketing and programs can be delivered.

Recommended Targets (2011)

Market Street recommends several revisions to the 2007 targets. These recommendations do not reflect a complete overhaul of current economic development targeting efforts, as the DED has had strong success in many of these areas. Rather than a “revolution” in replacing all the existing targets, they are an “evolution” of the more specific targets. Presented in no priority order, the State's proposed target sectors are:

- **Target Cluster: Advanced Manufacturing**
 - Niche: Transportation Equipment
 - Niche: Aerospace and Defense
- **Target Cluster: Energy Solutions**
- **Target Cluster: Biosciences**
 - Niche: Plant and Agricultural Technology
 - Niche: Companion and Feed Animal Sciences
 - Niche: Biomedical
- **Target Cluster: Health Sciences and Services**
 - Niche: Health Care Innovation
 - Niche: Health Sciences
 - Niche: Health Services
- **Target Cluster: Information Technology**
 - Niche: Software, Hardware, and Systems Design
 - Niche: Data Centers
 - Niche: Technology Resource Centers
- **Target Cluster: Financial and Professional Services**
 - Niche: Financial Services
 - Niche: Professional Services
 - Niche: Customer Care Centers
- **Target Cluster: Transportation and Logistics**
 - Niche: Freight Haulers
 - Niche: Warehousing
 - Niche: Wholesalers



These revised targets reflect a broad base of economic activity, with specific “niches” at their core. When appropriate, the more broadly-defined targets capture a range of subsectors that may indirectly benefit from strategies focused on the “niches” within each target. “Niches” reflect high-value opportunities for State economic growth based on Missouri’s competitive strengths. Effective development of these subsector niches leads to possibilities for growth of larger target groupings of affiliated companies and employment.

The report will also provide a brief overview of **cross-target “catalysts”** or business sectors that if recruited, expanded, or developed could provide entryways into multiple target areas. For example, a bioinformatics firm could provide valuable recruitment leads for both the Biosciences and Information Technology targets. Similarly, a worker trained in bioinformatics has the skills to find employment within firms central to both target clusters.

Effectively capitalizing on the State’s target opportunities will require state, regional, and local economic development organizations and departments, governments and training institutions to partner in dynamic ways to ensure that sectors are pursued through multi-faceted and holistic programs. This entails a focus on multiple strategies including existing business retention and expansion, small business development, and recruitment/attraction.

It should also be noted that target development does not necessitate the exclusion of growth opportunities in non-targeted sectors. These opportunities will be pursued as they arise but proactive economic development investments will focus on those clusters and niches with the greatest potential for growth and wealth-creation.

METHODOLOGY

This review of the State of Missouri's target business clusters employs both quantitative and qualitative research. Perspectives on certain sector's challenges and strengths have been gained through the first round of regional stakeholder meetings and by vetting recommended sectors with key Missouri Department of Economic Development staff. Additionally, input was gathered from over 40 leaders in the public and private sectors through the submission of **topic-specific white papers**, which were carefully reviewed and considered in developing target recommendations. This input complements the quantitative research and provides much needed perspective on each target's potential for future growth.

Decision Making Process

No one doubts that the recession that began late in 2007 has profoundly changed the national and State economy going forward. Even basic assumptions about sector job growth are challenged both nationally and globally. While the process for making target cluster recommendations typically centers on job growth performance and potential, the Great Recession had made it infeasible to make informed decisions strictly based on these considerations.

Projections prepared by the MERIC and the Bureau of Labor Statistics (BLS) for the 2008-2018 period are now relatively obsolete, given that the full impacts of the Great Recession have not yet been realized. MERIC's more recent, 2009-2011 short-term occupational projections across all industries indicate that among the 687 occupational sectors for which data are available only six percent (or 44 sectors) are projected to grow by at least 2.5 percent. Sixty-one percent of occupational sectors (427) are projected to exhibit no growth or negative growth in Missouri during this period.

Given this, alongside job losses incurred in recent years, target selections must be made according to considerations beyond recent employment growth dynamics.

Market Street began this process of making target recommendations with a look at the performance of the State's existing targets to assess the continued viability of these targets, which are: *Agribusiness, Automotive, Defense/Homeland Security, Energy, Finance, Information Technology, Life Sciences, and Transportation/Logistics*. We also examined data trends and wages in every four-digit NAICS code in addition to MERIC occupational data to identify trends not captured by the existing target sectors. Existing regional target strategies were also taken into account to ensure maximal continuity between state-level and regional efforts.

Above all, *Market Street's* recommendations are derived from a holistic view of the sectors and networks within each target. Wealth generation potential (wages and GDP), relevant support services, educational opportunities, research activity, recent developments, infrastructure, success with current targets, regional target activities, and stakeholder input are just a few of the considerations that complement the quantitative analysis and are taken into account when developing recommendations.

As *Market Street* refined internal recommendations, feedback from the regional stakeholder meetings also informed our process. Stakeholders indicated that the State would benefit from fewer targets and better focus and clarity within each target. *Market Street* has recommended paring down the number of targets from eight to seven and has introduced the concepts of niche areas and cross-target catalysts to better clarify target cluster opportunities, as discussed in October's Steering Committee meeting.

Quantitative Data

The quantitative portion of this review primarily utilizes data requested from MERIC that originated from the following federal (and state supported) sources: Quarterly Census of Employment and Wages (QCEW) from the Bureau of Labor Statistics (BLS); and Quarterly Workforce Indicators (QWI) from the Census Bureau.

QCEW and QWI provide information on local employment and wage levels for all sectors as defined as the North American Industrial Classification Systems (NAICS). The recommended targets for the State are clusters of related and supporting sectors grouped by NAICS codes. Sectors are defined broadly as 2-digit super-sectors, followed by increasingly specific detail down to the 6-digit level for the QCEW survey and down to the 4-digit level for the QWI survey.

The *Target Cluster Analysis* will utilize four-digit NAICS data for employment and wage trends. We realize that MERIC typically utilizes 6-digit level data. We have opted to utilize 4-digit level data for several reasons including:

- The report will, by and large, leverage QCEW data. In some instances, the Bureau of Labor Statistics will suppress subsector data to protect the identity of individual firms. The BLS suppresses employment and wage values for any industry sector where the number of establishments is less than or equal to three, or when a single employer represents more than 80 percent of total sector employment. While this occurrence is less common when running an analysis on the state-level as opposed to the community-level, suppression issues can still arise.

- In these instances, QWI data from the Census Bureau will be used to “fill in the blanks” where data has been suppressed through QCEW. QWI data is only available down to the 4-digit NAICS level.
- Additionally, *Market Street* has leveraged 2009-2011 employment projections developed by MERIC, which are also only available down to the 4-digit NAICS level.

Establishments that participate in the QCEW self-report the data collected by the BLS. As a result, some participants may classify their establishment as belonging to an industry that may not perfectly reflect the companies’ employment dynamics. This can lead to misrepresentations of the employment base in a given industry, especially if the reporting establishment is a relatively large employer in the region. Recognizing these limitations of publicly-available data, every effort will be made to provide the most comprehensive snapshot of employment and wages in the recommended targets.

Furthermore, some NAICS codes can be applied to multiple target areas and, of course, some economic activity related to target cluster development is not contained within employment and wage data. For these reasons, NAICS should not, in and of themselves, define the target.

Location Quotients

Location quotients are used to measure the relative concentration of local employment in a given business sector. When applied to sector employment, they measure the ratio of a sector’s share of total state employment to that sector’s share of total national employment.

$$LQ = \frac{(\text{State Employment in Sector} / \text{Total State Employment})}{(\text{National Employment in Sector} / \text{Total National Employment})}$$

A sector with an LQ equal to 1.0 possesses exactly the same share of total state employment as that sector’s share of national employment. When a state sector possesses a location quotient greater than 1.0, this signals that the sector is more concentrated in the state than it is nationwide. Conversely, a location quotient less than 1.0 indicates that the sector is less concentrated in the state than it is nationwide. The higher the location quotient, the more concentrated the level of state employment as compared to its national equivalent. For example, a location quotient of 1.25 would indicate that a sector’s share of total state employment is 25 percent higher than the same sector’s share of national employment.



TARGET CLUSTER: ADVANCED MANUFACTURING

Justification	Thousands of existing jobs in transportation, defense, and aerospace manufacturing companies.
	Strong workforce skills in engineering, assembly, metal working, and related occupations.
	Multiplier effects in manufacturing subsectors are relatively strong, suggesting a high return on investment for every Advanced Manufacturing job created.
	Extensive network of R&D and innovation centers supported by higher education institutions and collaborations between Missouri's public and private sectors.
	Advanced Manufacturing provides good paying jobs to workers with multiple skill levels. Many manufacturing subsectors pay average annual wages which exceed that of the State (Q4 2009 - \$43,128).
Challenges	Continued contraction of manufacturing sectors nationally and within the State puts consistent pressure on firms to innovate.
	Impending wave of retirements among the Baby Boomer generation combined with a nationwide shortage of STEM (Science, Technology, Engineering, and Mathematics) graduates will create a talent crisis for many manufacturing-based sectors.
	Federal budget woes will almost certainly require cuts to Department of Defense spending.
Opportunities	Creating a coordinated strategy among Aerospace and Defense stakeholders in the State of Missouri.
	Placing a stronger strategic focus on existing business services for Missouri's Advanced Manufacturers to stem job losses in these valuable sectors.
	Promotion of next-generation manufacturing practices, intrapreneurship, and niche area strategies among Missouri's manufacturing firms.
	Aggressively supporting cross-target catalyst opportunities with Energy Solutions, Transportation and Logistics, and Information Technology.
	Mining existing employer supply chains for short and long-term recruitment leads.

TARGET OVERVIEW

The Advanced Manufacturing target is comprised of two niches: **Aerospace and Defense** and **Transportation Equipment**. The side graphic illustrates the various subsectors included in the target. The Advanced Manufacturing target is focused on strong opportunity areas. However, the Advanced Manufacturing target also supports a larger umbrella of Missouri’s existing manufacturing activities through shared workforce, infrastructure, power, and incentive considerations. Statewide, manufacturing accounted for \$32 billion or 13.5 percent of Missouri’s GDP in 2008.



Over the years, there have been varying and broad official definitions of Advanced Manufacturing. In general, manufacturing describes the mechanical, physical, or chemical transformation of materials and substances into new products. Advanced Manufacturing refers to those industries that are technology-intensive and employ a larger than average number of workers in research and development. Further, it includes those operations that incorporate new technologies, production processes, and systems to improve the manufacturing process. This latter portion of the definition captures the transition that has taken place and that continues to occur within U.S. manufacturing.

Additionally, increasing efficiency demands, reusing and recycling materials that otherwise would have gone to waste, and focusing on issues like sustainability and closed-loop production cycles have caused many manufacturers to not only offer new products but also rework internal management policies and production standards. Missouri’s existing employment base in manufacturing offers potential opportunities to leverage this capacity and State support into a presence in the growing world of green products and processes.

On December 1, 2010, the White House's deficit commission released their initial recommendations for scaling back the nation’s debt, which included cuts to defense spending. With these pressures and a timeline for withdrawal from Iraq solidified, Department of Defense spending is expected to decrease after a 60 percent climb during the Bush administration. However, as recently demonstrated by St. Louis-based Boeing Defense, Security, and Space landing a \$5.3 billion contract to build 124 fighter jets for the Navy over the next four years, opportunities remain.

In addition to these changing dynamics within the Aerospace and Defense niche, workforce continues to be a key issue in all sectors of manufacturing. According to a 2005 National Association of Manufacturers (NAM)/ Deloitte Consulting survey of American manufacturers, “Skill shortages are extremely broad and deep, cutting across industry sectors and having an impact on more than 80 percent of companies surveyed.” Furthermore, the National Science Foundation’s 2010 Science and Engineering Indicators report found that 26 percent of workers in science and engineering are older than age 50.

This, combined with a lower percentage of college students in the United States pursuing degrees in science, technology, and engineering, will result in an increasing shortage of talent for American manufacturers. Complicating matters within Aerospace and Defense, foreign nationals are not permitted to hold U.S. defense jobs.

The **Aerospace and Defense** niche includes the production, assembly, operations, maintenance, and modification of aerospace and national defense-related products and services, as well as businesses that supply this sector. This niche has strong geographic inertia due to the large facilities and expensive industrial machinery that makes transporting products or relocating difficult. Thus, competing firms and suppliers tend to co-locate. Because of this, this niche area can be effectively developed to a large degree by meeting existing employers' needs and focusing recruitment efforts on these employers' suppliers.

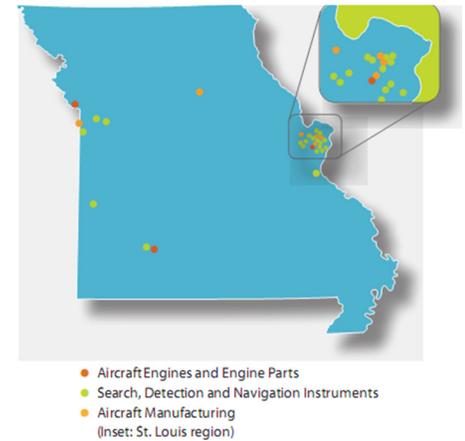
- Products and Parts: These firms are involved in the manufacture of complete aircrafts and artillery; engines, propulsion units, or parts; and product overhaul and rebuilding.
- Electronics: These firms include those engaged in the manufacture of electronic equipment and parts that are used in aircrafts, artillery, and other products including navigation instruments, circuit boards, inductors (chokes and coils), transistors, sensors, and gauges.
- Safety Equipment and Controls: These companies produce items that ensure passenger safety (e.g., fire detection, oxygen supplies) as well as sensors that monitor the overall the in-flight environment.
- Engineering: This comprises establishments engaged in engineering and design of aircraft, missiles and artillery, propulsion systems, and related technologies.

In 2008, Missouri received over \$20 billion in federal defense spending across over 2,300 employers statewide. According to a white paper submitted by the Leonard Wood Institute as part of this strategic planning process, Missouri ranks seventh in the nation for defense procurements. Among major cities, St. Louis ranks second in defense outlays. The Institute estimates that Missouri's defense industry employs over 50,000 civilians and active military personnel.

According to a 2009 impact brief prepared by MERIC, these Department of Defense contracts contributed \$379.3 million to State general revenues in 2008. "Major contributions to revenue were in sales and use, corporate and individual income taxes. Other impacts included migration to the State, spending on education, and spending on public amenities. This additional spending was offset by a \$68.3 million decrease in social

service spending, amounting to a \$41.2 million net decrease in expenditures. The net result for the Missouri State budget was an addition of \$420.5 million.” While defense spending creates jobs in all sectors, manufacturing and professional and technical services have benefited from strongest job growth statewide.

Missouri is home to an impressive list of both private employers and federal installations including Integrated Defense Systems (IDS)/Boeing Company, GKN, Honeywell, LaBarge, United Technologies, Westar, LMI, the U.S. Army’s Maneuver Support Center of Excellence at Fort Leonard Wood (FLW), Whiteman Air Force Base, the National Geospatial-Intelligence Agency (NGA) Operations Center, and the Department of Energy’s Kansas City Plant (operated by Honeywell), which provides 85 percent of components for our nation’s nuclear weapons. As shown in this map from the Missouri Partnership, the majority of the State’s Aerospace and Defense manufacturing activities are in St. Louis.



The **Transportation Equipment** niche includes the State of Missouri’s significant employment base in transportation equipment manufacturing and combines those sectors that leverage materials science to convert raw materials into functional products.

- **Materials:** Materials manufacturing is comprised of creating the raw materials needed to manufacture products, parts, and other tangible goods and may include research in materials processing, integrating design and manufacturing to ensure better utilization of raw materials. Materials range from fabricated metal to petroleum and coal products to paper and plastics to various minerals.
- **Energy Storage:** Firms in energy storage are involved in the research and development, engineering, and manufacturing of primary and storage batteries for household, commercial, and industrial use.
- **Machinery:** Machinery manufacturing requires highly skilled production workers, who are very highly paid for their skill sets. Machinery manufacturing is the development of machinery; there are seven types, many with direct applications to this niche area and all with applications to the Advanced Manufacturing target: agriculture, construction, and mining; metalworking; ventilation, heating, air-conditioning, and commercial refrigeration; industrial; commercial and service industry; engine, turbine, and power transmission equipment; and other general purpose machinery.

- Transportation Equipment and Auto Supplies: This area includes firms engaged in the manufacture and assembly of transportation parts and supplies including engines, lighting, steering and suspension components, brake systems, transmission and power train parts, heating and cooling systems, and interiors.

According to a 2009 report from the Missouri Automotive Jobs Task Force, automotive manufacturing is a \$4 billion industry in Missouri and automotive products represent 18 percent of Missouri's exports. Missouri's major employers in these areas include General Motors (Wentzille assembly plant outside of St. Louis), Ford (Claycomo assembly plant outside of Kansas City), Harley Davidson (Kansas City), Kawasaki (Maryville), Eagle-Picher (Joplin), Lear Operations (Hazelwood), and Able Manufacturing and Assembly (Joplin), among others.

Within this target cluster, there are several **cross-target catalyst** opportunities that if recruited, expanded, or developed could provide entryways into multiple target areas. Some examples of cross-target catalysts relevant to Advanced Manufacturing include, but are not limited to, the following:

- Engine and battery technologies
- Performance-based logistics
- Navigation instruments
- Ethanol, biodiesel, and bio-oil
- Defense consulting
- Inventory management software design, development, and device manufacture (tablet PC, handheld wireless scanners, etc.)
- Software and hardware design

PEOPLE: OCCUPATIONAL ANALYSIS

Of the 2.67 million workers in Missouri, 606,600, or 22.7 percent, are employed in core occupations relevant to the Advanced Manufacturing target. As shown in the following tables, over 90 percent of the evaluated occupations offer average annual wages that exceed Missouri's 2009 average annual wage of \$39,250. Of the occupations examined, 19.5 percent have both location quotients of 1.0 or greater and annual wages that exceed the State average wage. These occupations include computer programmers, computer specialists, cartographers and photogrammetrists, avionics technicians, mathematical technicians, some installation maintenance and repair occupations, and purchasing agents.

Advanced Manufacturing Occupational Target: Transportation Equipment, May 2009

SOC Code	Occupation	Employment		Annual Mean Wage	
		Missouri	LQ	Missouri	United States
	Total, all Occupations	2,668,450	1.00	\$39,250	\$43,460
<i>Transportation Equipment</i>					
510000	Production Occupations	203,500	1.12	\$32,430	\$33,290
530000	Transportation and Material Moving Occupations	183,430	1.02	\$31,460	\$32,180
490000	Installation Maintenance and Repair Occupations	109,640	1.05	\$40,230	\$42,210
472111	Electricians	11,650	0.98	\$54,980	\$50,850
414011	Sales Representatives Wholesale and Manufacturing Technical and Scientific Products	7,390	0.89	\$72,670	\$81,370
131023	Purchasing Agents Except Wholesale Retail and Farm Products	6,410	1.11	\$51,100	\$58,550
412022	Parts Salespersons	4,320	1.02	\$30,140	\$30,460
472211	Sheet Metal Workers	3,950	1.09	\$50,650	\$44,890
119041	Engineering Managers	2,390	0.79	\$106,030	\$122,810
113051	Industrial Production Managers	2,130	0.68	\$85,820	\$93,650
472221	Structural Iron and Steel Workers	1,850	1.26	\$48,790	\$48,470
173023	Electrical and Electronic Engineering Technicians	1,840	1.38	\$56,400	\$55,410
173013	Mechanical Drafters	1,150	0.86	\$48,380	\$49,790
113061	Purchasing Managers	1,060	0.75	\$94,800	\$96,910
173026	Industrial Engineering Technicians	800	1.28	\$44,470	\$49,030
173029	Engineering Technicians Except Drafters All Other	600	0.67	\$58,250	\$58,330
173012	Electrical and Electronics Drafters	580	0.97	\$51,960	\$54,800
173027	Mechanical Engineering Technicians	410	0.83	\$53,070	\$50,700
271021	Commercial and Industrial Designers	400	1.25	\$55,040	\$61,400
172111	Health and Safety Engineers Except Mining Safety	370	0.71	\$73,290	\$75,810
173024	Electro-Mechanical Technicians	100	0.29	\$54,190	\$49,880
172171	Petroleum Engineers	40	0.01	\$76,390	\$119,960
172161	Nuclear Engineers	30	0.02	*	\$100,350

Source: U.S. Bureau of Labor Statistics, via MERIC

Advanced Manufacturing Occupational Target: Aerospace and Defense, May 2009

SOC Code	Occupation	Employment		Annual Mean Wage	
		Missouri	LQ	Missouri	United States
	Total, all Occupations	2,668,450	1.00	\$39,250	\$43,460
<i>Aerospace and Defense</i>					
151031	Computer Software Engineers Applications	10,020	0.99	\$78,380	\$90,170
151051	Computer Systems Analysts	9,960	0.95	\$72,060	\$80,430
151021	Computer Programmers	8,470	1.13	\$68,490	\$74,690
151032	Computer Software Engineers Systems Software	4,840	0.62	\$77,980	\$96,620
412022	Parts Salespersons	4,320	1.02	\$30,140	\$30,460
151099	Computer Specialists All Other	4,280	1.07	\$75,840	\$78,010
172141	Mechanical Engineers	3,710	0.78	\$76,090	\$80,580
172112	Industrial Engineers	3,160	0.74	\$73,650	\$77,090
172071	Electrical Engineers	2,540	0.82	\$78,570	\$86,250
119041	Engineering Managers	2,390	0.66	\$106,030	\$122,810
113051	Industrial Production Managers	2,130	0.71	\$85,820	\$93,650
172072	Electronics Engineers Except Computer	2,090	0.75	\$82,780	\$91,540
493011	Aircraft Mechanics and Service Technicians	1,990	0.87	\$51,810	\$52,970
173023	Electrical and Electronic Engineering Technicians	1,840	0.58	\$56,400	\$55,410
173031	Surveying and Mapping Technicians	1,770	1.38	\$39,180	\$39,470
173013	Mechanical Drafters	1,150	0.78	\$48,380	\$49,790
113061	Purchasing Managers	1,060	0.80	\$94,800	\$96,910
171022	Surveyors	980	0.95	\$48,070	\$57,420
173026	Industrial Engineering Technicians	800	0.60	\$44,470	\$49,030
173012	Electrical and Electronics Drafters	580	0.93	\$51,960	\$54,800
171021	Cartographers and Photogrammetrists	450	1.88	\$54,020	\$59,340
173027	Mechanical Engineering Technicians	410	0.46	\$53,070	\$50,700
271021	Commercial and Industrial Designers	400	0.67	\$55,040	\$61,400
492091	Avionics Technicians	380	1.04	\$54,400	\$50,330
172041	Chemical Engineers	370	0.62	\$84,700	\$91,670
172111	Health and Safety Engineers Except Mining Safety Engineers and Inspectors	370	0.75	\$73,290	\$75,810
172131	Materials Engineers	330	0.72	\$88,730	\$85,660
172061	Computer Hardware Engineers	230	0.17	\$93,910	\$101,410
192021	Atmospheric and Space Scientists	170	1.00	\$91,020	\$85,160
173024	Electro-Mechanical Technicians	100	0.31	\$54,190	\$49,880
152091	Mathematical Technicians	60	2.70	\$42,250	\$44,230
151011	Computer and Information Scientists Research	*	*	\$69,460	\$105,370

Source: U.S. Bureau of Labor Statistics, via MERIC

The State of Missouri has several academic programs at two- and four-year public and private not-for-profit colleges and universities that support the Advanced Manufacturing target. Over half of the degrees relative to the Advanced Manufacturing target are related to engineering and engineering technologies. Engineering degrees are concentrated at the bachelor's and master's degree levels, while engineering technologies degrees are spread across certificates below baccalaureate, associate's, and bachelor's degrees.

Missouri Degrees and Certificates Awarded in Advanced Manufacturing Disciplines, 2005-2009

	Certificate below baccalaureate	Associate	Bachelor	Certificate above baccalaureate	Master	Doctorate/ Professional	TOTAL
Computer and information sciences and support services	229	1,394	4,474	254	1,390	43	7,784
Engineering technologies/technicians	1,411	1,954	1,505	10	170	-	5,050
Engineering	6	109	6,631	601	2,999	329	10,675
Mathematics and statistics	5	2	1,303	4	322	62	1,698
Mechanic and repair technologies/technicians	1,226	1,821	36	-	-	-	3,083
Natural resources and conservation	1	29	779	-	147	18	974
Precision production	383	302	0	-	-	-	685
Science technologies/technicians	16	89	12	-	-	-	117
Transportation and materials moving	542	-	233	-	135	-	910
Grand total	3,819	5,700	14,973	869	5,163	452	30,976

Source: National Center for Education Statistics, IPEDS Database

Note: Included in this analysis are all two and four-year public and private, not-for-profit colleges and universities in the State of Missouri.

There are many educational programs at all degree levels that train students for careers in Advanced Manufacturing. Following are some highlights of Missouri's higher educational training capacity resources for the Advanced Manufacturing target.

Crowder College offers an array of associate's degree and certificates in fields related to Advanced Manufacturing. Two-year programs include:

- Associate of Applied Science (AAS) in Advanced Manufacturing Technology,
- AAS in Automotive Technology,
- AAS in Diesel Technology,
- AAS in Computer and Network Support Technology,
- Associate of Arts (AA) in Information Science, and
- AA in Computer Science.

Certificate programs relevant to Advanced Manufacturing include:

- Industrial Maintenance Technician,

- Industrial Electrical Technician,
- Diesel Technology,
- PC Repair,
- Network Administration, and
- Cisco Networking.

Missouri State University has a Manufacturing Management undergraduate certificate program for students with three or more years of industrial experience and mathematical competency. The university also offers Bachelor of Science programs in construction management, facility management, and technology management; a Master of Science in project management, a Project Management Graduate Certificate program and a Technology Management Graduate Certificate program. The Bachelor of Applied Science in Technology Management program allows the transfer of all Associate of Science or Associate of Applied Science degree credits. Also offered are undergraduate programs in electrical engineering, environmental physics technology, geospatial sciences, and informatics. Additional graduate programs that support the Advanced Manufacturing target are geospatial sciences in geography and geology and material science.

Missouri University of Science and Technology offers an array of undergraduate engineering programs including aerospace engineering, chemical engineering, civil engineering, computer engineering, electrical engineering, engineering management, mechanical engineering, and petroleum engineering, to name a few. The school also offers Bachelor of Science degrees in applied mathematics; computer science; physics; and information science and technology. Also offered are advanced degree programs (Master of Science, Ph.D., and D.E.) in engineering: aerospace engineering, chemical engineering, construction engineering, materials science and engineering, structural engineering, transportation engineering, computer engineering, electrical engineering, engineering management, explosives engineering, aerospace engineering, control systems, energy conversion, instrumentation, manufacturing processes, mechanical design and analysis, thermal science, and systems engineering.

St. Louis Community College offers an AAS, a Certificate of Proficiency (CP), and a Certificate of Specialization (CS) in automotive technology, in diesel technology, and in information systems. Other opportunities include an AAS and CP in chemical technology, CS programs in computer aided design, computer aided manufacturing, lead maintenance mechanic, maintenance mechanic, microcomputer applications, and skilled trades industrial training. Other AAS programs include electrical and electronic engineering technology, engineering science, manufacturing technology, mechanical engineering technology, microcomputer support specialist, robotics technology, and software developer. Other CP programs include electrician, information technology/network administration, skilled trades industrial apprenticeship training, and telecommunications engineering technology/basic electronics.

Southeast Missouri State University offers two-year certificate programs in design drafting and electronics technology, preparing students for technical careers which involve various responsibilities such as implementing electrical and computer-controlled systems and computer networks and solving manufacturing process and production problems.

These programs are administered in the Department of Industrial and Engineering Technology, which is recognized as a Missouri Center of Excellence in Advanced Manufacturing Technology and as the State model for 2+2 transfer of technology degrees from community colleges.

Southeast Missouri's Department of Industrial and Engineering Technology also offers Bachelor of Science programs in the following Advanced Manufacturing-related majors:

- Engineering physics with options in computer applications, electrical applications, and mechanical applications;
- Engineering technology with options in electrical and control and mechanical and manufacturing systems;
- Technology management with options in construction management and design, industrial management, sustainable energy systems management, technology management, and telecommunications and computer networking;
- Computer science; and
- Computer information systems.

Minors include Air Force ROTC (aerospace studies), computer networking, electronic technology, and industrial management.

Programs in this department are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET) or the Association of Technology Management and Applied Engineering (ATMAE). In addition, all manufacturing students at Southeast Missouri take the Certified Manufacturing Technology (CMfgT) certification exam. The pass rate for Southeast Missouri students in the last three years is over 70 percent, compared to the national pass rate of 50 percent.

The **University of Missouri-St. Louis** and **Washington University** offer a Joint Engineering Program which offers undergraduate degrees in civil, electrical, and mechanical engineering.

The College of Engineering at the **University of Missouri** offers a wide array of degrees from Bachelor of Science to doctoral in various majors and minors, including general engineering, biological engineering, chemical engineering, civil engineering, computer science, electrical and computer engineering, industrial and manufacturing systems

engineering, information technology, mechanical and aerospace engineering, and naval sciences.

Washington University's School of Engineering and Applied Science has several opportunities for students interested in engineering fields, including undergraduate programs in computer science and engineering; electrical and systems engineering; energy, environmental, and chemical engineering; and mechanical engineering and materials science. Minors include aerospace engineering, computer science, electrical engineering, energy engineering, environmental engineering, mechatronics, nanotechnology, robotics, and systems science and engineering. Graduate programs are available in the Departments of Electrical and Systems Engineering; Energy, Environmental, and Chemical Engineering; Mechanical Engineering and Materials Science; and the Sever Institute.

In addition to technical college and university-level education, Missouri has also invested in technology and engineering education at the middle school and high school levels through Project Lead the Way (PLTW), a Missouri Department of Elementary and Secondary Education program. Offered in 44 Missouri middle schools, the PLTW Middle School program focuses on showing students how to implement engineering skills in everyday life to solve problems and exposes students to an overview of technology. Units, which are taught over a nine-week period, include focus on topics such as design and modeling, automation and robotics, and flight and space. PLTW also has a Pre-Engineering Program, which is currently offered in 87 high schools throughout the State and provides hands-on learning to students interested in engineering. The program includes three foundational courses: introduction to engineering design, principles of engineering, and digital electronics. Specialization courses include computer integrated manufacturing, civil engineering and architecture, biotechnical engineering, and aerospace engineering. Finally, the program offers a capstone course: engineering design and development.

PROSPERITY: BUSINESS SECTOR ANALYSIS

Growth in Missouri's Advanced Manufacturing sector has a strong multiplier effect in terms of creation of additional jobs and wealth. The following table highlights the economic impact of key Advanced Manufacturing subsectors as indicated by NAICS code. These impact estimates are provided by MERIC and are only available at the three-digit NAICS code granularity level. Jobs in these sectors of manufacturing have multiplier effects ranging from 2.02 to 3.73, meaning that for every 100 jobs created in these subsectors, between 102 and 273 jobs are created in other sectors.

The Impact of 100 New Jobs in Missouri by Sector: Advanced Manufacturing

NAICS and Description	Job Impact				GDP Impact in Millions			
	Jobs Multiplier	Direct Jobs	Indirect Jobs	Total Jobs	GDP Multiplier	Direct GDP	Indirect GDP	Total GDP
326 Plastics & Rubber Products	2.02	100	102	202	1.89	\$9.0	\$8.0	\$17.0
331 Primary Metal Mfg	3.73	100	273	373	3.14	\$9.9	\$21.2	\$31.1
332 Fabricated Metal Products	2.18	100	118	218	1.87	\$10.1	\$8.8	\$18.9
333 Machinery Mfg	2.48	100	148	248	2.37	\$8.3	\$11.4	\$19.7
334 Computer & Other Electronics	2.89	100	189	289	3.02	\$7.6	\$15.3	\$22.8
335 Electrical Eqmt & Appliances	2.31	100	131	231	1.86	\$12.1	\$10.4	\$22.4
336 Transportation Eqmt	3.72	100	272	372	2.57	\$13.7	\$21.5	\$35.2

Source: MERIC, IMPLAN Statewide Model

Note: Impacts represent rounded statewide estimates and are for reference only. Impact estimates for individual projects will vary based on region, time period, detailed industry, and project information. GDP listed in the millions.

The following table shows Missouri’s employment and wages for the Advanced Manufacturing target business sectors in the fourth quarter of 2009. Statewide, there are 160,490 jobs in these Advanced Manufacturing-specific sectors, representing approximately six percent of all jobs in the State. Seventy-two percent of business sectors in this target pay annual average wages higher than the Q4 2009 statewide average of \$42,434. The target’s average annual wage is \$73,023, which is 72 percent higher than the State’s average annual wage.

Manufacturing sectors were heavily impacted by the recession, causing an overall employment decline in the target of 19.8 percent. It may be because of these job losses that many Regional Forum participants indicated that the State’s current Automotive and Aerospace and Defense targets should no longer be pursued. At the same time, a lack of focus on Missouri’s existing businesses was viewed as the number one threat to the State’s economy by the highest proportion of forum participants. This Advanced Manufacturing target is critical in the sustained retention efforts of Missouri’s valuable transportation, aerospace, and defense manufacturing firms and to open up next-generation opportunities for all of Missouri’s manufacturers to innovate and expand.

Missouri Advanced Manufacturing Target: Private Employment (by business subsector), 4Q 2009

NAICS	Description	4Q09 Location 4Q09 Emp	4Q09 Average Quotient	4Q09 Average Wage	Employment Change 4Q04 - 4Q09			Average Annual Wage Change 4Q04-4Q09		
					MO # Change	MO % Change	US %Change	MO # Change	MO % Change	US % Change
Total across Sectors		2,604,179	-	\$42,434	-62,293	-2.3%	-2.1%	\$5,587	15.2%	16.0%
Aerospace and Defense										
3259	Other Chemical Product and Preparation Mfg	1,632	0.95	\$48,297	-203	-11.0%	-19.8%	\$8,339	20.9%	7.8%
3323	Architectural and Structural Metals Manufacturing	6,748	1.02	\$43,753	-1,665	-19.8%	-16.2%	\$5,641	14.8%	17.5%
3324	Boiler, Tank, and Shipping Container Manufacturing	2,087	1.24	\$53,701	-282	-11.9%	-8.6%	\$5,759	12.0%	17.1%
3329	Other Fabricated Metal Product Manufacturing	9,433	1.88	\$55,892	-286	-2.9%	-12.3%	\$10,005	21.8%	13.7%
3333	Commercial and Service Industry Machinery Mfg	2,649	1.40	\$49,169	-55	-2.0%	-18.3%	\$1,940	4.1%	12.7%
3334	Ventilation, Heating, Air-Conditioning, and Commercial Refrigeration Equipment Mfg	8,257	3.26	\$36,573	-840	-9.2%	-18.1%	\$2,454	7.2%	10.1%
3335	Metalworking Machinery Manufacturing	4,561	1.49	\$44,952	-463	-9.2%	-25.3%	\$821	1.9%	4.0%
3336	Engine, Turbine, Power Transmission Equipment Mfg	1,962	1.08	\$36,980	-1,021	-34.2%	-5.6%	\$5,696	18.2%	13.6%
3339	Other General Purpose Machinery Manufacturing	4,562	1.01	\$48,521	-1,298	-22.2%	-15.5%	\$5,273	12.2%	12.3%
3341	Computer and Peripheral Equipment Manufacturing	73	0.02	\$53,075	-180	-71.1%	-21.7%	\$18,626	54.1%	20.3%
3344	Semiconductor and Other Electronic Component Mfg	3,089	0.42	\$54,567	-1,434	-31.7%	-19.5%	\$7,345	15.6%	11.9%
3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	1,681	0.20	\$50,331	-98	-5.5%	-5.5%	-\$2,042	-3.9%	16.0%
3353	Electrical Equipment Manufacturing	5,659	2.03	\$53,908	-1,702	-23.1%	-10.7%	\$13,738	34.2%	18.3%
3359	Other Electrical Equipment and Component Mfg	5,047	2.13	\$40,902	-1,148	-18.5%	-14.8%	\$4,817	13.3%	14.7%
3364	Aerospace Product and Parts Manufacturing	14,928	1.52	\$87,380	-1,243	-7.7%	8.0%	\$10,861	14.2%	16.0%
5413	Architectural, Engineering, and Related Services	22,654	0.82	\$69,954	2,347	11.6%	1.4%	\$12,313	21.4%	22.5%
5414	Specialized Design Services	1,819	0.74	\$51,450	115	6.7%	-3.7%	\$8,473	19.7%	14.1%
5415	Computer Systems Design and Related Services	21,931	0.76	\$79,044	1,777	8.8%	20.9%	\$12,729	19.2%	14.6%
5417	Scientific Research and Development Services	10,094	0.79	\$109,573	2,271	29.0%	7.7%	\$13,527	14.1%	22.2%
Transportation Equipment										
3169	Other Leather and Allied Product Manufacturing	254	1.17	\$24,916	45	21.5%	-6.6%	\$3,651	17.2%	-8.6%
3261	Plastics Product Manufacturing	11,548	1.15	\$39,960	-2,908	-20.1%	-21.9%	\$3,095	8.4%	13.3%
3262	Rubber Product Manufacturing	3,210	1.31	\$39,667	-1,060	-24.8%	-29.9%	\$2,672	7.2%	5.8%
3313	Alumina and Aluminum Production and Processing	1,756	1.64	\$54,731	-431	-19.7%	-28.1%	\$8,583	18.6%	11.5%
3314	Nonferrous Metal (except Aluminum) Production and Processing	1,334	1.16	\$52,799	67	5.3%	-21.8%	\$13,946	35.9%	9.8%
3315	Foundries	2,161	0.99	\$44,822	-2,770	-56.2%	-35.9%	\$7,728	20.8%	4.0%
3344	Semiconductor and Other Electronic Component Mfg	3,089	0.42	\$54,567	-1,434	-31.7%	-19.5%	\$7,345	15.6%	11.9%
3345	Navigational, Measuring, Electromedical, and Control Instruments Mfg	1,681	0.20	\$50,331	-98	-5.5%	-5.5%	-\$2,042	-3.9%	16.0%
3353	Electrical Equipment Manufacturing	5,659	2.03	\$53,908	-1,702	-23.1%	-10.7%	\$13,738	34.2%	18.3%
3359	Other Electrical Equipment and Component Mfg	5,047	2.13	\$40,902	-1,148	-18.5%	-14.8%	\$4,817	13.3%	14.7%
3361	Motor Vehicle Manufacturing	*	*	\$120,544	*	*	-40.0%	\$45,751	61.2%	6.5%
3362	Motor Vehicle Body and Trailer Manufacturing	2,770	1.31	\$40,547	-1,136	-29.1%	-37.8%	\$3,141	8.4%	15.6%
3363	Motor Vehicle Parts Manufacturing	7,770	0.94	\$38,885	-9,257	-54.4%	-40.9%	\$2,425	6.7%	1.7%
3369	Other Transportation Equipment Manufacturing	822	1.18	\$49,428	-398	-32.6%	-14.4%	-\$1,462	-2.9%	8.4%
5417	Scientific Research and Development Services	10,094	0.79	\$109,573	2,271	29.0%	7.7%	\$13,527	14.1%	22.2%

Source: U.S. Bureau of Labor Statistics via MERIC

PLACE: MISSOURI'S DYNAMICS

Sites and Infrastructure

The Missouri Partnership's website provides a high-powered, interactive site selection search feature which connects prospective businesses to available sites and buildings based on a number of criteria, including community/metro area, zoning, specialty features, rail service, square footage, and distance to interstates, highways, and airports.

Input gathered from the Regional Forums indicated relative confidence in the State of Missouri's supply of development sites and buildings. Only 13 percent of forum participants indicated that this was among the State's top three competitive concern areas, with a higher proportion of participants expressing concern in the Northern (16 percent), Southwestern (14 percent), and Southeastern (19 percent) regions. *Market Street's* partner, Great River Associates (based in Springfield, Missouri) provided maps of available sites and infrastructure by region along with an aggregate of square footage marketed on LOIS, an economic development site search engine. These resources are included in the report's **Appendix**. These data confirm a smaller share of available industrial and warehousing and distribution square footage in the Southeast and Northern regions of the State.

Business Climate

The State of Missouri's tax credit programs were reviewed by a commission assembled by Governor Jay Nixon in the fall of 2010 in order to identify ways to rein in its 61 tax credit programs in the face of tough budget decisions. Recommendations include cutting tax credits by 40 percent and will be considered by the Legislature this spring.

Signed into law by Governor Nixon in July, the Missouri Automotive Manufacturing Jobs Act extends incentives to support automobile manufacturers and their suppliers as they reconfigure their operations to deliver next-generation vehicles. The Act will waive withholding taxes typically paid to the State for qualified manufacturers that bring next-generation production lines to Missouri. These incentives are capped at \$15 million per year and include claw-back provisions if the firms do not meet capital investment and staffing thresholds. In response to these new incentives, Ford recently announced that it will be adding a line at its Claycomo plant in Kansas City to replace the next-generation Escape SUV line it recently moved to Louisville, Kentucky.

According to the U.S. Department of Energy, average electricity costs have gone up in most states across all sectors (commercial, industrial, residential, and transportation). Despite this, Missouri's average electricity costs remain below U.S. averages in each sector, notably in industrial uses. However, the State's average costs across all sectors have shown a sizable increase between July 2009 and July 2010 dropping the State from #17 to #25 in terms of low-cost states. While this is a concern, many local utilities continue to provide

incentives which further lower costs beyond the retail price for industrial users. Thus, Missouri’s low cost of electricity, as shown in the following table, remains a business cost advantage related to Advanced Manufacturing development. Commercial, industrial, and transportation electricity costs to consumers are all lower in Missouri than adjacent states.

**Average Retail Price of Electricity to Ultimate Customers by End-Use Sector,
West North Central Region States, July 2010 and 2009 (Cents per Kilowatthour)**

	Residential		Commercial		Industrial		Transportation		All Sectors	
	Jul-10	Jul-09	Jul-10	Jul-09	Jul-10	Jul-09	Jul-10	Jul-09	Jul-10	Jul-09
South Dakota	9.85	9.32	8.01	7.33	6.1	5.68	--	--	8.31	7.7
Iowa	11.26	10.92	9.16	8.8	6.55	6.41	--	--	9.07	8.74
Missouri	10.53	9.62	8.85	8.13	6.58	6.27	8.99	8.39	9.29	8.51
Kansas	10.62	9.98	8.7	8.24	6.59	6.28	--	--	9.02	8.46
West North Central Region	10.66	10.03	8.78	8.24	6.64	6.46	8.3	8.06	9	8.48
North Dakota	9.43	8.92	7.72	7.16	6.69	6.28	--	--	7.88	7.37
Minnesota	10.9	10.44	9.04	8.53	6.72	6.81	7.68	7.75	9.07	8.75
Nebraska	10.35	9.95	8.29	8.06	6.85	6.63	--	--	8.48	8.19
U.S. Total	12.01	11.9	10.7	10.63	7.31	7.13	11.59	11.41	10.5	10.37

Source: Department of Energy, Energy Information Administration

Note: The industrial sector encompasses the following types of activity manufacturing (NAICS codes 31-33); agriculture, forestry, fishing and hunting (NAICS code 11); mining, including oil and gas extraction (NAICS code 21); and construction (NAICS code 23). The commercial sector includes service-providing facilities. The transportation sector consists of all vehicles whose primary purpose is transporting people and/or goods from one physical location to another. Included are automobiles; trucks; buses; motorcycles; trains, subways, and other rail vehicles; aircraft; and ships, barges, and other waterborne vehicles.

It is also important to note that white papers submitted as part of this strategic planning process by the Fort Leonard Wood Regional Commerce and Growth Association (FLW RCGA), the St. Louis Chapter of the National Defense Industrial Association, and the Leonard Wood Institute call for a statewide coordinated strategy for the Defense/National Security sectors in Missouri. Such a strategy could help to ensure that Missouri benefits from (or is not negatively impacted by) the military’s next round of BRAC (base realignment and closure). As this process enters the strategy and implementation phases, the Department of Economic Development should reach out to these partners to identify opportunities for retention, growth, and innovation.

Innovation Assets and Opportunities

Missouri’s Advanced Manufacturing businesses benefit from a robust network of research centers, which support innovation and project commercialization in materials science, fuels, software design, and fabrication and assembly processes. The following is a list of some of the State’s key research assets related to Aerospace and Defense and Transportation Equipment.

- **Missouri Technology Corporation (Jefferson City/Statewide):** Created by the State's General Assembly, MTC is a public-private partnership designed to promote high-tech entrepreneurs in many areas including applied engineering. MTC supports many projects throughout the State including the University Technology Park at Fort Leonard Wood, the Technology Commercialization Partnership, and the Research Alliance of Missouri.
- **Aerospace Research & Education Center (St. Louis):** A partnership between Washington University, Saint Louis University, University of Missouri-Columbia, Missouri University of Science & Technology, the private sector, and government, AeREC focuses on design optimization, materials, manufacturing, structures, and control systems R&D, and product commercialization.
- **Missouri University of Science and Technology Center for Aerospace Manufacturing Technologies (Rolla):** CAMT is a research center supported by many of the State's largest aerospace firms and is devoted to advancing fabrication and assembly technologies for the aerospace supply chain.
- **Missouri University of Science & Technology Center of Excellence for Aerospace Particulate Emissions Reduction Research (Rolla):** This is a smaller, multidisciplinary center which is integrated into a national consortium studying the environmental impacts of aviation-related activities.
- **Missouri University of Science & Technology Materials Research Center (Rolla):** Centered on the goal of advancing innovation in the fields of materials science and engineering, work conducted at MRC includes the development, evaluation, application, and understanding of metals, polymers, biomaterials, electronic materials and composites. MRC has been credited for breakthroughs in transparent composites for windows and armor, environmentally friendly corrosion coatings, laser glasses, sealing materials, and enhanced magnetic materials.
- **Missouri University of Science & Technology GE Aviation Development Center (Rolla):** The GE Aviation Development Center performs software development, verification and validation, mechanical design, and hardware design for applications in the aerospace industry.
- **Missouri University of Science and Technology Missouri Transportation Institute (Rolla):** MTI is involved with a range of research and technical assistance projects in many areas of transportation, including plug-in electric vehicles and hydrogen infrastructure development.

- **Missouri State University Center for Applied Science and Engineering (Springfield):** Located within the Jordan Valley Innovation Center as part of Springfield's downtown IDEA Commons, CASE provides engineering and support for electronics & devices, materials research, MEMS sensors and systems fabrication. The center is also involved with "high risk" R&D for Missouri firms.

There are also opportunities to help all manufacturers become "Advanced Manufacturers" through the promotion of next-generation manufacturing practices. According to a white paper submitted by Missouri Enterprise as part of this strategic planning process, next-generation manufacturers are those that are globally engaged, that support customer-focused innovation, are active in human capital acquisition/development/retention, have superior processes in focus, and are active in supply chain management and collaboration. Operated by Missouri Enterprise, the Missouri Manufacturing Extension Partnership (MMEP) is an organization comprised of experienced manufacturing and business management professionals delivering assistance directly to Missouri's small- and medium-size manufacturing companies.

Further, as noted by James Krudwig, Director of the Small Business and Technology Development Center at Missouri Southern State University, in a white paper submitted as part of this strategic planning process, there are opportunities to promote the idea of "intrapreneurship" among Missouri's manufacturers. Intrapreneurship is allowing innovation to be driven by employees working in all occupations within a firm – from R&D to management and administration and the assembly line – by providing support and incentives to work smarter and improve efficiency. It is noted that many Missouri firms' corporate cultures encourage intrapreneurship including Springfield Remanufacturing, Leggett-Platt, and Anderson Engineering. As the Department of Economic Development, local chambers of commerce, colleges and universities, and small business support providers work with Missouri's companies to innovate toward maximal competitiveness, intrapreneurship models are another potential strategy that can help promote this end.

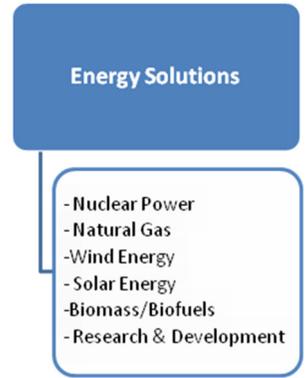


TARGET CLUSTER: ENERGY SOLUTIONS

Justification	Billions of federal dollars and mandates for renewable energy usage create dynamic future market opportunities in the sector.
	Potential for growth in nuclear power and wind- and biomass-based renewable energy based on geographic location, changing regulatory environment and positive private sector investments.
	Proximity to raw materials and strong resources for corn and cellulosic ethanol production.
	Ninety-one percent of occupations relevant to the Energy Solutions target pay an average annual wage that exceeds that for the State of Missouri.
Challenges	Competition to develop and produce renewable energy is becoming increasingly intense, both nationally and globally.
	A low number of occupations with LQs > 1.00 suggests that as this target area grows talent development will be an increasing issue.
	A relative shortage of venture capital financing in the State, as indicated by participants of the Regional Forums.
	Development of smart-grid infrastructure dependent on a complicated web of local, regional, and inter-state partnerships.
	Missouri has fallen behind neighboring states that have already heavily capitalized in opportunities in wind energy and biomass/biofuels.
	Limited State funding to support renewable energy research, entrepreneurship, and early-stage companies in the private sector.
Opportunities	Need for complete redevelopment of nation's energy grid to best capitalize on renewable energy potential can position leading-edge regions for dynamic success.
	Missouri ranks 8 th nationally for reliance on coal-fired energy production, pointing to the need to diversify in order to meet the demands of the State's next generation of businesses and residents.
	Continued development of Missouri's higher education and research capacity supporting the Energy Solutions target.
	Competitive environment for biomass and wind energy business opportunities in Northern Missouri.
	Missouri's Clean Energy Initiative requires that utility companies increase usage of renewable energy to 15 percent by 2021.

TARGET OVERVIEW

The Energy Solutions target does not separate provision methods out by niche areas. This target supports all energy technologies which provide **long-term, low-impact, high-value energy solutions** for the State of Missouri’s current and future residents and businesses. Energy Solutions incorporates the feedstock production component of the eliminated Agribusiness target from the State’s current program and many components of the existing Energy target.



Events such as wars in the Middle East and Hurricane Katrina, escalating fossil fuel costs, global warming concerns, and other occurrences have heightened national awareness of the implications of America’s dependency on foreign oil and non-renewable energy sources. With this awareness comes more prominent calls for leveraging renewable and alternative energy sources, reducing personal and corporate “carbon footprints” through changed consumption patterns and business policies, increasing recycling efforts, and constructing more energy efficient buildings. Because of heightened demand, entrepreneurs are starting new businesses, and existing companies are re-strategizing to take advantage of these new opportunities.

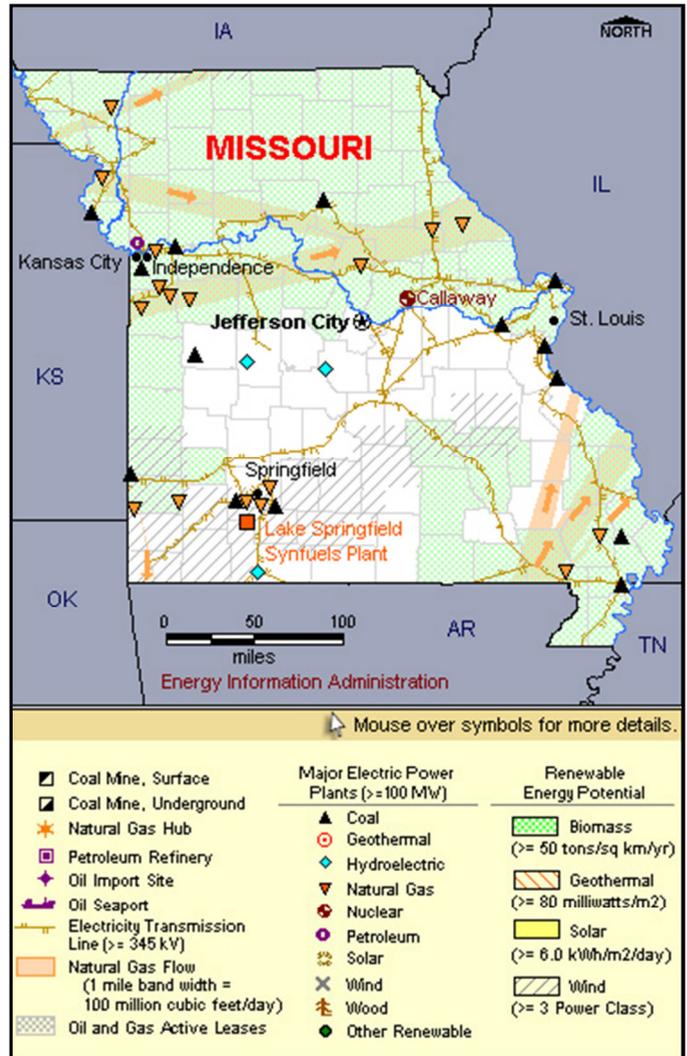
According to the U.S. Department of Energy, demand for electricity is expected to grow 30 percent by 2030. To help meet this demand, the current grid needs to be modernized, expanded, and better controlled to avoid blackouts. As noted by the Missouri Energy Development Association in a white paper submitted as part of this strategic process, “Utilities are in the midst of a capital investment cycle on a magnitude not seen in nearly four decades. The last cycle of utility build was in the late 1960s through the 1970s. In that period, investment was due to a variety of factors, one including the increased number of air conditioning installations for homes, schools, and businesses. The basic premise of today’s investments is to modernize the electrical system with the intent to provide infrastructure that will encourage growth in renewable energy sources, empower consumers to reduce their energy use, and lay the foundation for sustained, long-term economic expansion.”

As shown in the following table, Missouri currently generates about 9,089 thousand MWh of electricity on a monthly basis (ranking 17th nationally). Over three-quarters of this power is generated by coal-fire, 11 percent from natural gas, 9.8 percent from nuclear, and less two percent from hydro and other renewable resources. **The Energy Solutions target supports opportunities to further diversify the State’s energy provision beyond coal and to foster innovation in the technologies that can be applied by Missouri researchers and companies.**

While the State does not rank favorably in terms of its proportion of power generated from clean and renewable sources, new energy solutions are emerging in Missouri. This map from the U.S. Energy Information Administration shows the geographical spread of

current power sources across the State with many areas identified as favorable destinations for biomass (power derived from plant material and animal waste) and wind power in the long-term.

According to the Pew Charitable Trusts, in 2007, only eight percent of U.S. power production came from renewable sources – solar, hydro, wind, and geothermal – far short of President Obama’s goal of 17 percent by 2025. Because of its comparative cost benefits and the opportunities for large-scale, speedy installations (typically in one year or less for most farms), **wind energy** can fill a considerable amount of this demand in the coming years. The U.S. Department of Energy estimates that solar power costs for consumers range from 24-59 cents per kilowatt hour, while wind energy costs about 9-12 cents. This is in range of existing, traditional non-renewable energy sources like natural gas (5-10 cents). In 2008 alone, the country’s total wind energy capacity increased by 50 percent. In 2009, wind power accounted for 39 percent of the nation’s new generating capacity installed in that year. The Department of Energy notes that retail wind energy did not emerge in Missouri until 2007, and in just three years it is now ranked 21st nationwide for wind energy generation.



Bioenergy consists of power from **biomass** and utilization of **biofuels**. One of the most prominent components of the bioenergy market is ethanol, which can be produced from a number of crop-based products and can be used to power such devices as “flex-fuel” automobiles. Between 2000 and 2008, domestic ethanol production increased from 1.63 to 10.6 billion gallons and the number of production plants increased from 54 to 170. Total production will continue to increase, with the U.S. predicted to continue to be the global leader in ethanol production.

Net Electricity Generation (Thousand Megawatthours) by State and Source, August 2010

	Petroleum- Fired	Natural Gas- Fired	Coal-Fired	Nuclear	Hydro- electric	Other Renewable	Total Generation
Alabama	0.1%	35.1%	40.6%	18.6%	3.2%	2.1%	13,902
Alaska	13.0%	58.9%	7.9%	NM	19.8%	NM	545
Arizona	0.1%	37.3%	32.7%	24.5%	5.1%	0.2%	11,953
Arkansas	0.0%	34.1%	41.3%	18.3%	4.2%	2.0%	6,248
California	0.0%	52.0%	0.9%	16.4%	17.1%	11.9%	20,588
Colorado	0.0%	23.8%	69.1%	NM	2.9%	4.4%	5,032
Connecticut	2.5%	37.1%	10.1%	44.9%	NM	2.0%	3,217
Delaware	0.6%	60.8%	36.7%	NM	NM	1.9%	683
Florida	3.3%	56.9%	26.3%	9.4%	NM	1.7%	22,688
Georgia	0.0%	23.8%	51.3%	21.1%	1.5%	1.8%	14,256
Hawaii	74.9%	NM	15.2%	NM	NM	7.7%	928
Idaho	NM	19.6%	NM	NM	73.0%	6.8%	1,155
Illinois	0.1%	8.0%	47.4%	42.6%	NM	1.7%	18,620
Indiana	0.1%	8.1%	88.9%	NM	0.3%	0.9%	12,259
Iowa	0.1%	7.2%	72.4%	8.3%	NM	11.1%	5,354
Kansas	0.1%	11.9%	65.0%	17.6%	NM	5.2%	4,902
Kentucky	0.1%	3.8%	92.0%	NM	1.7%	0.4%	9,516
Louisiana	0.2%	58.7%	20.9%	13.6%	1.0%	1.8%	10,774
Maine	2.7%	53.9%	0.3%	NM	17.0%	23.9%	1,654
Maryland	1.1%	11.7%	55.6%	28.7%	1.1%	1.3%	4,305
Massachusetts	0.7%	64.6%	18.3%	11.2%	1.6%	2.4%	4,433
Michigan	0.2%	17.4%	55.7%	24.5%	0.8%	2.0%	11,860
Minnesota	0.1%	15.0%	51.6%	22.1%	NM	9.6%	5,278
Mississippi	NM	60.6%	23.0%	14.4%	NM	2.1%	6,368
Missouri	0.1%	11.0%	76.7%	9.8%	0.8%	0.8%	9,089
Montana	0.1%	NM	66.5%	NM	28.4%	2.8%	2,500
Nebraska	0.0%	4.5%	66.5%	26.9%	NM	1.0%	3,459
Nevada	0.0%	68.3%	20.2%	NM	5.5%	6.0%	3,478
New Hampshire	0.5%	30.7%	15.0%	44.8%	3.5%	5.3%	2,067
New Jersey	0.2%	41.7%	10.9%	45.4%	0.0%	1.2%	6,608
New Mexico	0.1%	29.0%	66.6%	NM	NM	3.6%	3,360
New York	1.6%	42.4%	10.9%	27.4%	14.9%	2.5%	13,776
North Carolina	0.2%	9.2%	56.7%	30.1%	2.2%	1.5%	12,447
North Dakota	0.1%	NM	83.9%	NM	5.2%	10.8%	3,085
Ohio	0.2%	8.6%	79.0%	10.9%	0.3%	0.4%	14,654
Oklahoma	NM	56.7%	38.2%	NM	2.2%	3.2%	8,596
Oregon	NM	39.5%	9.7%	NM	39.0%	11.4%	4,329
Pennsylvania	0.3%	17.7%	48.0%	31.8%	0.5%	1.3%	21,536
Rhode Island	NM	98.3%	NM	NM	NM	1.5%	883
South Carolina	0.1%	13.4%	38.1%	46.7%	1.3%	1.6%	10,187
South Dakota	NM	6.8%	25.3%	NM	61.2%	6.7%	1,136
Tennessee	0.3%	4.7%	55.9%	31.2%	7.9%	1.1%	7,822
Texas	0.0%	52.9%	33.5%	8.2%	0.2%	4.0%	44,500
Utah	0.1%	15.6%	80.3%	NM	NM	2.1%	3,984
Vermont	NM	NM	NM	76.6%	17.7%	5.5%	581
Virginia	1.9%	29.0%	33.0%	34.3%	1.3%	2.6%	7,487
Washington	NM	18.8%	10.7%	8.6%	54.6%	6.9%	8,921
West Virginia	0.2%	0.5%	98.0%	NM	0.9%	0.4%	7,486
Wisconsin	0.1%	15.4%	60.7%	18.0%	1.8%	2.8%	6,478
Wyoming	0.1%	1.3%	90.2%	NM	3.2%	4.7%	4,103
U.S. Total	0.6%	29.6%	43.6%	17.5%	4.8%	3.2%	409,095
<i>Missouri's Rank</i>	<i>34th</i>	<i>35th</i>	<i>8th</i>	<i>27th</i>	<i>31st</i>	<i>45th</i>	<i>17th</i>

Source: U.S. Energy Information Administration

NM=Not meaningful as determined by the EIA. Other renewable includes wind, biomass, geothermal, and solar.

The U.S. 2007 Energy Independence and Security Act mandates 36 billion gallons of ethanol to be used in motor fuel by 2022. To meet this benchmark, the industry is investing heavily in research and development. The Renewable Fuels Association estimates that over \$1.4 billion was spent on new generation ethanol technologies in 2008. Thus, despite production slowdowns since 2008 due to cost imbalances, the future prospects for biofuels are predicted to be strong.

Smart grid technologies are key to energy transmission management. By plugging electric appliances into sensing devices that then plug into the wall, the sensing device enables communication between points of use in a consumer's home and the utility provider. This creates a "smart" grid because it allows consumers to see what electricity they use and make smarter conservation or cost-saving decisions, and it also enables utilities to better balance supply and demand. Millions of dollars from the Federal Stimulus Package were devoted to smart grid grants to help modernize the nation's electricity infrastructure and provide jobs in occupations such as information technology consulting, overhead utility linemen, home energy inspectors, and other positions. The \$789 billion economic recovery bill included \$11 billion for smart grid technologies, \$7.5 billion for renewable energy and transmission line construction, \$500 million for green jobs training, \$400 million for alternative energy R&D, and the list goes on. There are clear and abundant economic opportunities for both existing businesses and entrepreneurs within the Energy Solutions cluster, both in alternative energy and innovations in traditional areas of energy production.

Within this target cluster, there are several **cross-target catalyst** opportunities that if recruited, expanded, or developed could provide entryways into multiple target areas. Some examples of cross-target catalysts relevant to Energy Solutions include, but are not limited to, the following:

- Engine and battery technologies
- Ethanol, biodiesel, and bio-oil
- Nanotechnology
- Smart grid technologies
- Energy consulting and auditing
- Solar powered traffic message boards and signals

PEOPLE: OCCUPATIONAL ANALYSIS

Approximately 12 percent, or 318,650, of the 2.67 million workers in the State of Missouri are employed in core occupations relevant to the Energy Solutions target. As shown in the following tables, nearly 92 percent of the evaluated occupations offer average annual wages that exceed Missouri's May 2009 average annual wage of \$39,250. Of the occupations examined, 15 percent have both location quotients of 1.0 or greater and annual wages that exceed the State average wage. These occupations are commercial and industrial

equipment electrical and electronics repairers, computer programmers, computer support specialists, other computer specialists, other drafters, sheet metal workers, and structural iron and steel workers. The low number of occupations with LQs > 1.0 indicates that, compared to the distribution of workers in occupations nationwide, Missouri has proportionally fewer workers employed in occupations relevant to Energy Solutions. As the State diversifies its energy generation and supports firms within the Energy Solutions target, talent development will be a key issue.

Energy Solutions Occupational Target, May 2009

SOC Code	Occupation	Employment		Annual Mean Wage	
		Missouri	LQ	Missouri	United States
	Total, all Occupations	2,668,450	1.00	\$39,250	\$43,460
510000	Production Occupations	203,500	1.12	\$32,430	\$33,290
151041	Computer Support Specialists	12,590	1.14	\$43,250	\$47,360
472111	Electricians	11,650	0.98	\$54,980	\$50,850
151031	Computer Software Engineers Applications	10,020	0.99	\$78,380	\$90,170
151051	Computer Systems Analysts	9,960	0.95	\$72,060	\$80,430
151021	Computer Programmers	8,470	1.13	\$68,490	\$74,690
499041	Industrial Machinery Mechanics	5,370	0.95	\$43,260	\$46,160
113021	Computer and Information Systems Managers	5,130	0.87	\$104,530	\$120,640
151032	Computer Software Engineers Systems Software	4,840	0.62	\$77,980	\$96,620
151099	Computer Specialists All Other	4,280	1.07	\$75,840	\$78,010
472211	Sheet Metal Workers	3,950	1.32	\$50,650	\$44,890
172141	Mechanical Engineers	3,710	0.78	\$76,090	\$80,580
172112	Industrial Engineers	3,160	0.74	\$73,650	\$77,090
172199	Engineers All Other	2,930	0.90	\$85,320	\$90,600
172071	Electrical Engineers	2,540	0.82	\$78,570	\$86,250
119041	Engineering Managers	2,390	0.66	\$106,030	\$122,810
113051	Industrial Production Managers	2,130	0.71	\$85,820	\$93,650
172072	Electronics Engineers Except Computer	2,090	0.75	\$82,780	\$91,540
472221	Structural Iron and Steel Workers	1,850	1.39	\$48,790	\$48,470
173023	Electrical and Electronic Engineering Technicians	1,840	0.58	\$56,400	\$55,410
492094	Electrical and Electronics Repairers Commercial and Industrial Equipment	1,770	1.19	\$50,490	\$51,210
192031	Chemists	1,480	0.91	\$64,240	\$72,740
192041	Environmental Scientists and Specialists Including Health	1,310	0.77	\$50,860	\$67,360
172081	Environmental Engineers	990	0.96	\$72,070	\$80,750

Source: U.S. Bureau of Labor Statistics, via MERIC

Energy Solutions Occupational Target, May 2009, continued

SOC Code	Occupation	Employment		Annual Mean Wage	
		Missouri	LQ	Missouri	United States
	Total, all Occupations	2,668,450	1.00	\$39,250	\$43,460
173026	Industrial Engineering Technicians	800	0.60	\$44,470	\$49,030
499044	Millwrights	800	0.94	\$50,340	\$50,110
499043	Maintenance Workers Machinery	780	0.58	\$39,650	\$39,570
194031	Chemical Technicians	710	0.54	\$42,790	\$43,900
499012	Control and Valve Installers and Repairers Except Mechanical Door	700	0.81	\$47,240	\$47,860
173029	Engineering Technicians Except Drafters All Other	600	0.43	\$58,250	\$58,330
173012	Electrical and Electronics Drafters	580	0.93	\$51,960	\$54,800
119121	Natural Sciences Managers	570	0.63	\$110,620	\$127,000
474041	Hazardous Materials Removal Workers	570	0.68	\$49,260	\$40,270
173019	Drafters All Other	480	1.28	\$49,290	\$48,210
173027	Mechanical Engineering Technicians	410	0.46	\$53,070	\$50,700
492095	Electrical and Electronics Repairers Powerhouse Substation and Relay	390	0.83	\$65,190	\$61,700
172041	Chemical Engineers	370	0.62	\$84,700	\$91,670
172111	Health and Safety Engineers Except Mining Safety Engineers and Inspectors	370	0.75	\$73,290	\$75,810
172131	Materials Engineers	330	0.72	\$88,730	\$85,660
194091	Environmental Science and Protection Technicians Including Health	320	0.51	\$38,780	\$43,520
473013	Helpers--Electricians	310	0.17	\$26,470	\$27,870
173025	Environmental Engineering Technicians	240	0.57	\$38,260	\$45,730
192032	Materials Scientists	130	0.72	\$75,620	\$82,350
172151	Mining and Geological Engineers Including Mining Safety Engineers	100	0.78	\$80,700	\$82,080
173024	Electro-Mechanical Technicians	100	0.31	\$54,190	\$49,880
192012	Physicists	90	0.32	*	\$111,250
172171	Petroleum Engineers	40	0.08	\$76,390	\$119,960
172161	Nuclear Engineers	30	0.09	*	\$100,350
151011	Computer and Information Scientists Research	*	*	\$69,460	\$105,370

Source: U.S. Bureau of Labor Statistics, via MERIC

There are several interesting academic programs in the State of Missouri at two- and four-year public and private not-for-profit colleges and universities that are geared toward Energy Solutions careers. About 59 percent of the degrees and certificates awarded between 2005 and 2009 that support the target are bachelor's degrees, and 19 percent are master's degrees. Engineering-related degrees comprise the largest percentage of degrees supporting this target (47.4 percent).

Missouri Degrees and Certificates Awarded in Energy Solutions Disciplines, 2005-2009

	Certificate below baccalaureate	Associate	Bachelor	Certificate above baccalaureate	Master	Doctorate/ Professional	TOTAL
Agriculture- agriculture operations- and related sciences	77	396	2,402	-	181	45	3,101
Architecture and related services	-	68	486	-	325	-	879
Computer and information sciences and support services	229	1,394	4,474	254	1,390	43	7,784
Engineering technologies/technicians	1,411	1,954	1,505	10	170	-	5,050
Engineering	6	109	6,631	601	2,999	329	10,675
Mathematics and statistics	5	2	1,303	4	322	62	1,698
Natural resources and conservation	1	29	779	-	147	18	974
Physical sciences	-	2	2,054	-	645	214	2,915
Science technologies/technicians	16	89	12	-	-	-	117
Grand total	1,745	4,043	19,646	869	6,179	711	33,193

Source: National Center for Education Statistics, IPEDS Database

Note: Included in this analysis are all two and four-year public and private, not-for-profit colleges and universities in the State of Missouri.

Missouri has programs specifically focused on topics related to energy.

Crowder College has an Alternative Energy Program which provides two-year training opportunities for students interested in solar and renewable energy technology. The Associate of Arts degree and the Associate of Applied Science degree in alternative energy has three focus options: biofuels, solar, and wind. The college also offers an Associate of Applied Science in Pre-Engineering. The first community college in the country to offer a biofuel degree, Crowder also has four biofuel-related certificate programs: biogas technician, biofuels technician, bioethanol fuel technician, and biodiesel technician.

Crowder College serves as the State’s renewable energy center and is the home of the Missouri Alternative and Renewable Energy Technology (MARET) Center. The Center, recognized internationally for its contributions to the energy field, offers educational programs, including those described above, and assists in product development and business support services in renewable energy. The Center received nearly \$3 million in federal funding for the construction of a 27,000 square foot facility, which began in 2009. The Center will be a living laboratory, employing innovations taught at the Center.

Missouri University of Science and Technology offers numerous undergraduate and graduate engineering programs, including nuclear engineering and petroleum engineering. Missouri S & T is the home of the Energy Research and Development Center. Supporting the goals of the University, the Missouri Department of Natural Resources, and the United States National Energy Policy, the Center’s mission is to “educate students in energy topics, solve energy-related problems of society, deliver solutions for energy-related

issues, increase the visibility of energy issues, and form collaborative relationships with university scientists, engineers, outside industrialists, and policy makers to prioritize, address, and resolve key energy-related issues.” One of the Center’s current initiatives is the Renewable Energy Demonstration Project, which consists of a grid inter-tie wind turbine system and a grid inter-tie photovoltaic array system with solar panels.

Washington University has a Department of Energy, Environmental, and Chemical Engineering, the only department of its kind in the nation. Undergraduate programs in this department include Bachelor of Science degrees in chemical engineering and in applied science focused on chemical engineering. Minors offered are environmental engineering science and energy engineering. The energy engineering minor can be pursued by students in chemical engineering, electrical engineering, and mechanical engineering and materials science.

In addition to its degrees in biochemistry and physics, the Department of Biochemistry, Chemistry, and Physics at the **University of Central Missouri** also offers a degree program in chemistry with focus on alternative energy, environmental, and entrepreneurship. The University also has a Center for Alternative Fuels and Environmental Science, which works with academic, government, and business partners to provide solutions to chemical-related problems in central Missouri communities. Current projects in the Center include the conversion of plastics, tires, waste, oils, and lubricants into suitable fuels; proton exchange membranes in hydrogen fuel cells; and analytical and environmental analysis of soil, water, and biomass. In addition, students at the Center have started building a solar-powered vehicle that costs less than similar projects across the nation.

It was announced in September that UCM would receive a \$190,000 Missouri State Energy Sector Partnership and training grant from the Missouri Department of Economic Development, Division of Workforce Development, to train workers to conduct energy audits and update buildings to make them more energy efficient. The pilot program is the only one of its kind in the nation that focuses specifically on the residential energy-efficiency sector. The program will be a collaboration of the University with partners in business, industry, community, and government to promote and expand “green” consumer demand.

The **University of Missouri-Columbia** is home to Missouri Industrial Assessment Center, which is funded by the United States Department of Energy and provides energy audits and productivity assessments for manufacturers in the State. The Center’s goal is to promote best practices in energy efficiency, reusable energy, waste reduction and productivity and it works with various departments of the University, State agencies, the University of Missouri Extension, the Manufacturing Extension Partnership program, State and local utilities, and industrial associations.

PROSPERITY: BUSINESS SECTOR ANALYSIS

Missouri is home to some of the nation's leading Energy Solutions providers. Major employers in the Energy Solutions target include Ameren Corporation, Associated Electric Cooperative, Inc., Confluence Solar, Empire District Electric Co., Kokhala, Inc., Kansas City Power & Light, and Iberdrola Renewables. In December 2010, Nordic Windpower USA announced plans to move its headquarters and production operations to Kansas City, after receiving \$5.6 million in incentives from the State.

It should be noted that it is difficult to quantify "clean and green" subsectors within the energy industry. The Bureau of Labor Statistics and its partners (including MERIC) are currently working to reclassify many business functions within the North American Industry Classification System (NAICS) in order to better track the impacts of the so-called Green Economy. As such, the included NAICS codes presented here may cast a wider net than actually intended. Again, it is important to keep in mind that NAICS codes do not define the target clusters, but rather help to track employment and wage trends within the State and nation. As new NAICS codes are adopted, MERIC may want to drill-down and refine this presented list.

The following table shows Missouri's employment and wages for the Energy Solutions target business sectors in the fourth quarter of 2009. Statewide, there are nearly 133,200 jobs in energy-specific sectors, representing over five percent of all jobs in the State. Nearly 80 percent of business sectors in this target pay substantially higher than Missouri's fourth quarter 2009 average annual wage of \$42,434. The target's average annual wage is \$57,346, or 35 percent higher than the State's average annual wage. Because of its reliance on the manufacture of new and existing technologies, the Energy Solutions target lost seven percent of its jobs between the fourth quarters of 2004 and 2009. Over the same time period, average annual wages increased by 23 percent.

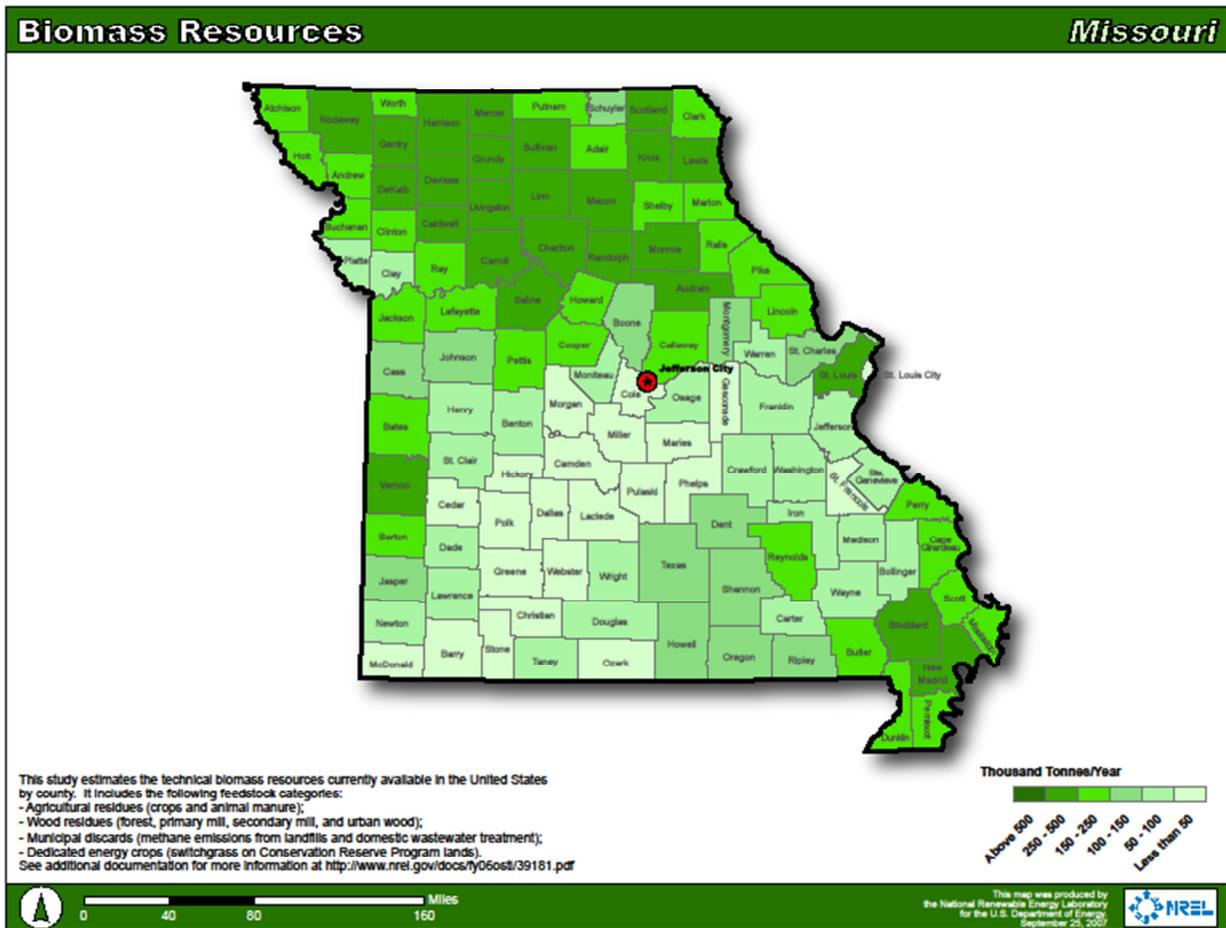
Missouri Energy Solutions Target: Private Employment (by business subsector), 4Q 2009

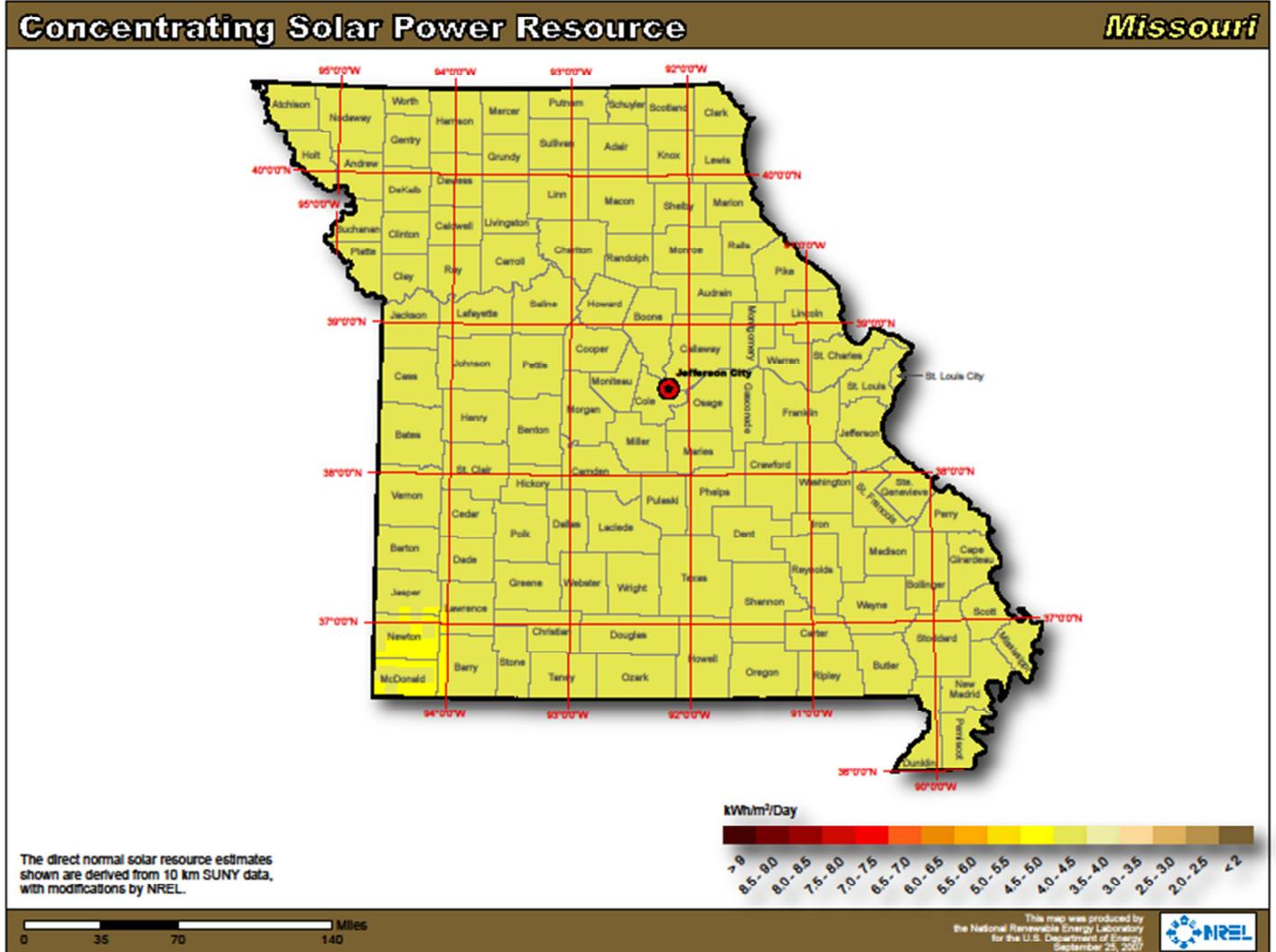
NAICS	Description	4Q09 Emp	4Q09 Location Quotient	4Q09 Average Annual Wage	Employment Change 4Q04 - 4Q09			Average Annual Wage Change 4Q04-4Q09		
					MO # Change	MO % Change	US %Change	MO # Change	MO % Change	US % Change
Total across Sectors		2,604,179	-	\$42,434	-62,293	-2.3%	-2.1%	\$5,587	15.2%	16.0%
3112	Grain and Oilseed Milling	2,255	1.88	\$45,851	314	16.2%	-3.5%	\$3,895	9.3%	11.6%
3251	Basic Chemical Manufacturing	3,023	1.05	\$66,029	162	5.7%	-7.3%	\$11,526	21.1%	9.2%
3252	Resin, Synthetic Rubber, & Artificial Synthetic Fibers & Filaments Mfg	795	0.44	\$60,827	-26	-3.2%	-15.4%	\$3,903	6.9%	11.6%
3253	Pesticide, Fertilizer, and Other Agricultural Chemical Mfg	1,686	2.30	\$65,863	-208	-11.0%	-12.0%	\$2,146	3.4%	15.7%
3261	Plastics Product Manufacturing	11,548	1.15	\$39,960	-2,908	-20.1%	-21.9%	\$3,095	8.4%	13.3%
3272	Glass and Glass Product Manufacturing	893	0.55	\$47,014	-213	-19.2%	-27.9%	\$7,166	18.0%	9.9%
3315	Foundries	2,161	0.99	\$44,822	-2,770	-56.2%	-35.9%	\$7,728	20.8%	4.0%
3323	Architectural and Structural Metals Manufacturing	6,748	1.02	\$43,753	-1,665	-19.8%	-16.2%	\$5,641	14.8%	17.5%
3329	Other Fabricated Metal Product Manufacturing	9,433	1.88	\$55,892	-286	-2.9%	-12.3%	\$10,005	21.8%	13.7%
3332	Industrial Machinery Manufacturing	1,492	0.76	\$46,599	-651	-30.4%	-19.4%	\$3,070	7.1%	6.6%
3334	Ventilation, Heating, Air-Conditioning, and Commercial Refrigeration Equipment Manufacturing	8,257	3.26	\$36,573	-840	-9.2%	-18.1%	\$2,454	7.2%	10.1%
3336	Engine, Turbine, and Power Transmission Equipment Mfg	1,962	1.08	\$36,980	-1,021	-34.2%	-5.6%	\$5,696	18.2%	13.6%
3344	Semiconductor and Other Electronic Component Mfg	3,089	0.42	\$54,567	-1,434	-31.7%	-19.5%	\$7,345	15.6%	11.9%
3345	Navigational, Measurement, Electromedical, Control Instruments Manufacturing	1,681	0.20	\$50,331	-98	-5.5%	-5.5%	-\$2,042	-3.9%	16.0%
3353	Electrical Equipment Manufacturing	5,659	2.03	\$53,908	-1,702	-23.1%	-10.7%	\$13,738	34.2%	18.3%
3359	Other Electrical Equipment and Component Manufacturing	5,047	2.13	\$40,902	-1,148	-18.5%	-14.8%	\$4,817	13.3%	14.7%
4247	Petroleum and Petroleum Products Merchant Wholesalers	2,254	1.16	\$45,992	-123	-5.2%	-5.0%	\$10,693	30.3%	28.2%
5413	Architectural, Engineering, and Related Services	22,654	0.82	\$69,954	2,347	11.6%	1.4%	\$12,313	21.4%	22.5%
5416	Management, Scientific, and Technical Consulting Services	9,684	0.48	\$67,265	231	2.4%	21.2%	\$13,625	25.4%	16.8%
5417	Scientific Research and Development Services	10,094	0.79	\$109,573	2,271	29.0%	7.7%	\$13,527	14.1%	22.2%
8112	Electronic and Precision Equipment Repair & Maintenance	1,663	0.84	\$50,687	-322	-16.2%	-4.5%	\$8,251	19.4%	13.3%
8113	Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair & Maintenance	2,798	0.79	\$42,801	363	14.9%	7.0%	\$7,834	22.4%	22.8%
9241	Administration of Environmental Quality Programs	5,312	0.82	\$38,434	-463	-8.0%	-0.8%	\$6,310	19.6%	18.1%
9261	Administration of Economic Program	12,995	1.00	\$53,066	-38	-0.3%	10.5%	\$8,416	18.8%	16.3%

Source: U.S. Bureau of Labor Statistics via MERIC

PLACE: MISSOURI’S DYNAMICS

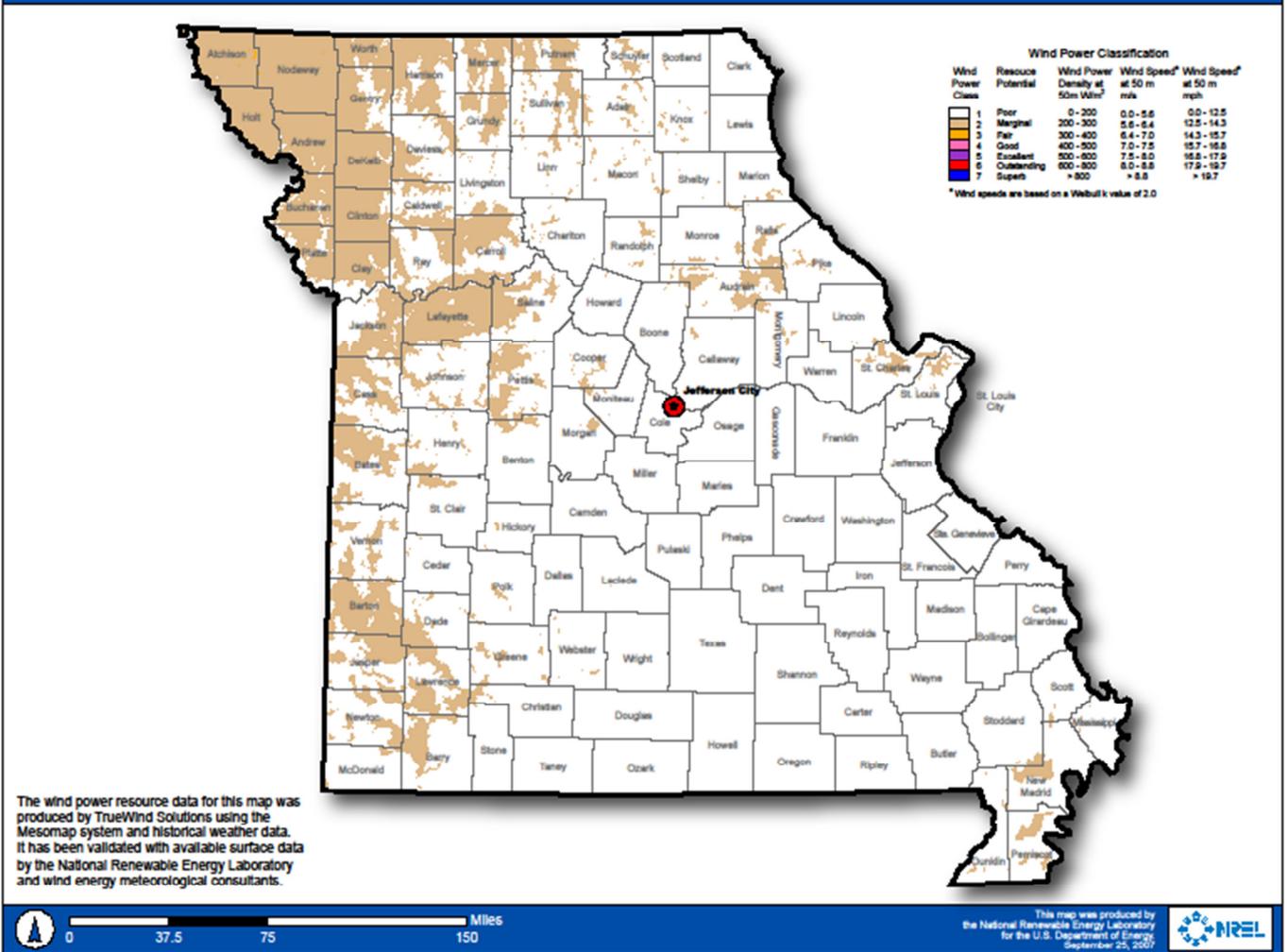
The following maps are from the U.S. Department of Energy’s National Renewable Energy Laboratory and show the State’s potential in biomass, solar, and wind power based on existing environmental conditions. The Northern and Southeastern regions of Missouri have particularly strong competitive advantages in terms of biomass resources. The entire State is moderately competitive for solar, with the Southwestern portion of Missouri showing a slight advantage. The Western portion of the State has stronger winds than the Eastern, but the State has less of a comparative advantage in this area of Energy Solutions. Still, Missouri is adjacent to the nation’s “wind corridor” stretching from the Dakotas to Texas, putting it in a better position to capitalize on wind energy than many locations.





50 m Wind Power Resource

Missouri



Business Climate

Through a series of new rules, the U.S. Environmental Protection Agency plans to cap coal power plants' sulfur, mercury, water, ash, carbon, and other types of emissions. According to a white paper submitted by the Missouri Energy Development Association as part of this strategic process, "EPA actions around new rules in the next 36 to 60 months could force some coal plants to either shut down requiring equivalent electricity to be purchased from the market or shifted to other potentially more expensive sources, or require major investments to be made in environmental controls. If investments in environmental equipment are made, it is already estimated to cost billions of dollars across Missouri's electric industry. Currently Missouri's investor-owned, cooperative and municipal electric

service providers are developing a statewide impact study of the EPA's proposed regulations. Initial calculations indicate that the capital investments necessary to comply with these regulations between now and 2020 could exceed \$5 billion. These actions would have a significant effect on the State's position as a low-cost energy provider. According to Small Business and Entrepreneurship Council's Energy Cost Index, Missouri currently ranks third. However, under Missouri's Clean Energy Initiative which requires that utility companies increase usage of renewable energy to 15 percent by 2021, changes are inevitable.

Existing regulations may also soon be changed to foster growth in nuclear power generation in Missouri. In November 2010, Governor Nixon announced proposed legislation that would speed the building of a second power plant in Missouri. Currently, Missouri law does not allow utilities to charge customers for the costs incurred from the permitting process. The consortium united behind this proposal includes Ameren Missouri, the Association of Missouri Electric Cooperatives, Kansas City Power & Light, and the Missouri Public Utility Alliance. Should they pursue a second power plant, it will be located 25 miles north of Jefferson City at Ameren Missouri's existing nuclear facility in Callaway County. It is estimated that early site permits could cost \$40 million, resulting in an additional cost of \$1 to \$2 per year for each customer.

At the same time, some participants of the Regional Forums and the white paper process indicated that additional regulatory support is needed in other areas of Energy Solutions, including energy efficiency and smart grid projects.

Innovation Assets

While there are several initiatives underway supported by Missouri's utilities, local, state, and federal governments, and public private partnerships, Missouri does not have the breadth of innovation assets of many competitor states. The Department of Energy has 18 National Laboratories which are driving forces in Energy Solutions research and development – three are located in the Midwest (Ames Laboratory in Iowa, and Fermi Lab and Argonne in Illinois). Furthermore, while the State has many research assets such as those included in the People discussion of this discussion, Missouri lacks the presence of top-tier PhD physics programs (Washington University ranks #40 and University of Missouri ranks #93), putting the State at a disadvantage in terms of energy research capacity, despite having many research centers and test project sponsorships, as previously mentioned. However, many private sector employers are driving innovation and creating economic growth opportunities in Energy Solutions. A few examples include:

- The Department of Energy's Biomass Program provides a platform for the federal government and private business to work together and share costs associated with getting more biorefineries online in order to meet long-term U.S. biofuel production goals. The DOE currently supports 12 pilot-stage projects, nine

demonstration projects that have passed the pilot phase, and six commercial projects that have passed the demonstration phase and are able to process at least 700 metric tons of biomass per day. ICM's Cellulosic Biorefinery in St. Joseph is one of the pilot projects. ICM is applying biochemical conversion technologies to turn corn fiber, switchgrass, and energy sorghum into fuel-grade ethanol.

- The Department of Energy has also shown support for St. Louis-based Ameren Corporation and the FutureGen Industrial Alliance in the form of \$1 billion in stimulus funding to help transition an idled oil-fired plant to a carbon-capture coal plant by 2015 (pending needed cost recovery legislation in Illinois). While the plant is located in Western Illinois, it could have future benefits for Ameren's plants in Missouri and the corporation's long-term growth options.
- Kansas City Power and Light has launched a SmartGrid Demonstration to serve as an industry blueprint for improved efficiency, environmental performance, and smart grid technologies implementation. Deployed within a determined Green Impact Zone, KCP&L's SmartGrid Demonstration has invested \$48.1 million in the Zone, serving 14,000 customers. The end-to-end process includes smart generation (including rooftop solar systems and battery storage), smart distribution (automated meter reading, smart switches, and smart capacitors), and smart consumption (giving customers the tools to manage their electricity).

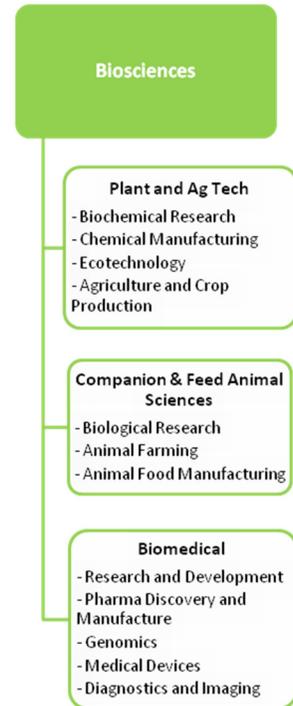


TARGET CLUSTER: BIOSCIENCES

Justification	Despite the Great Recession, the State’s Biosciences cluster registered five-year employment and wage gains.
	Missouri is a top-tier state in crop production and animal farming, which are the cornerstones driving new “seed and feed” technologies.
	Biosciences provide high-wage job opportunities (\$61,814 average wage across the entire target cluster) and occupational options for workers of diverse skill sets and abilities in Missouri’s rural and urban communities.
	Over the last five years, R&D services experienced explosive growth adding 2,271 jobs in Missouri (29 percent growth compared to 7.68 percent growth nationwide).
	Extensive network of university and corporate-supported research and workforce development resources throughout the State supporting diverse niche areas within the Biosciences cluster.
	Eighty percent of Biosciences and other technology-based companies stay in the location where they begin.
Challenges	Over the last five years, pharmaceutical manufacturing in Missouri contracted at a more rapid rate than it did nationwide during the recession.
	Concern that the State’s economic development programming supporting Biosciences has not been well coordinated or aggressive enough, with stakeholders pointing to the success of the Kansas Bioscience Authority as an example.
	Long-term funding of the Missouri Technology Investment Fund at risk since MOSIRA failed to pass the State Legislature in 2009.
	Stemming comparatively low per capita expenditures on Biosciences academic research and development, low rates of business formation, and venture capital capture by in-state firms.
Opportunities	Robust network of existing high-tech employers including corporate headquarters, research labs, production sites, and industry associations which continue to expand and invest in Missouri; supply chains provide valuable recruitment leads.
	Striving for a “tier 1” K-12 talent pipeline status for preparation in the Biosciences.
	Beginning to close commercialization, venture capital, and firm creation gaps in Missouri affecting all target clusters, but particularly long-term growth optimization with the Biosciences cluster.
	Working with State legislators and regional partners to optimize Biosciences incentives and research/technology funds.
	Capturing an increased proportion of Missouri-originated venture capital by Missouri-based firms.
	Cross-target catalyst growth opportunities with all six of Missouri’s other recommended target clusters.

TARGET OVERVIEW

The Biosciences target encompasses three niches: **Plant and Agricultural Technology, Companion and Feed Animal Sciences, and Biomedical.** The side graphic illustrates the various subsectors included in this target. The Biosciences cluster incorporates the plant and animal research and chemical, pharmaceutical, and medical equipment manufacturing aspects of Missouri’s existing Life Sciences target as well as the chemical, crop, and animal feed production aspects of the Agribusiness target. The remaining pieces of the Life Sciences and Agribusiness targets have been assigned elsewhere or dropped as economic development priorities. These changes received positive feedback from participants in the Regional Forums and the Steering Committee.



The Biosciences target encompasses components of the biotechnology industry: agriculture chemicals and feedstock (17 percent of the market, according to Battelle), drugs and pharmaceuticals (33 percent), medical devices and equipment (37 percent), and research and testing (13 percent). Communities across the United States continue to vie for the biotechnology market; however, projections are that current biotech hubs such as Boston, Northern New Jersey, Philadelphia, Raleigh-Durham, San Diego, San Francisco, Seattle, and Washington/Baltimore will continue to dominate employment in this sector for years to come. However, smaller markets that have developed strong niche areas have emerged as players. This is certainly the case for the State of Missouri and its competitive advantages in animal sciences, agricultural technologies, pharmaceutical and chemical manufacturing, and medical equipment manufacturing.

BIO (Biotechnology Industry Organization) reports an impressive list of Missouri activities that support growth in biotechnology (many of which will be discussed later), while the National Venture Capital Association reports that the amount of venture capital invested in biotechnology has held steady in Q3 2010, after deep declines in 2008 and 2009. It remains the most well funded industry by venture capitalists.

According to a white paper submitted as part of this strategic planning process by the Center for Emerging Technologies, 80 percent of bioscience and other technology-based companies stay in the location where they begin. Missouri has a robust network of public and private entities supporting research and economic growth within this target including companies such as Monsanto, an agricultural chemical product manufacturer and Sigma-Aldrich Corporation, a biological product manufacturer. The State also has headquarters

for important industry associations such as the U.S. Soybean Export Council (Chesterfield, MO), the National Biodiesel Board (Jefferson City, MO), the National Corn Growers Association (St. Louis, MO), the American Soybean Association (St. Louis, MO), the American Angus Association (St. Joseph, MO), and Dairy Farmers of America (Kansas City, MO). Missouri also benefits from the recognition of Kansas City as the global leader in animal health and nutrition research and innovation. Other key employers include ABC Laboratories, a biochemistry and pharmaceutical lab; Sinclair Research Center, a biomedical research facility providing services to animal and human health industries; and Inovatia Laboratory, an analytical chemistry research firm.

The **Plant and Agricultural Technology** niche leverages the State's agriculture base and combines it with its research and existing life sciences bases to create various products, such as biochemicals and ecotechnologies that enhance the existing target segment of pharmaceutical and chemical manufacturing.

- Biochemical Research: This research combines elements of the studies of chemistry and biology to understand the chemistry of living organisms, or how chemical materials behave in biological systems. Biochemical research includes identifying and characterizing structures and processes; examining functions, causes, and effects; and developing new ways to synthesize and engineer compounds for various applied uses. An example of this is genetically modified crop research, an endeavor undertaken by Monsanto as well as Danforth Plant Science Center. This process involves genetic engineering techniques, and the first commercially grown genetically modified crop was a tomato by Calgene, which later became a subsidiary of Monsanto.
- Chemical Manufacturing: This subsector includes the creation of chemicals, including separate chemical elements as well as chemically-defined compounds, using an array of processes. Businesses within this sector manufacture petrochemicals, industrial gas, inorganic and organic synthetic dyes and pigments, other inorganic chemicals, such as alkalis and chlorine, and other organic chemicals, such as ethyl alcohol.
- Ecotechnology: This field of study, also known as ecological engineering, is the integration of engineering and ecological principles to create approaches to conserving and restoring the environment. Ecotechnology seeks to operate within the natural system, finding ecosystem-based solutions, instead of overcoming or contravening it. Also important, ecotechnology emphasizes acknowledging and understanding the entire ecosystem instead of specific components separate from others.

- Agriculture and Crop Production: In 2009, the Missouri Field Office of the United States Department of Agriculture (USDA) reported that the State of Missouri had a total of 108,000 farms, covering over 29 million acres of land, or 66 percent of the State's total land use. According to the 2007 Census of Agriculture, Missouri ranks 2nd in number of farms and in forage. Missouri ranks 5th in the nation in acres of soybeans, 9th in acres of corn for grain, 9th in acres of cotton, and 13th in acres of wheat for grain. Agriculture has been a major asset for the State, evidenced by its rank of 12th in the nation in total value of agricultural products sold (\$7.5 billion in 2007) and 13th in the value of crops (\$3.5 billion in 2007). With 47 percent of Missouri's total agricultural receipts generating from crops, it is important to note that corn and soybeans are two of Missouri's top crops.

The **Companion and Feed Animal Sciences** niche includes the humane use of animals for the production of safe food, fiber, and other biological uses as well as the study of companion animals, their physiology in health and disease, and the ways companion animals can contribute to biomedical research.

- Biological Research: Animals are used in biological and biomedical research for various reasons, including to advance scientific knowledge about the behavior, development, and biological functions of animals and humans; to study disease processes and to develop new vaccines and medicines for both animals and humans; and to assess the safety of chemicals that could be harmful to animals, humans, or the environment.
- Animal Farming: Animal farming, or the breeding and raising of livestock, is an important part of Missouri's agricultural base. According to the 2007 Census of Agriculture, livestock production accounts for 53 percent of Missouri's agricultural receipts. Cattle and calves, hogs, and turkeys top production within the State. Missouri ranks 13th in the nation in the value of its livestock, poultry, and related products (\$4 billion in 2007).
- Animal Food Manufacturing: This subsector is comprised of businesses engaged in manufacturing food for animals from ingredients such as grain, oilseed mill products, and meat products.

The **Biomedical** niche offers high wages and the potential for dynamic spin-off employment through technology transfer and research commercialization. Biomedical sciences encompasses the study of the structure and function of the healthy body and the mechanisms of disease at the molecular, cellular, organ, and system levels and in all phases of life. More simply, through this niche, researchers are able to understand the causes of diseases and then develop safe and effective processes of diagnosing, preventing, and treating disease. This niche provides a platform for building additional innovation capacity

that feeds directly into the Health Sciences and Services target and formalizing processes to capitalize on this capacity for employment growth.

- Biomedical Research and Development: Medical laboratories provide diagnostic and analytic services to the medical profession as a whole and to patients as referred by a health provider. These include biological, forensic, and medical pathology labs.
- Pharmaceutical Discovery and Manufacturing: Pharmaceutical and medicine manufacturing involves the discovery and processing of botanical drugs and herbs and the manufacture of medicinal products, a necessary component of health care. This subsector also includes the making of products, such as tablets, capsules, and vials, needed for the consumption of medicine.
- Genomics: Genomics involves the study of DNA and, more broadly, organism genomes and the application of research discovery into new patient therapies.
- Medical Devices: Medical devices cover a range of products that are utilized during medical procedures, research, or to support general healthcare. The healthcare field is growing and expected to continue growing into the foreseeable future. As the overall sector grows, so will the need for medical devices.
- Diagnostics and Imaging: Radiology plays a vital role in biomedical applications. This sector includes processes that use electromedical and electrotherapeutic apparatus, such as magnetic resonance imaging equipment, medical ultrasound equipment, and electromedical endoscopic equipment to determine diagnoses.

Within this target cluster, there are several **cross-target catalyst** opportunities that if recruited, expanded, or developed could provide entryways into multiple target areas. Some examples of cross-target catalysts relevant to Biosciences include, but are not limited to, the following:

- Ethanol and biodiesel
- Bioinformatics
- Pharmaceutical and vaccine development and sales
- Bio-logistics
- Agricultural consulting
- Biosensors
- Farm product warehousing and storage
- Bio-oil asphalt binders

PEOPLE: OCCUPATIONAL ANALYSIS

Nearly 133,670 of the 2.67 million workers in Missouri are employed in core occupations relevant to the Biosciences target. As shown in the following tables, over 54 percent of the evaluated occupations offer average annual wages that significantly exceed Missouri's May 2009 average annual wage of \$39,250. Over 26 percent of the occupations examined, including agricultural and food science technicians, animal breeders, animal scientists, conservation scientists, food scientists and technologists, medical scientists, soil and plant scientists, and statisticians, have both location quotients of 1.0 or greater and annual wages that exceed the State average wage.

Biosciences Occupational Target: Plant and Agricultural Technology, May 2009

SOC Code	Occupation	Employment		Annual Mean Wage	
		Missouri	LQ	Missouri	United States
	Total, all Occupations	2,668,450	1.00	\$39,250	\$43,460
<i>Plant and Agricultural Technology</i>					
513092	Food Batchmakers	3,010	1.47	\$27,460	\$26,730
192031	Chemists	1,480	0.91	\$64,240	\$72,740
192041	Environmental Scientists and Specialists Including	1,310	0.77	\$50,860	\$67,360
452092	Farmworkers and Laborers Crop Nursery and Greenhouse	1,270	0.27	\$21,640	\$19,780
291031	Dietitians and Nutritionists	1,220	1.12	\$44,240	\$53,230
172081	Environmental Engineers	990	0.96	\$72,070	\$80,750
519011	Chemical Equipment Operators and Tenders	890	0.90	\$45,130	\$45,100
194011	Agricultural and Food Science Technicians	820	2.17	\$41,430	\$36,850
452091	Agricultural Equipment Operators	750	1.64	\$26,430	\$25,220
194031	Chemical Technicians	710	0.54	\$42,790	\$43,900
513093	Food Cooking Machine Operators and Tenders	650	0.86	\$20,860	\$24,630
191031	Conservation Scientists	590	1.72	\$53,010	\$61,180
119121	Natural Sciences Managers	570	0.63	\$110,620	\$127,000
452011	Agricultural Inspectors	440	1.54	\$37,920	\$41,860
191021	Biochemists and Biophysicists	380	0.81	\$55,750	\$88,550
131021	Purchasing Agents and Buyers Farm Products	340	1.42	\$43,880	\$62,450
194091	Environmental Science and Protection Technicians	320	0.51	\$38,780	\$43,520
194093	Forest and Conservation Technicians	300	0.47	\$36,720	\$36,370
191013	Soil and Plant Scientists	290	1.20	\$78,550	\$65,180
513091	Food and Tobacco Roasting Baking and Drying Machine Operators and Tenders	280	0.84	\$27,810	\$28,870
191012	Food Scientists and Technologists	240	1.09	\$59,650	\$64,370
451011	First-Line Supervisors/Managers of Farming Fishing and Forestry Workers	200	0.48	\$45,100	\$43,720
191032	Foresters	130	0.62	\$51,440	\$55,220
452041	Graders and Sorters Agricultural Products	120	0.15	\$25,180	\$20,640
452099	Agricultural Workers All Other	50	0.33	\$25,220	\$28,040
454021	Fallers	50	0.38	\$25,750	\$35,570
119011	Farm Ranch and Other Agricultural Managers	*	*	\$45,020	\$64,760
292051	Dietetic Technicians	*	*	\$26,880	\$28,530
454011	Forest and Conservation Workers	*	*	\$37,490	\$29,410

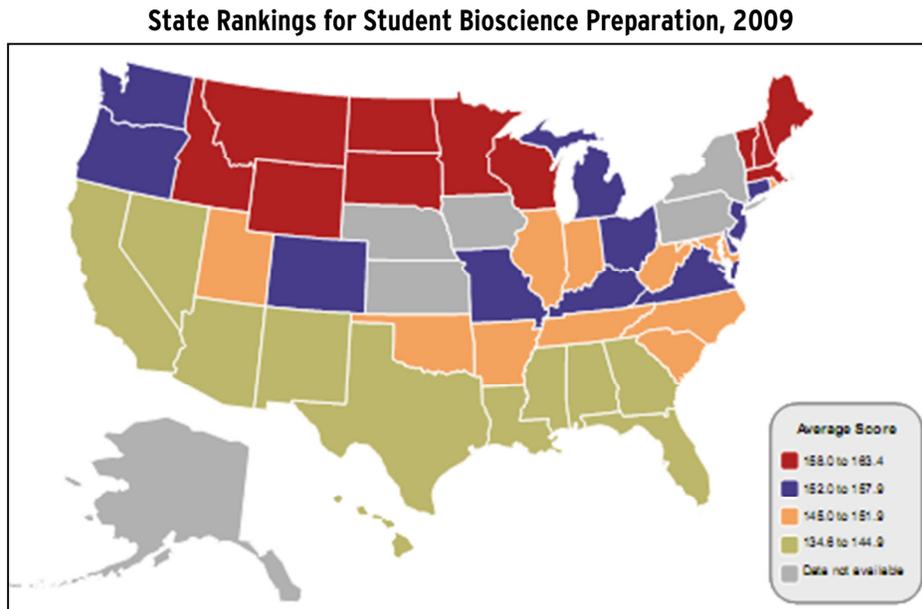
Source: U.S. Bureau of Labor Statistics, via MERIC

Biosciences Occupations: Companion and Feed Animal Sciences and Biomedical, May 2009

SOC Code	Occupation	Employment		Annual Mean Wage	
		Missouri	LQ	Missouri	United States
	Total, all Occupations	2,668,450	1.00	\$39,250	\$43,460
<i>Companion and Feed Animal Sciences</i>					
513022	Meat Poultry and Fish Cutters and Trimmers	2,730	0.79	\$24,440	\$22,900
513021	Butchers and Meat Cutters	2,480	0.97	\$26,150	\$30,270
513023	Slaughterers and Meat Packers	2,310	1.16	\$24,010	\$23,740
194021	Biological Technicians	1,350	0.89	\$38,590	\$41,140
292056	Veterinary Technologists and Technicians	1,180	0.73	\$30,530	\$30,580
452093	Farmworkers Farm and Ranch Animals	1,040	1.45	\$23,150	\$23,640
291131	Veterinarians	1,010	0.91	\$71,600	\$90,110
191029	Biological Scientists All Other	620	1.02	\$63,230	\$69,430
191023	Zoologists and Wildlife Biologists	320	0.90	\$50,180	\$60,670
191011	Animal Scientists	50	1.12	\$68,350	\$64,510
452021	Animal Breeders	40	1.15	\$25,080	\$35,210
<i>Biomedical</i>					
512092	Team Assemblers	29,950	1.47	\$28,500	\$28,840
292052	Pharmacy Technicians	9,980	1.47	\$25,190	\$28,940
151021	Computer Programmers	8,470	1.13	\$68,490	\$74,690
514041	Machinists	8,300	1.07	\$37,010	\$38,940
131023	Purchasing Agents Except Wholesale Retail and Farm Products	6,410	1.11	\$51,100	\$58,550
512099	Assemblers and Fabricators All Other	5,900	1.08	\$39,460	\$32,280
291051	Pharmacists	5,510	1.01	\$108,770	\$106,630
119111	Medical and Health Services Managers	4,430	0.80	\$74,400	\$90,970
292011	Medical and Clinical Laboratory Technologists	3,740	1.10	\$52,450	\$55,620
292012	Medical and Clinical Laboratory Technicians	3,620	1.16	\$33,300	\$37,860
512022	Electrical and Electronic Equipment Assemblers	2,910	0.74	\$30,560	\$30,690
119041	Engineering Managers	2,390	0.66	\$106,030	\$122,810
514081	Multiple Machine Tool Setters Operators and Tenders Metal and Plastic	2,190	1.41	\$31,750	\$32,860
191042	Medical Scientists Except Epidemiologists	2,180	1.05	\$69,300	\$84,760
512041	Structural Metal Fabricators and Fitters	1,730	0.87	\$36,790	\$35,080
292099	Health Technologists and Technicians All Other	1,160	0.72	\$39,210	\$42,180
499062	Medical Equipment Repairers	820	1.16	\$44,160	\$44,950
194099	Life Physical and Social Science Technicians All Other	610	0.50	\$38,180	\$44,870
152041	Statisticians	530	1.21	\$61,020	\$75,220
152011	Actuaries	440	1.20	\$88,780	\$97,450
292033	Nuclear Medicine Technologists	420	0.95	\$65,590	\$68,450
172041	Chemical Engineers	370	0.62	\$84,700	\$91,670
194091	Environmental Science and Protection Technicians Including Health	320	0.51	\$38,780	\$43,520
519082	Medical Appliance Technicians	230	0.82	\$35,180	\$38,590
191022	Microbiologists	200	0.60	\$68,760	\$71,980
172031	Biomedical Engineers	160	0.53	\$68,620	\$82,550
191099	Life Scientists All Other	110	0.44	\$89,670	\$72,590
191041	Epidemiologists	80	0.85	\$50,600	\$64,950

Source: U.S. Bureau of Labor Statistics, via MERIC

In 2009, Battelle released “Taking the Pulse of Bioscience Education in America,” a state-by-state assessment of student achievement in both the biosciences, state standards in biosciences, bioscience teacher quality and preparation, and bioscience experiential learning and career awareness. The following map shows the assessment scores of all 50 states with higher scores indicating stronger biosciences preparation among students. Overall, Missouri placed favorably in the second quartile, indicating solid overall preparation of a future pipeline of workers in the Biosciences target.



Source: Battelle

The State of Missouri has several programs at two- and four-year public and private not-for-profit colleges and universities that support the Biosciences target. Approximately 49 percent of the degrees and certificate awarded between 2005 and 2009 related to the Biosciences were in health professionals and clinical sciences programs. Other fields of study that comprised over 10 percent of degrees and certificates pertaining to Biosciences are engineering (13.1 percent) and biological and biomedical sciences (11.2 percent).

Degrees supporting this target are concentrated at the bachelor’s level (47.5 percent). It is important to note that only 0.1 percent of degrees and certificates supporting Biosciences are from science technologies programs. This may be an area that needs attention.

Missouri Degrees and Certificates Awarded in Biosciences Disciplines, 2005-2009

	Certificate below baccalaureate	Associate	Bachelor	Certificate above baccalaureate	Master	Doctorate/ Professional	TOTAL
Agriculture, agriculture operations, and related sciences	77	396	2,402	-	181	45	3,101
Biological and biomedical sciences	-	19	7,806	69	883	358	9,135
Computer and information sciences and support services	229	1,394	4,474	254	1,390	43	7,784
Engineering technologies/technicians	1,411	1,954	1,505	10	170	-	5,050
Engineering	6	109	6,631	601	2,999	329	10,675
Health professions and related clinical sciences	5,477	9,692	11,854	466	6,858	5,987	40,334
Mathematics and statistics	5	2	1,303	4	322	62	1,698
Natural resources and conservation	1	29	779	-	147	18	974
Physical sciences	-	2	2,054	-	645	214	2,915
Science technologies/technicians	16	89	12	-	-	-	117
Grand total	7,222	13,686	38,820	1,404	13,595	7,056	81,783

Source: National Center for Education Statistics, IPEDS Database

Note: Included in this analysis are all two and four-year public and private, not-for-profit colleges and universities in the State of Missouri.

The State of Missouri has several educational resources that support the Biosciences target, including, but not limited to, the following highlights.

St. Louis Community College

- St. Louis Community College offers associate degrees in biotechnology, chemical technology, clinical laboratory technology, biomedical engineering technology, and radiologic technology.
- The home for its Center of Plant and Life Sciences, the institution currently leases 10,500 square feet in the Bio-Research and Development Growth Park at the Danforth Plant Science Center. The space has three labs: one for tissue culture, one for molecular biology, and one for bio-manufacturing.

Metropolitan Community College-Longview

- MCC-Longview has an Associate in Applied Science in Grounds and Turf Management as well as certificate programs in grounds and turf maintenance, horticulture, and sustainable agriculture.
- MCC partners with Johnson County Community College in Kansas to provide access to the sustainable agriculture and horticulture certificate programs.
- The biology and chemistry majors at MCC campuses are also important as they prepare students to transfer to four-year institutions to major in these areas.

Lincoln University College of Agricultural and Natural Sciences

- The College of Agricultural and Natural Sciences at Lincoln University has two academic departments: the Department of Agriculture and Environmental Sciences and the Department of Life and Physical Sciences.
- In the former, students have five undergraduate options: Bachelor of Science degree programs in agriculture with emphases in animal science, plant and soil science, or natural resources management, in agribusiness, and in environmental science. The department also offers several minors, including agriculture, agribusiness, aquaculture, biotechnology, environmental science, geospatial information science, and wildlife management.
- Students are also able to take advantage of the pre-veterinary medicine pre-professional training program that provides the curriculum needed to qualify to apply to the College of Veterinary Medicine at the University of Missouri-Columbia. The Department of Agriculture and Environmental Sciences also offers a Master of Science in Environmental Science.
- The Department of Life and Physical Sciences offers undergraduate programs in biology, chemistry, and physics.
- Assets at Lincoln University include its George Washington Carver Farm, which supports research in plant science, environmental science, and animal science, and a new master plan to enhance its 280-acre Alan T. Busby farm to showcase integrated management systems for aquaculture, grazing management, power generation, and water conservation. The conversion will include new equipment for science laboratories and the development of two laboratories: an algae research lab to study the use of algae in biodiesel production and an adaptive optics and nanophotonics lab.

Missouri State University William H. Darr School of Agriculture

- Undergraduate majors include agricultural business, agricultural communications, agricultural education, agronomy, animal science, food plant management, general agriculture, horticulture, pre-professional in veterinary medicine, technology education, and wildlife/conservation management.
- The School of Agriculture offers Master of Science degree programs in natural and applied sciences, education, and plant science.
- Fruit science is an important cornerstone of MSU with significant research assets including the Darr Agricultural Center, the Missouri State Fruit Experiment Station, the Paul Evans Library of Fruit Science, the Horticulture Demonstration Area, and the Grapevine Biotechnology Center. Additionally, the University partners with the National Science Foundation, community and technical colleges throughout the Midwest, and regional vineyards and wineries through the Viticulture Enology Science and Technology Alliance (VESTA).

Northwest Missouri State University Department of Agriculture

- Eight undergraduate majors are offered: agriculture business, agriculture economics, agriculture education, agriculture science, agronomy, animal science, animal science (pre-vet), and horticulture, along with six minors: agronomy, agriculture science, animal science, commercial agriculture, horticulture, and precision agriculture.
- Northwest Missouri offers a farm operations certificate and a Bachelor of Technology degree in agriculture.
- In addition, there are three Master of Science degree programs offered in the Department of Agriculture: agriculture, education (teaching agriculture at the secondary level), and business administration with an emphasis in agricultural economics.
- The Department has a horticulture complex that houses classrooms, a research lab, a preparatory room, a growth chamber, and seven greenhouses. There is also a rodeo arena, a university dairy with over 80 cows, and an Embryo Transfer Laboratory. Northwest Missouri's R.T. Wright University Laboratory Farm is 750 acres and has a beef herd, a swine operation, grows corn, soybeans, alfalfa, and grass hay, and supports research in soil analysis and global positioning. The University's newest achievement is its utility patent for a bio-energy project which processes animal waste into fuel, making Northwest a pioneer in biomass energy.

Saint Louis University

- The Parks College of Engineering, Aviation, and Technology at SLU offers Bachelor of Science and Master of Science degree programs in biomedical engineering. The Biomedical Engineering (BME) Department has a teaching laboratory, five research laboratories, and four core facilities.
 - The teaching lab, which features 2,000 square feet of space, is a combined chemistry and biology laboratory with equipment such as a chemical fume hood, a biological safety cabinet, a pH meter, a centrifuge, and a UV and fluorescence spectrophotometer.
 - Research labs in the BME Department are the Reparative Medicine Lab, Tissue Engineering Lab, Interfacial Biomaterials Lab, Electrophysiology Lab, and Soft Tissue Biomechanics Lab.
 - Core facilities include a microscopy facility, a confocal microscope facility, an atomic force microscope facility, and a tissue culture facility.
- Current faculty research in the BME Department focuses on tissue engineering and biomaterials; biomedical signal processing, modeling, and electrophysiology; and orthopedic and cardiovascular biomechanics.
- The SLU School of Medicine offers a graduate program in biomedical sciences, which has four Ph.D. programs: biochemistry and molecular biology, molecular

microbiology and immunology, pathology, and pharmacological and physiological sciences.

- The Department of Biochemistry and Molecular Biology in addition to its Ph.D. program offers students an opportunity to seek a joint MD/Ph.D. degree. Resources within this departments include a Proteomics Center, an X-Ray Facility, molecular graphics facility, calorimetry, metabolomics, a SMART system, bioinformatics facility, spectrometry facility, labs with specialized instrumentation including a BioRad CHEF-DRIII gel system for separation of extremely large molecules of DNA, and a “real-time” PCR instrument, which can be used in applications such as measuring viral loads.
- The School of Medicine has an Institute of Molecular Virology which provides special facilities to research molecular virology, viral oncology, and cancer biology. The Institute’s research encompasses studying DNA tumor viruses and retroviruses as models for understanding the molecular basis of cancer and AIDS.
- Areas of interest in the Department of Molecular Microbiology and Immunology are viral pathogenesis, immunology, molecular and cellular biology, vaccine development, biodefense, and cancer gene therapy.

Southeast Missouri State University

- SMSU launched a new four-year agri-business degree program with focuses in agriculture industry, plant and soil science, animal science, and horticulture at its Kennett, Malden, and Sikeston regional campuses this fall. The program emphasizes row-crop production while focusing on accounting, finance, and marketing for agriculture.
- Southeast Missouri State University also has agricultural education, several categories within biology, and pre-veterinary medicine majors and minors.
- The Department of Agriculture has a new Charles L. Hutson Horticulture Greenhouse complex, which is located on a 17-acre site and covers 11,000 square feet.

University of Central Missouri Department of Agriculture

- UCM’s Department of Agriculture has bachelor’s degree programs in three majors: agriculture business, agriculture education, and agriculture technology. Within agriculture technology, students may focus on agriculture mechanization, agronomic science, animal science, or horticulture science.
- The University boasts its history of providing agriculture education for over a century and its hands-on learning environment. In addition to computer labs, the institution has a greenhouse/nursery complex and two university farms.

University of Missouri-Columbia

- The College of Agriculture, Food, and Natural Resources (CAFNR) offers several undergraduate majors, including agribusiness management; agricultural economics; agricultural education; agricultural journalism; agricultural systems management; sustainable agriculture; animal sciences; biochemistry; fisheries and wildlife sciences; food science and nutrition; forestry; parks, recreation and tourism; plant sciences; and soil environmental, and atmospheric sciences.
 - Within CAFNR is the Division of Animal Sciences. Undergraduate program majors include animal production and business, animal biotechnology, meat science, and pre-veterinary science. Minors include captive wild animal management and equestrian science. The Division also offers Master of Science and Ph.D. degree programs in animal science.
- CAFNR also offers several graduate programs in the following fields of study: agricultural education; agricultural economics; animal sciences; biochemistry; biological engineering; fisheries and wildlife sciences; food science; forestry; parks, recreation and tourism; plant sciences; rural sociology; and soil, environmental and atmospheric science.
- Additionally, 16 university-supported Agricultural Experiment Stations located throughout the State provide an extensive research and technology transfer network supporting agricultural, livestock, and wildlife development.
- The College of Veterinary Medicine has three academic departments: Biomedical Sciences, Veterinary Medicine and Surgery, and Veterinary Pathobiology.
 - Graduate degree programs offered in the CVM include Ph.D. programs in biomedical sciences and veterinary pathobiology; a Doctor of Veterinary Medicine program; and master's degree programs in biomedical sciences with emphasis areas in biomedical sciences, comparative medicine, vet medicine, and surgery.
- The CVM has several research facilities and resources. They include:
 - The Veterinary Medical Diagnostic Lab, with sections in anatomic pathology, avian, bacteriology and mycology, clinical pathology, histopathology, serology, toxicology, and virology and molecular diagnostics;
 - The Veterinary Medical Teaching Hospital, a state-of-the-art teaching and medical services facility which has a small animal clinic, an equine clinic, a food animal clinic, and an array of specialty services;
 - The Research Animal Diagnostic Laboratory, which provides rodent diagnostics, biological materials testing, genetic testing, and reproductive services colony management; and
 - The Zalk Veterinary Medical Library, which is the only one of its kind in the State and one of only 28 across the country, archives materials pertaining to all aspects of veterinary medicine.
 - Finally, the University of Missouri has a Genetics Area Program, an interdisciplinary Ph.D. program. The Program integrates research from 13

departments. Research areas include aging, cancer, disease resistance, genomics, plant molecular biology, proteomics, reproductive biology, and viral genetics.

- The Christopher S. Bond Life Sciences Center is a valuable campus asset and is committed to interdisciplinary research. Investigators at the Center focus on plant research; biomedical problems, including virology and diseases; and computational science, such as bioinformatics and biostatistics.

Washington University in St. Louis

- Washington University’s Department of Biomedical Engineering, the largest division of the School of Engineering and Applied Science, offers Bachelor of Science, Master of Science, and Doctor of Philosophy degree programs in biomedical engineering. Students also have the opportunity to pursue joint degrees: MS/MBA and MD/Ph.D. This MD/Ph.D. program, also referred to as the Medical Scientist Training Program (MSTP), is the largest in the nation.
- Major research areas within the Department of Biomedical Engineering are biomaterials and tissue engineering; cardiovascular engineering; imaging; molecular, cell, and systems engineering; and neural engineering.
- The School of Medicine received nearly \$500 million in financial support for biomedical research. One of many research areas, BioMed21 is the newest research initiative in the school and focuses on life sciences and specifically, on disease research. Other research areas include but are not limited to biochemistry and biophysics, bone and joint health and disease, cell biology and regulation, infectious diseases, neuroscience, pharmacology, and psychiatry and behavioral medicine.
- The Division of Biology and Biomedical Sciences has twelve doctoral training programs, ten of which are ranked among the nation’s top ten. These programs are biochemistry; computational and molecular biophysics; computational and systems biology; developmental biology; evolution, ecology, and population biology; human and statistical genetics; immunology; molecular cell biology; molecular genetics and genomics; molecular microbiology and microbial pathogenesis; neurosciences; and plant biology. These programs are interdisciplinary, and students are able to choose additional pathways of study: imaging sciences; human pathobiology; infectious disease; cancer biology; entrepreneurship; cognitive, computational, and systems neuroscience; and molecular engineering and biophysics.
- The Genome Center, one of only three National Institute of Health funded large-scale sequencing centers in the nation, is a global leader in genomics. Since the Center opened in 1993, it has received over \$800 million in funding and was a key player in the Human Genome Project, contributing 25 percent of the finished

sequence. Currently, major projects include cancer genomics, human genetics, and human microbiomes.

In addition to these institution-specific academic programs, the State of Missouri benefits from the **Agriculture Pathways Partnership**, a collaboration between Missouri State University, Crowder College, Missouri State University-West Plains, Northeast Oklahoma A&M, and Redlands Community College (Oklahoma). These institutions together offer a Bachelor of Applied Science (B.A.S.) in Agriculture. Upper division courses are administered by Missouri State University-Springfield and are available to students who do not plan to transfer to the physical location via alternative distance education methods, such as online classes and interactive television (ITV) intense weekend classes.

Missouri has also invested in biomedical science education at the middle school and high school levels, rounding out a dynamic talent pipeline. Project Lead The Way (PLTW) is a program offered through the Missouri Department of Elementary and Secondary Education and provides hands-on learning experiences to students. PLTW has a Pre-Engineering Program, which is currently offered in 87 high schools throughout the State, and a Biomedical Sciences Program, which operates in 13 high schools. Seven of these high schools are the first in the nation to earn national certification for the PLTW Biomedical Science Program. One specialization course offered in the Pre-Engineering Program is biotechnical engineering. The Biomedical Sciences program provides significant enrichment to students interested in math, science, and the human body, demonstrating how skills learned in the traditional classroom are used in the biomedical sciences, and helps students to develop a solid foundation in biomedical science before college. Offered in 44 Missouri middle schools, the PLTW Middle School program focuses on showing students how to implement engineering skills in everyday life to solve problems and exposes students to an overview of technology.

A 2008 Battelle report ranks the states in terms of per capita academic funding for the biosciences. While Missouri expends high per capita dollars on bioscience R&D, this research does not always translate into direct employment gains. Where Missouri is said to trail its competitors is in the capital-formation, proof-of-concept and incubation components of the commercialization pipeline.

Leading States—Academic Bioscience R&D Expenditures, FY 2006

Academic Bioscience R&D			
Leading States	Total in \$ Thousands	Leading States	Per Capita
California	\$4,008,809	District of Columbia	\$306.82
New York	\$2,528,232	Maryland	\$234.50
Texas	\$2,217,069	Massachusetts	\$174.02
Pennsylvania	\$1,478,008	Vermont	\$172.59
Maryland	\$1,313,685	Connecticut	\$161.29
North Carolina	\$1,310,490	North Carolina	\$147.75
Illinois	\$1,127,038	Nebraska	\$141.46
Massachusetts	\$1,119,740	New York	\$131.12
Ohio	\$1,048,200	Iowa	\$130.43
Florida	\$560,576	Missouri	\$127.08

Source: Battelle 2008 *State Bioscience Initiatives* report.
 Battelle calculations—based on NSF data and U.S. Census Bureau population estimates.

PROSPERITY: BUSINESS SECTOR ANALYSIS

Although some subsectors included in Missouri’s current Agribusiness target have been eliminated, agriculture remains a vital part of the State’s economy. As such, promising growth sectors are incorporated in this and other targets.

The following table shows Missouri’s employment and wages for the Biosciences target business sectors in the fourth quarter of 2009. Statewide, there are over 51,800 jobs in Biosciences-specific sectors, representing two percent of all jobs in the State. Over 60 percent of business sectors in the Biosciences target pay significantly higher than Missouri’s fourth quarter 2009 average annual wage of \$42,434. In fact, the target’s average annual wage is \$61,814, or 45.7 percent higher than the State’s average annual wage. From the fourth quarter of 2004 to the fourth quarter of 2009, the Biosciences target grew jobs by 6.3 percent. Over the same time period, average annual wages increased by 2.4 percent.

Over the last five years, three of Missouri’s Biosciences subsectors added jobs despite national job losses (grain and oilseed milling, chemical manufacturing, and medical equipment and supply manufacturing) and scientific research and development services experienced explosive growth adding 2,271 jobs (29 percent growth compared to 7.68 percent growth nationwide). At the same time, pharmaceutical manufacturing in Missouri contracted at a more rapid rate than it did nationwide during the recession.

Missouri Biosciences Target: Private Employment (by business subsector), 4Q 2009

4-Digit Code	Description				Employment			Average Annual Wage		
					MO # Change, 04-09	MO % Change, 04-09	US % Change, 04-09	MO # Change, 04-09	MO % Change, 04-09	US % Change, 04-09
Total across Sectors		2,604,179	-	\$42,434	-62,293	-2.34%	-2.15%	\$5,587	15.16%	16.00%
Plant and Agricultural Technology										
1111	Oilseed and Grain Farming	1,859	2.21	\$29,483	527	39.57%	33.23%	\$4,826	19.57%	23.40%
3112	Grain and Oilseed Milling	2,255	1.88	\$45,851	314	16.15%	-3.48%	\$3,895	9.28%	11.58%
3251	Basic Chemical Manufacturing	3,023	1.05	\$66,029	162	5.66%	-7.27%	\$11,526	21.15%	9.22%
3253	Pesticide, Fertilizer, and Other Agricultural Chemical Mfg	1,686	2.30	\$65,863	-208	-11.00%	-11.97%	\$2,146	3.37%	15.72%
3254	Pharmaceutical and Medicine Manufacturing	4,565	0.80	\$73,637	-668	-12.76%	-1.75%	\$10,120	15.93%	24.37%
4245	Farm Product Raw Material Merchant Wholesalers	2,502	1.61	\$48,453	-297	-10.61%	1.73%	\$19,964	70.08%	37.48%
5417	Scientific Research and Development Services	10,094	0.79	\$109,573	2,271	29.03%	7.68%	\$13,527	14.08%	22.20%
Companion and Feed Animal Sciences										
1122	Hog and Pig Farming	1,703	2.94	\$28,663	-291	-14.61%	19.75%	\$3,008	11.72%	17.36%
1152	Support Activities for Animal Production	533	0.95	\$26,428	-31	-5.50%	7.92%	\$1,054	4.15%	21.26%
3111	Animal Food Manufacturing	3,500	3.36	\$77,559	288	8.98%	5.42%	\$18,493	31.31%	13.53%
3254	Pharmaceutical and Medicine Manufacturing	4,565	0.80	\$73,637	-668	-12.76%	-1.75%	\$10,120	15.93%	24.37%
5417	Scientific Research and Development Services	10,094	0.79	\$109,573	2,271	29.03%	7.68%	\$13,527	14.08%	22.20%
5419	Other Professional, Scientific, and Technical Services	11,606	0.98	\$34,245	679	6.21%	9.93%	\$7,080	26.06%	26.79%
Biomedical										
3254	Pharmaceutical and Medicine Manufacturing	4,565	0.80	\$73,637	-668	-12.76%	-1.75%	10,120	15.93%	24.37%
3391	Medical Equipment and Supplies Manufacturing	4,769	0.78	\$52,814	249	5.51%	-0.21%	12,481	30.95%	13.23%
5417	Scientific Research and Development Services	10,094	0.79	\$109,573	2,271	29.03%	7.68%	13,527	14.08%	22.20%
6215	Medical and Diagnostic Laboratories	3,789	0.85	\$50,457	86	2.33%	14.35%	931	1.88%	14.04%

Source: U.S. Bureau of Labor Statistics via MERIC

Growth in Missouri's Biosciences sector has a strong multiplier effect in terms of creation of additional jobs and wealth. The following table highlights the economic impact of key Biosciences subsectors as indicated by NAICS code. These impact estimates are provided by MERIC and are only available at the three-digit NAICS code granularity level. Jobs in these sectors of manufacturing have multiplier effects ranging from 1.27 to 5.55, meaning that for every 100 jobs created in these subsectors, between 27 and 455 jobs are created in other sectors. Additionally, the GDP generated in these subsectors, particularly in food products and chemical manufacturing are strong, creating nearly \$92 million in impact for every 100 jobs in just these two subsectors.

The Impact of 100 New Jobs in Missouri by Sector: Biosciences

NAICS and Description	Job Impact				GDP Impact			
	Jobs Multiplier	Direct Jobs	Indirect Jobs	Total Jobs	GDP Multiplier	Direct GDP	Indirect GDP	Total GDP
111 Crop Farming	1.27	100	27	127	1.52	\$3.8	\$2.0	\$5.7
112 Livestock	1.31	100	31	131	1.92	\$2.1	\$2.0	\$4.1
115 Ag & Forestry Svcs	1.26	100	26	126	1.76	\$2.2	\$1.7	\$3.9
311 Food Products	4.03	100	303	403	3.37	\$8.5	\$20.1	\$28.6
325 Chemical Manufacturing	5.55	100	455	555	2.59	\$24.4	\$38.9	\$63.3
339 Miscellaneous Mfg	2.12	100	112	212	1.93	\$8.9	\$8.2	\$17.1
42 Wholesale Trade	2.11	100	111	211	1.67	\$11.8	\$7.9	\$19.7
541 Professional, Scientific & Tech Svcs	2.04	100	104	204	1.88	\$8.2	\$7.2	\$15.3
621 Ambulatory Health Care	1.77	100	77	177	1.67	\$7.9	\$5.4	\$13.3

Source: MERIC, IMPLAN Statewide Model

Note: Impacts represent rounded statewide estimates and are for reference only. Impact estimates for individual projects will vary based on region, time period, detailed industry, and project information. GDP listed in the millions.

PLACE: MISSOURI’S DYNAMICS

This section discusses some of Missouri’s incentives and innovation assets that make it a competitive location for Biosciences firms.

Incentives and Funding Support

Missouri has incentive programs specifically for biosciences/agriculture firms. Ensuring that these programs reflect the highest-value opportunities to facilitate employment growth from research and corporate-based endeavors will be a critical cluster-development strategy moving forward.

Energize Missouri Agriculture is a U.S. Department of Energy-approved initiative under the American Recovery and Reinvestment Act and received \$57.4 million in Recovery Act funding for promoting energy efficiency and renewable energy. There are two programs the Missouri Department of Natural Resources’ Division of Energy is operating through this initiative.

- The *Field Day Energy Training Program* provides farmers with the ability to reduce energy costs while strengthening energy efficient practices. Through a competitive application process, this program distributes grants of up to \$500,000 to organizations to provide education and training to Missouri farmers.
- The *Energy Efficiency Cost-Share Grant Program* is designed to help farmers become more energy efficient and profitable. Eligible farm operators, owners, or renters are reimbursed up to 75 percent of the purchase cost of qualifying equipment and systems, up to \$5,000 per applicant. Supported projects include solar powered systems, insulated waterers, global positioning systems, irrigation improvements,

improvements to dairy, swine, or poultry facilities, grain dryer upgrades or purchases, lighting upgrades, motion sensors and timers, conservation tillage equipment, high efficiency electric motors, and biomass furnaces and boilers for operations other than poultry houses.

The **Missouri Qualified Biodiesel Producer Incentive Fund** was established in 2002 to advance biodiesel production in the State. The grant is equal to thirty cents per gallon for the first 15 million gallons of biodiesel produced from Missouri agricultural products and ten cents per gallon for the next 15 million gallons. The maximum grant per fiscal year is \$6 million per plant; and producers, who must have a facility that is at least 51 percent owned by Missouri agricultural producers or use feedstock that is at least 80 percent of Missouri origin (and 100 percent of American origin) to qualify, are eligible for a total of 60 months.

Missouri supports the following tools to spur innovation and small business development within the Biosciences.

- Enacted in 2007, \$335 million **Lewis and Clark Discovery Fund** provides monetary support for life science facilities and infrastructure to enhance the competitiveness of Missouri's universities in conjunction with \$230 million in federal and local match funding. In addition to a \$15 million earmark for the Missouri Technology Corporation, programs supported by the Fund include the following:
 - Ag Biotech Company Recruitment Fund (\$3.35 million),
 - Opportunity Fund for Bioenergy Research Center/National Bio and Agro-defense Facility (\$3.25 million),
 - MTC Entrepreneur Pipeline Program (\$1.5 million),
 - Plant and Ag Biotech Seed Capital Co-Investment Fund (\$1.5 million),
 - High Tech Small Business Development Incentive Program (\$1.25 million),
 - Intellectual Property Management Fund (\$1.1 million),
 - St. Louis Information Technology Initiatives (\$1 million),
 - Medical Device Innovation Program (\$350,000),
 - High Tech Marketing Promotion Fund (\$350,000),
 - Missouri Open Innovation Network (\$250,000),
 - Missouri Power Resource Center (\$200,000),
 - AgBio Outreach Program (\$125,000), and
 - Emerging Firms Mapping Project (\$50,000).

- Administered by the Missouri Technology Corporation (MTC), the **Ag Biotech Recruitment Fund** supports the recruitment and retention of agriculture biotechnology companies through grants, low-interest loans, convertible debt, and direct equity investments in companies moving to Missouri. MTC also supports the

Missouri Venture Partners project, a \$15 million fund that provides awards up to \$50,000 to promising agbio, agritech, and medical devices/diagnostics firms in need of seed capital, and the **Missouri Technology Incentive Program**, which provides grants to assist small businesses with innovation and technology transfer costs. The aim of this program is to increase the number of Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) awards granted to small businesses in the State of Missouri.

- Established in 2003, the **Missouri Life Science Research Trust Fund** supports research and commercialization within the Bioscience cluster. By diverting 25 percent of Missouri funds received from the Tobacco Master Settlement Agreement, the fund issued approximately \$13 million annually in 2007 and 2008 in grants to support the following research areas: animal science; plant science; medical devices; biomaterials and composite research; diagnostics; nanotechnology related to drug development and delivery; clinical imaging; and information technology related to human health.

Two white papers submitted as part of this strategic planning process by Michael Helmstetter of the Midwest Research Institute and Donn Rubin of The Coalition for Plant and Life Sciences discussed Governor Nixon's proposed 2009 MOSIRA program, which was not passed by the State Legislature. The **Missouri Science and Innovation Reinvestment Act** (MOSIRA) would capture a small percentage of new growth in gross wages generated by employees working in certain firms focused on science and innovation. The program would not create any new taxes but rather create a sustainable funding stream for the Missouri Technology Investment Fund to invest in developing research and technology enterprises. Many stakeholders feel that the failure to pass MOSIRA through the Legislature was a missed opportunity for the State of Missouri.

Innovation Assets

Missouri has a number of assets that contribute to its competitive advantage in Biosciences, including a system of university-supported incubators (as referenced in the Information Technology cluster section).

The **Missouri Technology Corporation** (MTC), a private non-profit entity established by the State to enhance and expand the potential for technologically-based employment to drive Missouri's job growth in the coming decades. MTC oversees the operations of ten Innovation Centers in the State, works closely with the University of Missouri and the Missouri Federal and State Technology Program, and also provides grants and direct seed capital to businesses and organizations that conduct significant research and development or demonstrate the promise of growth or job creation, as previously mentioned. A sample listing of the projects that have received MTC funds are as follows:

- Missouri Western State University and its partnership with leading companies in the St. Joseph region were awarded \$175,000 to establish a laboratory and workforce training facility dedicated to animal health and nutrition located on the MWSU campus. The project, the *Animal Health Workforce Development Initiative*, was able to purchase equipment, lab supplies, hardware, and casework for the lab with the funding.
- The *Medical Device Innovation Program* at the University of Missouri-Columbia received a total of \$350,000 over three phases to enhance opportunities in medical device innovation and development and in tech transfer of businesses specializing in the development of medical devices. The program provides mentoring for student fellows matriculating through the process of delivering new devices and engineering health care solutions to the health market and encourages collaboration between physicians, engineers, and business people to create new entrepreneurial endeavors.
- MTC has also joined with the University of Missouri system to fund a new *Missouri Plant Science Center*, a plant science research center with manufacturing capabilities. The State has provided \$7.5 million in funding and incentives for the center, \$2.5 million of which was appropriated to MTC for the planning, design, renovation, equipment purchase, and construction of the facility.
- MTC has announced four new programs: Missouri TechLaunch, Bioscience Industrial Expansion, Seed Capital Co-Investment, and Missouri Building Entrepreneurial Capacity. These programs are intended to accelerate tech transfer within the state.
 - *Missouri TechLaunch* provides pre-seed funding to entrepreneurs for intellectual property development and evaluation for the purpose of facilitating the commercialization of research discoveries and increase the number of tech transfer start-ups launched.
 - *Bioscience Industrial Expansion* supports expansion efforts that secure significant capital investment and high-earning jobs in bioscience clusters.
 - The *SeedCap*, or Seed Capital Co-Investment, program provides seed capital funds that match qualified private capital investments and can be used for intellectual property development and evaluation.
 - The *Missouri Building Entrepreneurial Capacity* program (MOBEC) invests in entrepreneurs that are commercializing new technologies and enhancing the state's innovation capacity.

The **Missouri Botanical Garden** in St. Louis is a world renowned botanical research and conservation institution and is also the nation's oldest botanical garden. The Botanical Garden employs several Ph.D. researchers specializing in botanical research, science education, and biodiversity. The Garden maintains the world's largest database of plant information, TROPICOS, which contains web-based records for over 900,000 plant names

and nearly 2 million specimens. The Garden has several research centers, including but not limited to:

- The *William L. Brown Center* is designed to understand human relationships with plants and their environment, or ethnobotany. It is devoted to the study of useful plants and the conservation of plant species and preservation of knowledge. Botanists and researchers in this Center are involved in exploration and collection of botanical specimen and samples and in the use of ethnobotany and community development programs to preserve information about plant use.
- The *Center for Biodiversity Informatics* discovers and provides innovative technology solutions with respect to biodiversity to life science scholars. Biodiversity informatics is the creation, integration, analysis, and understanding of the degree of variation of life forms in any given ecosystem.
- The *Center for Conservation and Sustainable Development* seeks to inform conservation decision-making. Its mission is “to safeguard Earth’s biodiversity through the collaborative development and wise application of scientific expertise and resources.” The Center’s task is to consolidate and apply the Botanical Garden’s scientific expertise to ensure that the planet’s biological diversity is protected. The Center bridges the gap between research and conservation.
- The *Center for Plant Conservation* was created to prevent the extinction of U.S. native plants. A network of 36 leading botanic institutions, the Center operates the only coordinated national program of off-site conservation of rare plant material. The Center, working in research, restoration, technical assistance, education, and advocacy, is believed to be the largest living collection of rare plants in the world and maintains the national Collection of Endangered Plants.

Also in St. Louis is the **Donald Danforth Plant Science Center**, a not-for-profit research institute. The Center’s most prominent fields of research are biofuels, biofortification, disease resistance, drought tolerance, pesticide and fertilizer reduction, and biosafety and regulation. The Danforth Center aims to advance the applications of plant biology, genetics, and biotechnology to positively impact modern agriculture, global food production, human health and nutrition, and environmental sustainability. The Center boasts an impressive campus, which has on it a new Bio-Research and Development Growth Park (BRDG Park) that provides incubator space for emerging life science and clean tech start-up firms. The facilities feature research grade greenhouses, growth rooms and chambers, a microscopy suite, a proteomics facility, a tissue transformation complex, and world-class wet laboratories.

Other assets of the State are Greater Kansas City’s **Animal Health Corridor** and its reputation as a global leader in animal health and nutrition research, innovation, business function, and production. The Corridor was formed in 2006 and spans geographically from Manhattan, Kansas to Columbia, Missouri and north to St. Joseph, Missouri. The

Corridor consists of over 120 companies, all involved in animal health and nutrition, representing the largest single concentration of animal health companies in the world. Together, these companies make up nearly a third of the \$19 billion animal health market and seven percent of the \$49 billion pet food market. Since its origin, the Corridor has attracted thirteen new companies and three major expansions, creating 1,250 new jobs and over \$900 million in capital investment. At the core of this Corridor is the cutting-edge research being conducted at the institutions considered stakeholders of the Kansas City Area Life Sciences Institute, including:

- *University of Missouri – Columbia*, which has a Life Sciences Center and a Swine Research Center, and
- *Midwest Research Institute*, which boasts over 60 years of science research and development experience and specific expertise in various animal health care services, such as pharmaceutical safety.

The **Stowers Institute for Medical Research** is a biomedical research organization that conducts research leading to long-term solutions to genetically-based diseases such as cancer, diabetes, dementia, and birth defects. With over 490 employees, the Institute has a ten-acre campus in Kansas City with a \$300 million, 600,000 square foot, state-of-the-art facility that houses laboratories and research support facilities. The Institute also has a 280,000 square foot facility in south Kansas City that houses support functions, storage space, and the headquarters of BioMed Valley Discoveries, a for-profit research and development organization that develops basic biomedical discoveries into applications to improve human health. The Institute currently has 20 independent research programs and three technology development programs in bioinformatics, proteomics, and imaging.

The **Columbia Environmental Research Center**, located in Columbia, Missouri, is a U.S. Geological Survey environmental science research facility. Its mission is to conduct research needed to address national and global environmental contaminant issues and effects of habitat alterations on aquatic and terrestrial ecosystems. The Center employs scientists in several fields within environmental science who partner with federal, state, and local agencies, non-governmental organizations, and universities to advance scientific knowledge regarding the nation's natural resources.

Missouri has four research hospitals, three of which are teaching hospitals and are ranked by *U.S. News and World Report*. **Barnes-Jewish Hospital/Washington University** in Saint Louis is a teaching hospital and a 1,196 bed general medical and surgical facility with several specialties, 15 of which have been ranked, including 7th nationally in Orthopedics and 9th in Diabetes and Endocrinology. **Children's Mercy Hospitals and Clinics** in Kansas City is a 260-bed children's general facility and teaching hospital with five ranked pediatric specialties, including 13th in kidney disorders. **St. Louis Children's Hospital-Washington University** is a 250-bed children's general facility that serves as a teaching

hospital and has ten ranked pediatric specialties, including 5th in neurology and neurosurgery and 7th in pulmonology. **St. Luke's Hospital** is located in Kansas City and has 404 beds. In 2010, St. Luke's was awarded the Missouri Quality Award from the Excellence in Missouri Foundation.

Programmatic Support

Feedback provided during this strategic process expressed concern that Missouri is falling behind its competitor states in key areas of tech-based economic development capacity.

- Stakeholders and white paper authors pointed to the Kansas Bioscience Authority (KBA), which was established in 2004 through the Kansas Economic Growth Act along with a \$580 million fund, as a model; the Authority landed/grew 1,170 new jobs and generated \$212 million in new capital investments, \$86 million in new research funding, and \$43 million in equity investment between the 2004-09 period. Additionally, Kansas was selected to be the location for the \$650 million National Bio and Agro-Defense Facility, the Center of Excellence for Emerging Zoonotic Diseases, and Anthropod-Borne Animal Disease Research Unit. It was recently announced a second federal research lab will locate there as well. Ensuring that Missouri's economic development efforts keep pace with competitors in Biosciences is a key concern. By 2009, Kansas was ranked fifth in the nation for biotechnology strength and first in increased funding from the National Institute of Health. For every \$1 invested by KBA, the economy of Kansas gains \$9.41, despite the economic climate.
- A white paper submitted by Jay DeLong of the St. Louis RCGA on behalf of the Grow Me State Initiative Steering Committee pointed to significant commercialization, venture capital, and firm creation gaps in Missouri. These are issues that cross all targets but have been included here because of the extent to which research, development, and commercialization impacts the Biosciences cluster. DeLong points to some stark statistics including:
 - Missouri has extremely low per capita spending on capital formation -- \$0.10 compared to \$2.79 in neighboring states.
 - Missouri has increased its total amount of venture capital origination, but it has also seen a decrease in the proportion of this venture capital that is earmarked for in-state companies.
 - The 1996-2009 Kaufman Index of Entrepreneurial Activity shows that Missouri is very low in firm formation. DeLong notes, "Unfortunately, Missouri's company creation record has been poor. In the 2009 Kauffman Index of Entrepreneurial Activity, Missouri was second worst in the number of new companies created in 2008: 150 per 100,000 adults, compared to 590 in Georgia." This low index underscores the importance

of highlighting the low per capita spending on capital formation mentioned in the first bullet above.

Participants of the first round of Regional Forums indicated strong concern for commercialization and technology transfer funding and “proof of concept” support services at Missouri’s public universities, and angel investor and venture capital availability. Fifty-seven percent of participants identified these issues as their region’s #1 or #2 biggest innovation weakness with the greatest need for funding.



TARGET CLUSTER: HEALTH SCIENCES AND SERVICES

Justification	The Health Sciences and Services employment subsectors together have grown by seven percent over the last five years, despite the recession, with solid wage growth.
	Health Sciences and Services provide high-wage job opportunities (\$51,303 average annual wage across the target cluster) and occupational options for workers of diverse skill sets and abilities.
	Because eighty percent of Bioscience and other technology-based companies stay in the location where they begin, Missouri is poised to be a leader in health innovation.
	Missouri’s universities have a wide base of business-related programs that support the Health Sciences niche, training professionals able to increase efficiency in business processes in health care institutions.
	Broad base of health care service providers and innovators across all areas of the state including many nationally ranked hospital systems.
	Strong support from Regional Forum participants and the Steering Committee to support health care in state-level economic development programming.
Challenges	Low health ranking by the United Health Foundation (39 th in the nation).
	Missouri has workforce shortages in physicians in eighty percent of its counties and faces significant problem escalation if not addressed.
	White papers and research studies point to Missouri’s comparatively low rate of business formations and capital formation; Regional Forum participants express the need for enhanced commercialization and “proof of concept” support.
	Uncertainty regarding the fate of federal health care reforms and eventual impacts on Missouri’s health care providers.
	Inadequate information on the State’s health care workforce, as pointed out by some white paper submissions, makes it difficult to plan for capacity needs in the long-term or to craft maximally effective workforce recruitment and retention plans.
	While the State has a lower proportion of uninsured residents, 38 percent of Regional Forum participants indicate that health care costs are the most restrictive costs limiting their business growth, a larger percent than any other factor.
Opportunities	Missouri has established organizations such as the Missouri Technology Corporation that facilitate health technology transfer, providing the infrastructure needed to support health innovation.
	Continuing to work with communities and educational institutions to provide incentives for physicians to relocate to Missouri’s rural areas.
	Leveraging federal health reform and initiatives encouraging the use of electronic health records.
	Department of Economic Development can play a coordinating role between existing regional strategies that target health care by helping to address common competitive concerns.
	Missouri’s medical schools provide opportunities, not only for general medicine, but also for specialized areas of medicine and cross-target research areas.
Growth in the development of health care workers and the capacity to fill the training “pipeline.”	

TARGET OVERVIEW

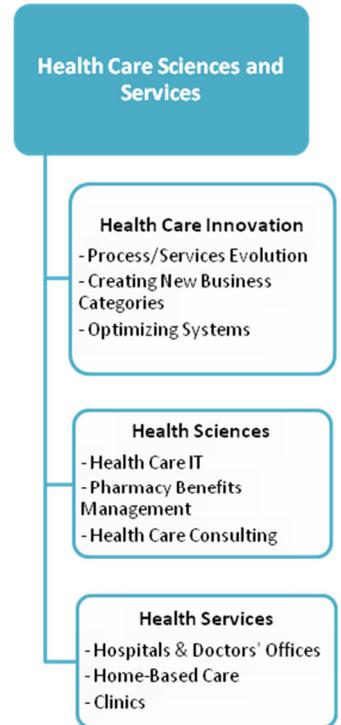
The Health Sciences and Services target encompasses three niches: **Health Care Innovation, Health Sciences, and Health Services.** The side graphic illustrates the various subsectors included in the target. This target encompasses the delivery and administration of health care as well as health innovations that advance the ease and efficiency of delivering services to patients and the translation of these innovations into start-up companies. This target provides high wage jobs, opportunities for workers of all skill levels, and contributes to the enhancement of Missouri’s overall quality of life.

This is a new target for the State of Missouri. Participants of the first round of Regional Forums indicated strong support for the creation of a target centering on opportunities in health care. Twenty percent of Forum participants felt that health care services should be targeted by the State, the largest proportion behind green technologies (which have, to a certain extent, been incorporated in all recommended targets). Only four percent felt that components of the existing 2007 Life Sciences target should no longer be pursued; three percent for the existing Information Technologies. These areas which have carried over into the 2011 targets coalesce nicely with growth opportunities in health care. Additionally, many existing regional target strategies incorporate health care. There are great opportunities for the Department of Economic Development to play a coordinating role.

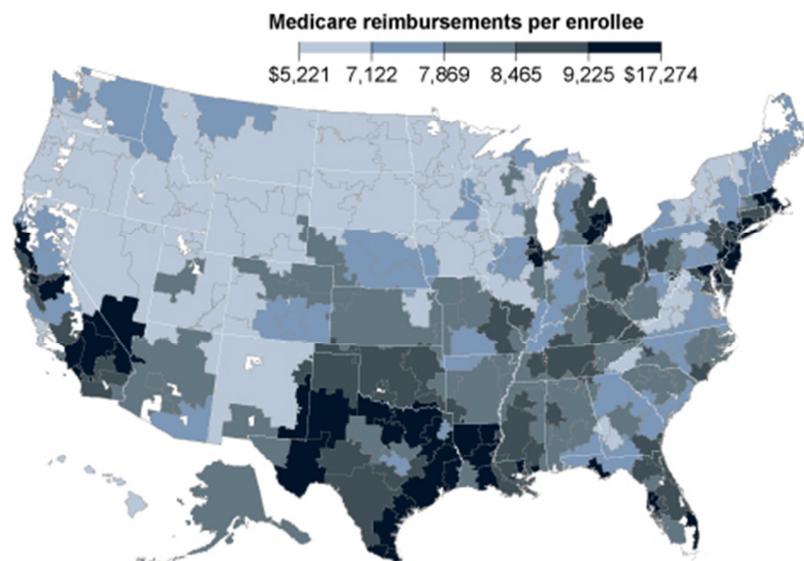
The health care sector is a not only a State strength—it is a national asset that has shown resilience throughout the recession, growing jobs despite overall job losses and continuing to make significant direct and indirect GDP impacts on communities. In 2009, although the nation lost over 3.9 million jobs, the health care sector gained 266,700 jobs, one of only two sectors to gain jobs (the educational services sectors gained 13,800 jobs).

With the first wave of the Baby Boom generation entering retirement, the U.S. Census Bureau estimates that, between 2010 and 2030, the national proportion of residents ages 65 and over will increase from 13 to 20 percent. As the nation’s overall population ages along with the Baby Boom generation, an increasing number of individuals will require medical services, hospital, nursing, and at-home care, and will purchase trillions of dollars worth of medications, medical devices, and other health related products. While federal reform efforts¹ may change the nature of service delivery, demand for health care services and investments in life science research will continue to rise.

¹ Note: The Missouri Hospital Association submitted white papers on the potential impacts of federal health care reform on health care coordination models and other areas germane to this target. However, with a potential repeal looming as Republicans have gained control of the House of Representative issues associated with federal reform remain very much in the air at this juncture.



One issue of concern which may threaten the sector’s long-term performance and stability is the rising cost of health care. In 2008, the U.S. spent \$2.4 trillion on health care and, with average annual growth of 6.2 percent a year, this is expected to balloon to \$4.4 trillion by 2018, if left unchecked. The sector’s annual increase in spending reflects a rate nearly three times that of inflation (2.7 percent). This is further complicated by great regional variations in the cost of health care service delivery. The following map from the Dartmouth Atlas of Health Care shows Medicare reimbursements per enrollee. While most of Missouri falls in the middle of the cost spectrum, it is bookended by the Springfield region on the low-cost end and the St. Louis region on the high-cost end.



Source: Dartmouth Atlas of Health Care as published in The New York Times, 2010

The U.S. Census Bureau recently reported a decline in the proportion of adults covered by private or employer-provided health insurance nationwide for the eighth year in a row. High costs are reducing access, hitting small businesses and people with chronic disease the hardest. In fact, thirty-eight percent of Regional Forum participants indicate that health care costs are the most restrictive costs limiting their business growth, a larger percent than any other factor including labor (21 percent) or taxes (14 percent). At the same time, many seem to be satisfied with their quality of health care services. Health care ranked low in terms of priorities to improve quality of life in Missouri’s communities.

In fact, the State’s health care assets actually lead to traded employment as many patients travel from out of state for care. Because of its central location, as Missouri’s quality of general and specialty medical care continues to improve and expand, the State attracts out-of-state residents needing services. According to the Missouri Hospital Association, in 2009, out-of-state residents accounted for 9.5 percent of hospital discharges in Missouri, with \$3.3 billion in charges. Synergies between health innovation, sciences, and services

contribute to the attractiveness of Missouri health care options; the niches help drive state-of-the-art processes, products, and services that make health care delivery more efficient, safer, and more affordable.

The target's **Health Care Innovation** niche refers to the process of optimizing the provision of health care, whether through new services, health products or optimized health care administration. By capturing opportunities to advance the business and/or delivery of health care, companies can develop new lines of business or reinvent themselves as consultants or managers of health-system-improvement processes. In a sense, Health Care Innovation is a platform that subsequently leads to employment growth in the Health Sciences niche. It is a platform, however, that can be advanced through specific programming and guidance from key statewide organizations.

Health Sciences can be considered the “business side” of health services. It involves the application of health innovation to the marketplace. Examples include the following:

- Health Care Information Technology: The federal government and other entities are providing resources to improve health care delivery and diagnosis through the digitization and distribution of health care data. Examples of health care IT products are biosurveillance, clinical informatics, electronic health records, immunizations and response management, management engineering-process improvement, medication management, nursing informatics, organizational patient safety tools and practices, and public health case reporting.
- Pharmacy Benefits Management: Pharmacy benefit management is the third party administration of prescription drug programs and includes processing and paying of prescription drug claims, contracting with pharmacies, and negotiating discounts and rebates with pharmaceutical manufacturers. Seeking better means of managing the cost and utilization of prescription drugs and improving pharmacy benefits contributes to increasing patient treatment success.
- Health Care Consulting: Health care consultants provide an array of advisory services imperative to the effectiveness of health care providers, such as facilities planning, financial operations and planning, government regulation, human resources, information technology management, internal hospital management, managed care, operations, governance, physician practice management, strategy development and implementation, marketing, equipment planning, support and clinical services, and legal counsel.

Health Services includes hospitals, clinics, wellness centers, and medical laboratories. Health services jobs typically feature higher than average wages. While doctors, physicians, and nurse specialists earn top salaries, the jobs available to individuals without substantial

professional training can still provide viable, high-paying career opportunities in a stable profession. Furthermore, numerous technical support occupations in health services require only one or two years of education beyond high school.

- Hospitals and Clinics: “Hospitals” encompass children’s hospitals, general medical and surgical hospitals, substance abuse hospitals, mental health hospitals, and specialty hospitals such as osteopathic hospitals and physical rehabilitation hospitals. “Clinics” include doctors and dentist offices, nursing facilities, and rehabilitation centers. Additionally, adding emphasis to specialty medical services provides Missouri’s communities the opportunity to serve patients from outside of the State. Hospitals and clinics are the health service deliverers, and they are also important as they serve as an important portion of medical education for health professionals, providing hands-on training and experience for residents.
- Medical Laboratories: Medical laboratories provide diagnostic and analytic services to the medical profession as a whole, and to patients as referred by a health provider. These include dental, optical, and orthopedic labs as well as biological, forensic, and medical pathology labs.
- Wellness Centers: Wellness centers encourage residents to be proactive in their health. Through education and prevention measures, patients are empowered to live healthy lifestyles, avoiding when possible major illnesses and diseases such as diabetes and heart disease.

Within this target cluster, there are several **cross-target catalyst** opportunities that if recruited, expanded, or developed could provide entryways into multiple target areas. Some examples of cross-target catalysts relevant to Health Sciences and Services include, but are not limited to, the following. However, it should be noted that the niche areas health care innovation and health sciences are significant catalyst areas in and of themselves.

- Electronic health records
- Health care entrepreneurship
- Health informatics
- Health insurance regulation and management
- Hospital finance planning and management
- Medical device wholesalers

PEOPLE: OCCUPATIONAL ANALYSIS

Over 15 percent, or 403,750, of the 2.67 million workers in Missouri are employed in core occupations relevant to the Health Sciences and Services target. As shown in the following tables, this target is critical to the State economy, with 65.4 percent of the evaluated

occupations (covering 254,870 workers) offering average annual wages that significantly exceed Missouri's May 2009 average annual wage of \$39,250. Of the occupations examined, 30.8 percent (covering 189,740 workers) have both location quotients of 1.0 or greater and annual wages that exceed the State average wage. These occupations include, but are not limited to, budget analysts, chief executives, family and general practitioners, medical equipment repairers, network and computer systems administrators, occupational therapists, pharmacists, radiologic technologists and technicians, and registered nurses.

White papers submitted as part of this strategic planning process by the Missouri Hospital Association and Weldon D. Webb, Associate Dean for Rural Health at the University of Missouri's School of Medicine suggest that there is inadequate information on Missouri's health care workforce to adequately plan for capacity needs in the long-term or to craft maximally effective workforce recruitment and retention plans. Other states which have faced similar challenges include Iowa and North Carolina and in response have created Health Professions Data Systems.

Health Sciences and Services Occupational Target: Health Sciences, May 2009

SOC Code	Occupation	Employment		Annual Mean Wage	
		Missouri	LQ	Missouri	United States
	Total, all Occupations	2,668,450	1.00	\$39,250	\$43,460
<i>Health Sciences</i>					
111021	General and Operations Managers	35,380	1.03	\$94,920	\$110,550
151041	Computer Support Specialists	12,590	1.14	\$43,250	\$47,360
151051	Computer Systems Analysts	9,960	0.95	\$72,060	\$80,430
151071	Network and Computer Systems Administrators	8,700	1.26	\$67,220	\$70,930
111011	Chief Executives	7,100	1.17	\$150,040	\$167,280
131111	Management Analysts	6,420	0.57	\$71,010	\$84,650
113031	Financial Managers	5,870	0.58	\$107,060	\$113,730
131073	Training and Development Specialists	5,440	1.30	\$49,590	\$55,310
113021	Computer and Information Systems Managers	5,130	0.87	\$104,530	\$120,640
131079	Human Resources Training and Labor Relations Specialists All Other	4,220	0.94	\$55,980	\$59,070
151081	Network Systems and Data Communications Analysts	3,850	0.83	\$80,490	\$76,560
113011	Administrative Services Managers	3,720	0.75	\$75,620	\$81,530
151061	Database Administrators	2,840	1.29	\$65,320	\$74,290
112021	Marketing Managers	2,580	0.75	\$104,750	\$120,070
131072	Compensation Benefits and Job Analysis Specialists	2,300	1.01	\$51,490	\$58,520
132031	Budget Analysts	1,320	1.06	\$64,320	\$69,240
112031	Public Relations Managers	1,130	1.04	\$88,310	\$101,850
113049	Human Resources Managers All Other	1,110	0.86	\$101,150	\$105,510
152031	Operations Research Analysts	830	0.67	\$65,900	\$75,370
132061	Financial Examiners	700	1.32	\$76,240	\$79,070
112011	Advertising and Promotions Managers	630	0.86	\$77,100	\$97,670
113042	Training and Development Managers	510	0.85	\$84,410	\$94,360
113041	Compensation and Benefits Managers	470	0.65	\$96,760	\$95,230

Source: U.S. Bureau of Labor Statistics. Data refers to May 2009.

Health Sciences and Services Occupational Target: Health Services, May 2009

SOC Code	Occupation	Employment		Annual Mean Wage	
		Missouri	LQ	Missouri	United States
	Total, all Occupations	2,668,450	1.00	\$39,250	\$43,460
<i>Health Services</i>					
291111	Registered Nurses	62,130	1.18	\$57,460	\$66,530
311012	Nursing Aides Orderlies and Attendants	40,410	1.38	\$21,910	\$24,980
292061	Licensed Practical and Licensed Vocational Nurses	18,880	1.27	\$35,100	\$40,900
311011	Home Health Aides	13,090	0.67	\$20,060	\$21,620
292052	Pharmacy Technicians	9,980	1.47	\$25,190	\$28,940
292041	Emergency Medical Technicians and Paramedics	8,400	1.89	\$32,630	\$33,020
319092	Medical Assistants	8,160	0.81	\$26,560	\$29,450
251071	Health Specialties Teachers Postsecondary	6,410	2.36	\$102,310	\$103,340
292034	Radiologic Technologists and Technicians	5,690	1.30	\$49,110	\$54,180
291051	Pharmacists	5,510	1.01	\$108,770	\$106,630
319091	Dental Assistants	5,250	0.87	\$33,740	\$34,000
119111	Medical and Health Services Managers	4,430	0.80	\$74,400	\$90,970
291069	Physicians and Surgeons All Other	4,160	0.74	\$185,550	\$173,860
292071	Medical Records and Health Information Technicians	4,050	1.16	\$31,630	\$33,880
291062	Family and General Practitioners	4,030	1.99	\$154,590	\$168,550
291123	Physical Therapists	4,030	1.13	\$65,060	\$76,220
211022	Medical and Public Health Social Workers	4,000	1.47	\$41,190	\$48,340
292011	Medical and Clinical Laboratory Technologists	3,740	1.10	\$52,450	\$55,620
292012	Medical and Clinical Laboratory Technicians	3,620	1.16	\$33,300	\$37,860
211023	Mental Health and Substance Abuse Social Workers	3,550	1.37	\$34,260	\$41,350
292053	Psychiatric Technicians	3,380	2.34	\$24,340	\$30,730
311013	Psychiatric Aides	3,280	2.56	\$22,210	\$27,430
291127	Speech-Language Pathologists	2,860	1.25	\$61,250	\$68,350
211015	Rehabilitation Counselors	2,780	1.21	\$32,710	\$34,710
291126	Respiratory Therapists	2,720	1.24	\$47,980	\$54,200
319099	Healthcare Support Workers All Other	2,560	0.66	\$29,220	\$31,340
291122	Occupational Therapists	2,250	1.13	\$63,090	\$70,680
292021	Dental Hygienists	2,240	0.63	\$63,980	\$67,860
191042	Medical Scientists Except Epidemiologists	2,180	1.05	\$69,300	\$84,760
319094	Medical Transcriptionists	1,960	1.16	\$31,970	\$33,350
292081	Opticians Dispensing	1,800	1.45	\$26,580	\$34,790
292055	Surgical Technologists	1,620	0.87	\$37,590	\$40,710
291021	Dentists General	1,530	0.87	\$143,080	\$156,850
312021	Physical Therapist Assistants	1,480	1.14	\$46,040	\$48,590
211091	Health Educators	1,380	1.07	\$43,920	\$49,060
211011	Substance Abuse and Behavioral Disorder Counselors	1,320	0.82	\$36,030	\$40,420
291031	Dietitians and Nutritionists	1,220	1.12	\$44,240	\$53,230
292056	Veterinary Technologists and Technicians	1,180	0.73	\$30,530	\$30,580
319093	Medical Equipment Preparers	1,170	1.22	\$29,150	\$29,780

Source: U.S. Bureau of Labor Statistics. Data refers to May 2009.

Health Sciences and Services Occupational Target: Health Services, continued, May 2009

SOC Code	Occupation	Employment		Annual Mean Wage	
		Missouri	LQ	Missouri	United States
	Total, all Occupations	2,668,450	1.00	\$39,250	\$43,460
<i>Health Services, continued</i>					
292099	Health Technologists and Technicians All Other	1,160	0.72	\$39,210	\$42,180
211014	Mental Health Counselors	1,090	0.50	\$33,870	\$41,710
299011	Occupational Health and Safety Specialists	1,090	1.03	\$61,330	\$64,200
519081	Dental Laboratory Technicians	1,080	1.31	\$38,590	\$37,690
251072	Nursing Instructors and Teachers Postsecondary	1,050	1.05	\$58,520	\$65,240
211029	Social Workers All Other	950	0.63	\$40,140	\$50,470
292031	Cardiovascular Technologists and Technicians	850	0.87	\$41,970	\$49,730
519083	Ophthalmic Laboratory Technicians	830	1.33	\$29,930	\$29,880
292032	Diagnostic Medical Sonographers	830	0.79	\$61,140	\$63,640
499062	Medical Equipment Repairers	820	1.16	\$44,160	\$44,950
291125	Recreational Therapists	810	1.81	\$32,260	\$41,270
319011	Massage Therapists	780	0.68	\$35,180	\$39,780
291071	Physician Assistants	750	0.48	\$68,390	\$84,830
312011	Occupational Therapist Assistants	650	1.19	\$47,230	\$50,830
312022	Physical Therapist Aides	640	0.71	\$23,520	\$24,990
291041	Optometrists	630	1.16	\$98,810	\$106,960
299099	Healthcare Practitioner & Technical Workers All Other	610	0.53	\$51,810	\$52,110
291067	Surgeons	590	0.65	*	\$219,770
291061	Anesthesiologists	560	0.73	*	\$211,750
291063	Internists General	540	0.55	\$207,420	\$183,990
291011	Chiropractors	510	0.95	\$74,370	\$80,390
292054	Respiratory Therapy Technicians	460	1.49	\$37,830	\$45,680
299012	Occupational Health and Safety Technicians	450	2.19	\$52,670	\$47,280
299091	Athletic Trainers	450	1.44	\$43,430	\$44,020
292033	Nuclear Medicine Technologists	420	0.95	\$65,590	\$68,450
211013	Marriage and Family Therapists	400	0.74	\$56,820	\$49,020
291066	Psychiatrists	400	0.88	\$162,360	\$163,660
291065	Pediatricians General	340	0.57	\$155,350	\$161,410
131061	Emergency Management Specialists	330	1.24	\$49,220	\$56,900
319095	Pharmacy Aides	320	0.30	\$23,350	\$22,330
312012	Occupational Therapist Aides	280	1.71	\$28,100	\$28,890
291064	Obstetricians and Gynecologists	270	0.65	\$202,280	\$204,470
291121	Audiologists	250	0.97	\$58,200	\$66,850
519082	Medical Appliance Technicians	230	0.82	\$35,180	\$38,590
291124	Radiation Therapists	230	0.72	\$70,670	\$77,340

Source: U.S. Bureau of Labor Statistics. Data refers to May 2009.

Health Sciences and Services Occupational Target: Health Services, continued, May 2009

SOC Code	Occupation	Employment		Annual Mean Wage	
		Missouri	LQ	Missouri	United States
	Total, all Occupations	2,668,450	1.00	\$39,250	\$43,460
<i>Health Services, continued</i>					
291129	Therapists All Other	190	0.69	\$50,140	\$54,400
291199	Health Diagnosing and Treating Practitioners All Other	160	0.24	\$61,760	\$77,630
291081	Podiatrists	140	0.71	\$139,830	\$131,730
292091	Orthotists and Prosthetists	110	0.98	\$66,720	\$66,600
291022	Oral and Maxillofacial Surgeons	90	0.82	\$232,770	\$210,710
211019	Counselors All Other	80	0.13	\$30,650	\$44,400
533011	Ambulance Drivers and Attendants Except Emergency Medical Technicians	60	0.15	\$21,150	\$23,140
291029	Dentists All Other Specialists	40	0.39	\$181,440	\$153,570

Source: U.S. Bureau of Labor Statistics. Data refers to May 2009.

The State of Missouri has several programs at two- and four-year public and private not-for-profit colleges and universities that support the Health Sciences and Services target. As shown in the chart on the following page, approximately 22.8 percent of the degrees and certificates relevant to this target awarded between 2005 and 2009 were in health professionals and clinical sciences programs, while 47.5 percent were business and management-related. Only four percent of Health Sciences and Services-related degrees conferred were at the doctorate-level. This may indicate a shortage of medical doctor training programs, since Missouri's physicians per 100,000 residents (207.7) lags behind the nation (220.5). In fact, according to the Missouri Hospital Association, eighty percent of Missouri counties do not have an adequate number of physicians. As the population continues to age, this problem may escalate.

Missouri Degrees and Certificates Awarded in Health Sciences and Services Disciplines, 2005-2009

	Certificate below baccalaureate	Associate	Bachelor	Certificate above baccalaureate	Master	Doctorate/ Professional	TOTAL
Biological and biomedical sciences	-	19	7,806	69	883	358	9,135
Business, management, marketing, and related support services	1,062	3,698	46,378	419	32,422	82	84,061
Communications technologies/technicians and support services	74	265	275	-	-	-	614
Computer and information sciences and support services	229	1,394	4,474	254	1,390	43	7,784
Family and consumer sciences/human sciences	331	890	2,869	4	163	12	4,269
Health professions and related clinical sciences	5,477	9,692	11,854	466	6,858	5,987	40,334
Physical sciences	-	2	2,054	-	645	214	2,915
Psychology	-	162	12,118	42	4,584	253	17,159
Science technologies/technicians	16	89	12	-	-	-	117
Social sciences	11	6	8,866	91	1,407	142	10,523
Grand total	7,200	16,217	96,706	1,345	48,352	7,091	176,911

Source: National Center for Education Statistics, IPEDS Database

Note: Included in this analysis are all two and four-year public and private, not-for-profit colleges and universities in the State of Missouri.

Missouri has six medical schools:

- A.T. Still University
- Kansas City University of Medicine and Bioscience
- Saint Louis University
- University of Missouri-Columbia
- University of Missouri-Kansas City
- Washington University in St. Louis

Washington University in St. Louis is ranked 4th for research and 30th for primary care by *U.S. News and World Report* for top medical schools.

There are several healthcare management and nursing programs in the State, including but not limited to, the following:

- **Park University** offers undergraduate degree programs in health care management and organizational communication and associate's degree programs in medical records management, nursing, and office management.
- **Saint Louis University** offers undergraduate degree programs in clinical laboratory science, cytotechnology, health informatics and information management, health management, health sciences, information technology

management, investigative and medical sciences, nursing, occupational science and occupational therapy, physical therapy, and public health.

- SLU's Health Information Management (HIM) program is the oldest University-based HIM program in the nation. Fully accredited by the Commission on Accreditation for Health Informatics and Information Management Education (CAHIIM), the program is located on the campus of the University Health Sciences Center, creating an atmosphere of interdisciplinary learning with students and faculty in other areas such as nursing, physical therapy, and clinical laboratory science.
- **University of Missouri's** Department of Health Management and Informatics (HMI) has executive graduate certificate programs in health informatics and in health ethics, Master of Health Administration degree programs, Master of Science in Health Informatics programs, and an Informatics Ph.D. program.
 - The Health and Behavioral Risk Research Center, located within the Department of HMI, received a \$1.85 million grant from the Missouri Foundation for Health to conduct a 2011 county-level health surveillance study to determine local needs, the largest ever conducted in the State.
 - Of \$267 million provided through the American Recovery and Reinvestment Act of 2009, \$6.8 million was awarded to University of Missouri to establish the Missouri Health Information Technology Assistance Center. The Center will help to increase the use of electronic records by assisting thousands of primary care providers in the selection and use of the technology.
- **Webster University** offers undergraduate degree programs in biotechnology; health care administration; information management; information systems; information technology; management with emphasis areas in health care administration, human resource management, international business, and marketing; nursing; pre-dentistry; pre-medicine; pre-occupational therapy; and psychology. Webster also offers a Master of Health Administration program; Master of Science programs in computer science and distributed systems, nurse anesthesia, and nursing; and a Doctor of Management program. Graduate certificate programs include computer science and distributed systems, decision support systems, gerontology, healthcare education, healthcare leadership, nonprofit management, nurse educator, and nurse leader.
- **Ozarks Technical Community College (OTC)** has several programs that support the Health Sciences and Services target. Associate's degree programs include an Associate of Science in Nursing and Associate of Applied Science degrees in dental hygiene, dental assisting, emergency medical technician-paramedic, health

information technology, hearing instrument sciences, medical laboratory technician, occupational therapy assistant, physical therapist assistant, respiratory therapy, and surgical technology. Ozark also offers a practical nursing certificate program, which is approved by the Missouri State Board of Nursing. Upon graduation students are eligible to take the NCLEX-PN exam to become a licensed Practical Nurse.

OTC's High School Health Sciences offers high school seniors a program called Orientation to Health Occupations that provides an opportunity to observe health-related occupations. Students learn basic nursing skills and are prepared for the certified nurse aide exam. Through this Missouri Department of Health and Senior Services-approved nursing assistant training program, students receive exposure via the classroom as well as clinical rotation and observations.

- **Metropolitan Community College (MCC)** offers Associate in Applied Science programs in dental assisting, health information technology, generalist (a Human Services program), drug addiction services, LPN to ADN nursing, mental health, nursing, occupational therapy assistant, paramedic, physical therapist assistant, polysomnography, professional nursing, radiologic technology, respiratory care, and surgical technology. Certificate programs at MCC include basic EMT, coding specialist, dental assisting, drug addiction, medical transcriptionist, mental health technician, paramedic, and practical nursing.
- Programs that support the Health Sciences and Services target offered by **St. Charles Community College (SCC)** include Associate of Applied Science programs in computer science-database management and occupational therapy assistant and Associate of Science programs in health information technology and nursing. There is also an Associate of Applied Science in human services with five options: general, gerontology, substance abuse services, victimology, and youth services. Certificate of Achievement programs at SCC include training in data management and practical nursing. SCC's Pre-Health Professions Transfer Program allows students to pursue Associate of Arts degrees while preparing to transfer to four-year medical, dental, optometry, pharmacy, or veterinary programs.

PROSPERITY: BUSINESS SECTOR ANALYSIS

Companies such as Express Scripts, a pharmacy benefit management firm that processes prescription drug claims and manages drug plans for government agencies, private firms, and unions and the largest company headquartered in the St. Louis region, illustrate how massively the Health Sciences niche can affect the health care sector as a whole. The firm employs nearly 4,000 people in the St. Louis region and has a two-building headquarters on the campus of the University of Missouri at St. Louis, and a \$74 million drug

distribution center opened in June 2010. It is considering an expansion that would create 150 additional jobs and add a \$63 million building to its campus. Other top employers for this target include the University of Missouri Health System, Boone Hospital Center in Columbia, Fulton State Hospital, St. Mary's Health Center in Jefferson City, St. John's Health System and CoxHealth in Springfield, and the U.S. Department of Veteran Affairs.

The following table shows Missouri's employment and wages for the Health Sciences and Services target business sectors in the fourth quarter of 2009. Statewide, there are over 427,000 jobs in Health Sciences and Services-specific sectors, representing 16.4 percent of all jobs in the State. Many jobs in this target pay significantly higher than Missouri's fourth quarter 2009 average annual wage of \$42,434. In fact, the target's average annual wage is \$51,303, or 21 percent higher than the State's average annual wage. Nationwide, the health care sector as a whole has proved resilient throughout economic turmoil. Despite the recession, Missouri's Health Sciences and Services target has grown jobs by seven percent, and annual average wages have increased by nearly 14 percent.

Missouri Health Sciences and Services Target: Private Employment (by business subsector), 4Q 2009

4-Digit Code	Description	4Q09 Emp	4Q09 LQ	4Q09 AAW	Employment			Average Annual Wage		
					MO # Change, 04-09	MO % Change, 04-09	US % Change, 04-09	MO # Change, 04-09	MO % Change, 04-09	US % Change, 04-09
Total across Sectors		2,604,179	-	\$42,434	-62,293	-2.34%	-2.15%	\$5,587	15.16%	16.00%
Health Sciences										
5112	Software Publishers	2,792	0.55	\$77,476	399	16.68%	6.98%	\$803	1.05%	21.14%
5415	Computer Systems Design and Related Services	21,931	0.76	\$79,044	1,777	8.82%	20.92%	\$12,729	19.19%	14.56%
5416	Management, Scientific, and Technical Consulting Services	9,684	0.48	\$67,265	231	2.44%	21.19%	\$13,625	25.40%	16.84%
5417	Scientific Research and Development Services	10,094	0.79	\$109,573	2,271	29.03%	7.68%	\$13,527	14.08%	22.20%
5511	Management of Companies and Enterprises	57,874	1.56	\$75,925	-6,619	-10.26%	7.84%	\$5,451	7.73%	14.18%
Health Services										
6211	Offices of Physicians	40,141	0.85	\$78,156	2,792	7.47%	11.31%	\$10,457	15.45%	17.26%
6212	Offices of Dentists	13,349	0.80	\$45,485	551	4.30%	7.42%	\$6,126	15.56%	14.91%
6213	Offices of Other Health Practitioners	13,291	0.99	\$34,008	2,993	29.07%	22.70%	\$3,862	12.81%	16.73%
6214	Outpatient Care Centers	12,566	1.02	\$42,159	1,352	12.05%	19.15%	\$4,314	11.40%	20.51%
6215	Medical and Diagnostic Laboratories	3,789	0.85	\$50,457	86	2.33%	14.35%	\$931	1.88%	14.04%
6216	Home Health Care Services	17,473	0.81	\$27,567	4,525	34.95%	33.03%	\$5,132	22.87%	20.56%
6219	Other Ambulatory Health Care Services	7,972	1.47	\$35,352	1,221	18.09%	23.99%	\$5,030	16.59%	17.57%
6221	General Medical and Surgical Hospitals	131,488	1.19	\$46,844	9,923	8.16%	7.95%	\$8,371	21.76%	23.60%
6222	Psychiatric and Substance Abuse Hospitals	2,033	0.40	\$34,515	305	17.65%	1.91%	\$6,496	23.19%	16.44%
6223	Specialty (except Psychiatric & Substance Abuse) Hospitals	3,597	0.79	\$41,965	-21	-0.58%	24.07%	\$3,462	8.99%	24.93%
6231	Nursing Care Facilities	49,719	1.42	\$22,425	2,252	4.75%	4.80%	\$3,609	19.18%	17.61%
6232	Residential Mental Retardation, Mental Health and Substance Abuse Facilities	16,593	1.21	\$22,299	2,483	17.59%	10.89%	\$2,455	12.37%	14.68%
6233	Community Care Facilities for the Elderly	10,016	0.67	\$19,705	853	9.31%	22.76%	\$2,345	13.51%	13.80%
6239	Other Residential Care Facilities	2,771	0.77	\$25,337	536	24.00%	-2.39%	\$3,226	14.59%	11.62%

Source: U.S. Bureau of Labor Statistics via MERIC

The following table highlights the economic impact of key target subsectors as indicated by NAICS code. These impact estimates are provided by MERIC and are only available at the three-digit NAICS code granularity level. Jobs and wealth in these health sciences and services sectors have lower multiplier effects than other target subsectors, but it is important to note that subsectors relating to health sciences have important multipliers in this target—creating between 104 to 181 jobs in other subsectors and between \$15.3 to \$28.8 million in total GDP for every 100 jobs created in these particular subsectors.

The Impact of 100 New Jobs in Missouri by Sector: Health Sciences and Services

NAICS and Description	Job Impact				GDP Impact in Millions			
	Jobs Multiplier	Direct Jobs	Indirect Jobs	Total Jobs	GDP Multiplier	Direct GDP	Indirect GDP	Total GDP
511 Publishing Industries	2.81	100	181	281	1.91	\$14.0	\$12.7	\$26.8
541 Professional, Scientific & Tech Svcs	2.04	100	104	204	1.88	\$8.2	\$7.2	\$15.3
551 Management Of Companies	2.77	100	177	277	1.77	\$16.3	\$12.5	\$28.8
621 Ambulatory Health Care	1.77	100	77	177	1.67	\$7.9	\$5.4	\$13.3
622 Hospitals	1.78	100	78	178	2.04	\$5.6	\$5.9	\$11.5
623 Nursing & Residential Care	1.28	100	28	128	1.70	\$2.7	\$1.9	\$4.6

Source: MERIC, IMPLAN Statewide Model

Note: Impacts represent rounded statewide estimates and are for reference only. Impact estimates for individual projects will vary based on region, time period, detailed industry, and project information. GDP listed in the millions. GDP listed in the millions.

PLACE: MISSOURI’S DYNAMICS

Understanding current health care quality and access in the State is an important part of understanding the necessity and role that the Health Sciences and Services target will play in the wellness of residents across the State.

As discussed in the *Demographic and Economic Analysis*, according to the U.S. Census Bureau, 12.6 percent of Missouri residents are uninsured, compared to 15.4 percent nationally. However, according to Sperling’s, while there are 220.5 physicians per 100,000 residents nationwide, there are only 207.7 in Missouri. These measures help to illustrate the State’s health care capacity; but since together, in this instance, they do not depict a clear indication of Missouri’s capacity, a larger picture is necessary.

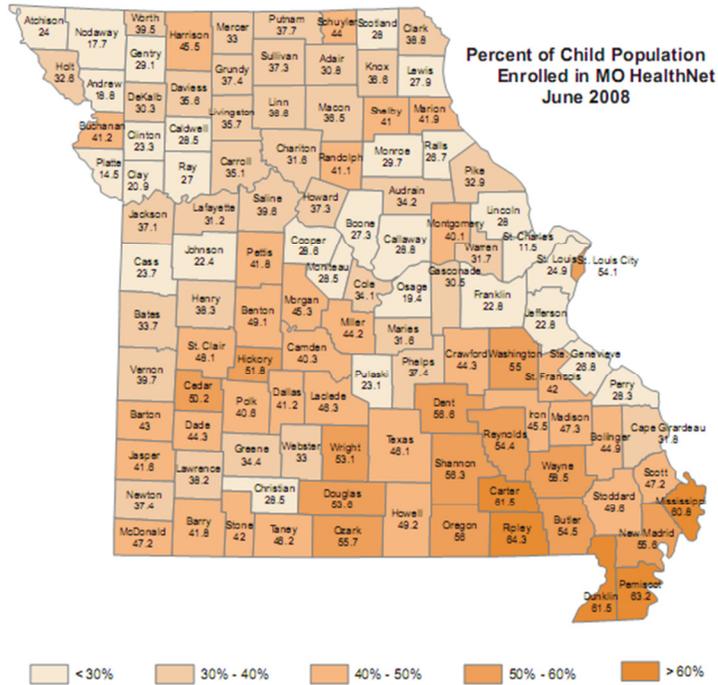
In 2010, Missouri ranked 39th in the nation in America’s Health Rankings, published by the United Health Foundation. The rankings are based on four groups of health determinants to provide a holistic view of health in the State: daily behaviors that affect personal health; the community and environment that reflect the daily lives of residents; public and health policies that affect the availability of programs to the general population; and clinic care, which is comprised of the quality and cost of health care services.

According to the report, Missouri’s strengths are a high rate of high school graduation, defined by the percentage of ninth graders who graduate within four years (81.9 percent), a low incidence of infectious disease (10.4 cases per 100,000 residents), and ready access to early prenatal care, defined by the percentage of pregnant women who receive prenatal care during the first trimester (86.4 percent). Challenges, however, include a high prevalence of smoking (23.1 percent of the State’s population); low public health funding (\$45 per person); low immunization coverage, defined by the percentage of children between the ages of 19 and 35 months who receive immunizations (86 percent), and a high incidence of

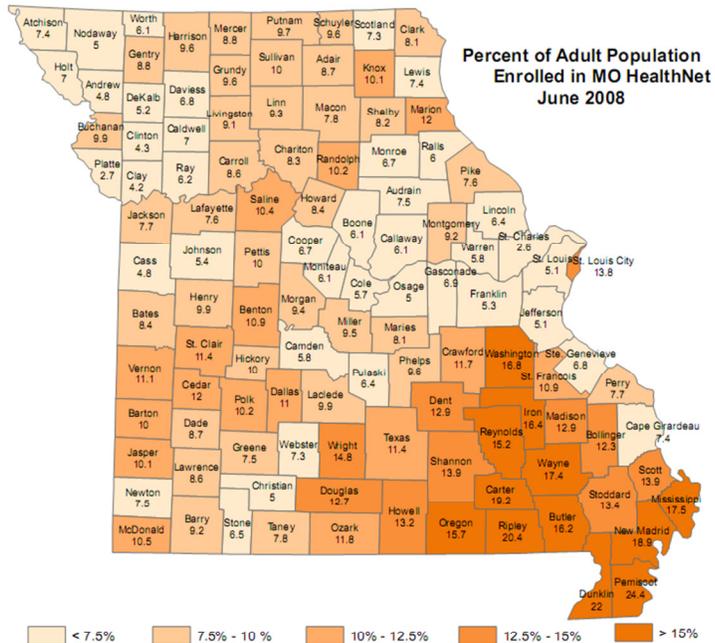
preventable hospitalizations, defined by the number of discharges per 1,000 Medicare enrollees (77.3). Health disparities found in Missouri include obesity and diabetes: 38.4 percent of non-Hispanic blacks are considered obese, compared to 28.4 percent of non-Hispanic whites, and 10.8 percent of non-Hispanic blacks have diabetes compared to 8.1 percent of non-Hispanic whites.

The Missouri Hospital Association (MHA) is a non-profit membership organization with over 150 member hospitals, representing every acute care hospital in Missouri as well as many of the federal and State hospitals and substance abuse and mental health facilities. MHA publishes several reports that reflect important statistics for the Health Sciences and Services target. As mentioned in the Prosperity section, the health care industry has proven its stability in difficult economic times. According to the MHA, Missouri hospitals added 1,100 jobs in 2009 while 62,600 were lost statewide across all sectors. In addition, one primary care physician working in a rural area creates 23 jobs and \$1.2 million in annual revenue, a significant impact. In 2008, Missouri hospitals invested \$1.4 billion in capital improvements and provided \$1.3 billion in patient care services for which they were not reimbursed. These community investments are evidence of how important hospitals are to Missouri's economy.

The MO HealthNet program was formerly the State's Medicaid program and provides health care benefits to low-income children and their parents and caregivers and to the elderly and disabled. Following are county maps showing the percent of adult and child populations enrolled in MO HealthNet in June 2008. There are similar patterns of enrollment across the two populations, with higher percentages of residents enrolled in HealthNet in the Southeastern portion of the State.



Sources: Medicaid Enrollment - Missouri Department of Social Services, Research and Evaluation, 0.14% of cases missing age category
Census Data - HIDI Online 2008 Census Report



Sources: Medicaid Enrollment - Missouri Department of Social Services, Research and Evaluation, 0.14% of cases missing age category
Census Data - HIDI Online 2008 Census Report

Missouri can point to recent examples of health care employers that have innovated to capture new growth opportunities. The Springfield Neurological and Spine Institute began as an independent neurosurgery group of 12 doctors, nine of whom were neurosurgeons, in 2001. In 2003, the group opened an imaging clinic next to its main clinic and initiated an alliance with CoxHealth. Since then, the group has grown into an 80-employee Institute that treats brain, spinal, and peripheral nerve disorders such as brain tumors and herniated discs and attracts patients from the Springfield areas as well as neighboring states, such as Kansas and Arkansas. Its upcoming takeover by the CoxHealth integrated health system will help to advance the Institute's goal of creating a neuroscience center that has national renown while helping to eliminate redundancies in patient care.

Another example, this time of Health Care Innovation leading to Health Sciences employment, is ClearPractice, a software company that has expanded to impact health care far beyond its initial focus on technology. The company started in 1999 as a software company with an electronic prescribing product and later added electronic health records and most recently, a product called Nimble to allow doctors to manage patient information by connecting their iPads to data centers managed by ClearPractice. The company now has nearly 500 doctors using its software. In 2007, the owners, John Doerr, a venture capitalist and Dr. Tom Doerr, a physician and software designer, purchased Essence Healthcare, a Medicare Advantage health maintenance organization, and have incrementally shifted the venture toward paying doctors for helping make patients healthier and now cover 50,000 people in six states. As the companies continue to expand and evolve, finding ways to leverage the federal programs encouraging the market for electronic health records, the Doerr brothers plan to encourage the delivery of better patient care by tackling the obstacles of cost and complexity preventing widespread adoption of electronic health records by doctors.



TARGET CLUSTER: INFORMATION TECHNOLOGY

Justification	Despite the recession, the Information Technology employment subsectors together have grown by sixteen percent over the last five years.
	More than three-quarters of the core occupations relevant to the IT cluster offer an average annual wage that exceeds (in many cases significantly exceeds) Missouri’s May 2009 average annual wage of \$39,250.
	Venture capital, R&D investments, and plans to hire new staff within the IT sectors show promising signs of rebound.
	Strong existing base of employers including DST Systems, Cerner Corporation, 3M, Northrop Grumman Interconnect, and Jack Henry & Associates.
	Missouri has the third lowest business energy costs in the nation, the fourth lowest electricity rates in the nation, and abundant water supply.
Challenges	Tax climate for data centers in Missouri is anti-competitive compared to adjacent states. Regional Forum participants cited the State’s business incentives as Missouri’s greatest competitive weakness.
	Below average competitive position with regard to broadband infrastructure.
	Many Regional Forum participants feel that existing private sector venture capital and state-supported R&D and technology commercialization funding are inadequate. In the wake of the realities of the Great Recession, these issues are difficult to rectify.
	Foreign competition in certain areas of Information Technology remains, although entry costs remain relatively high.
	Over the last five years, the State’s colleges and universities have conferred a very small number of certificates supporting this target, indicating potential workforce supply issues for technical entry-level jobs.
Opportunities	Areas like cyber security, health IT, data storage, and technology resource centers offer promising growth opportunities within the field and coalesce with other recommended target clusters.
	New data center niche focuses on opportunities in rural areas of the State that offer skilled workforces, low-cost power, and ample space for development.
	Leveraging relationships the State of Missouri has developed with IT businesses as its State government has been recognized for using information technologies to improve service and efficiency.
	Missouri currently has 15 million square feet of underground sites, offering natural climate control, enhanced security, and reduced vulnerability to natural disasters.
	Missouri Technology Corporation provides strong statewide support for entrepreneurs in high-tech fields, including Information Technology.

TARGET OVERVIEW

The Information Technology target encompasses three niches: **Software, Hardware, and Systems Design; Data Centers;** and **Technology Resource Centers**. The side graphic illustrates the various subsectors included in the target. Information Technology can be defined quite broadly; in general, IT is the use of technology to create, store, manage, exchange, and use data of various formats. IT can involve hardware and software, manufacturing, and services.

Information Technology continues to have an impact on businesses in virtually every industry sector. It is projected to be a sustainable growth sector as businesses continue to rely on innovative software, hardware, Internet applications, data processing services, file digitization, and computer security solutions to drive the growth of their businesses. Nationally, there are already promising signs of a turnaround in IT as companies finally ramp up spending on new software, hardware, and services. Furthermore, growth opportunities will continue to be born out of disruptive technologies, cyber security concerns, and other catalysts.

Published by CompTIA, a non-profit IT trade association, the *IT Industry Business Confidence Index* is a survey of IT businesses that aggregates three metrics: confidence in the national economy, confidence in the IT industry, and confidence in one’s own business. While the overall Index rose only 0.2 points in September, the six-month outlook for the IT industry saw a 5.0 point increase. The survey found that 53 percent of firms plan to invest in R&D or new revenue-generating initiatives and 37 percent of firms expect to expand their staff in the next six months. IT executives participating in the survey of nearly 400 firms indicated particular interest in security products and services and health care information technologies.

Cyber security is a growing opportunity area in IT. According to a recent article in *USA Today*, “U.S. Internet crime losses reached \$560 million in 2009, up from \$265 million in 2008, says the Federal Deposit Insurance Corporation. Research firm Market Research Media estimates that the federal government will spend \$55 billion from now through 2015 on cyber security. Globally, a recent study by the Computing Technology Industry Association, a non-profit trade group, found that 63 percent of large organizations surveyed in 10 nations experienced at least one security incident in the past 12 months, with 45 percent of those incidents classified as serious.” (“Security needs drive cyberforensics industry” –November 23, 2010).

Additionally, recent data from the National Venture Capital Association suggests that while overall venture capital (VC) investments nationwide have yet to rebound, many sectors germane to Information Technology have seen increases in VC investments over the one-



year period. As shown in the following chart, the semiconductor, software, IT services, and telecommunications sectors have all seen an increase in VC funds. While they have not yet reached pre-recession levels, this is nonetheless promising.

U.S. Venture Capital Investments: IT Sector 5-Year Trends

	<i>Millions of Dollars Invested</i>					<i>Change</i>	
	Q3 2006	Q3 2007	Q3 2008	Q3 2009	Q3 2010	1-Year	5-Year
Computers and Peripherals	\$178.36	\$115.60	\$98.54	\$104.01	\$86.40	-17%	-52%
IT Services	\$319.24	\$486.88	\$457.25	\$307.03	\$453.13	48%	42%
Networking and Equipment	\$281.86	\$411.04	\$177.32	\$263.46	\$124.01	-53%	-56%
Semiconductors	\$594.71	\$710.80	\$392.04	\$207.57	\$249.83	20%	-58%
Software	\$1,028.67	\$1,192.61	\$1,327.57	\$803.63	\$1,001.92	25%	-3%
Telecommunications	\$851.59	\$668.69	\$324.21	\$98.76	\$207.00	110%	-76%
<i>Total (all industries)</i>	<i>\$6,627.09</i>	<i>\$7,801.68</i>	<i>\$7,054.48</i>	<i>\$5,197.87</i>	<i>\$4,820.09</i>	<i>-7%</i>	<i>-27%</i>

Source: National Venture Capital Association and PricewaterhouseCoopers

Note: Category definitions can be found online at:

<https://www.pwcmoneytree.com/MTPublic/ns/nav.jsp?page=definitions>

While some outsourcing within IT is expected for programmers and similar occupations, significant IT employment is expected to remain in the U.S. because installation, repair and maintenance, and even the development of new software applications or systems, computer networks, or hardware systems must often occur onsite. The Great Recession heightened the cost-saving measures companies were willing to explore. While many IT firms explored outsourcing, most did not move forward due to the up-front capital needed to cover transaction costs, and those with existing contracts sought to re-negotiate at lower prices. These issues have been noted by many trade publications and business journals during 2009 and 2010.

On the public sector side, Missouri has been recognized for embracing IT to improve efficiency. Missouri scored a B+ in the 2010 *Digital States Survey* published by the Center for Digital Government. The survey examines policies and practices of state governments in their use of digital technologies to better serve their citizens and make more efficient their operations. Missouri's private business community in Information Technology is robust with major employers such as DST Systems, Cerner Corporation, 3M, Northrop Grumman Interconnect, and Jack Henry & Associates. Missouri has several economic development opportunities in the three niches within this target cluster.

The **Software, Hardware, and Systems Design** niche encompasses software design and publishing; data processing and hosting; computer systems design, including hardware, software, and communication integration; and research and development.

- **Software Design and Publishing:** This subsector includes establishments engaged in the design, development, documentation, installation, and publication of software. These firms also provide support services to software purchasers.

- Data Processing and Hosting: Businesses in this area provide infrastructure for hosting or data processing services. Data processing firms provide complete processing and specialized reports from client data or supply automated data processing and data entry services. Data hosting firms provide services such as web hosting, streaming services, application hosting, providing application service provisioning, and providing general timeshare mainframe facilities to clients.
- Computer Systems Design: This area is comprised of firms that are engaged in writing, modifying, testing, and supporting software; those that plan and design computer systems that integrate computer hardware, software, and communication technologies; those that specialize in the on-site management and operation of client computer systems and data processing facilities; and those that provide other professional and technical computer-related advice and services.
- Research and Development: These establishments conduct research and experimental development in electronics, computers, and other technology-related fields. This area fuels innovation and is imperative to keeping the State of Missouri in the forefront, increasing its competitiveness in this target cluster.

Data Centers provide additional growth opportunities for the State. According to the Missouri Coalition for Data Centers (which submitted a white paper on this topic as part of this strategic planning process), data centers are a \$27 billion industry in the United States, and represent a \$100 billion global industry growing at more than 8.0 percent annually. As more consumers use the Internet to conduct personal and financial business, companies are not only investing in increased server capacity but also in measures to protect their consumers' information and to manage information-related risks. Information assurance includes not only "server farms" or data centers, but it also requires skilled technicians and analysts to monitor usage and system performance.

The third niche area within the Information Technology target is **Technology Resource Centers**, which provide technical support services to customers and businesses. An example is IBM's new technology delivery center in Columbia, which provides customer assistance for more than 800 IBM products. These centers offer high-wage, high-skill employment opportunities and have the potential to expand as new markets for corporate products and technologies are developed.

Within this target cluster, there are several **cross-target catalyst** opportunities that if recruited, expanded, or developed could provide entryways into multiple target areas. Some examples of cross-target catalysts relevant to Information Technology include, but are not limited to, the following:

- Electronic health record management
- Bioinformatics
- Supply chain management/Third-party logistics recruitment (3PL)
- Inventory management software design, development, and device manufacturing
- Smart grid technologies
- Technology resource centers
- Geospatial intelligence and cyber security

Missouri's 2007 Information Technology target focused on three areas: communication services, computer systems design, and electronics manufacturing. Feedback from the Initiative's Steering Committee suggested weak support for the continued pursuit of electronics and communication services based on the performance of these sectors and their potential for growth throughout the entire State. Data provided by MERIC and input from DED staff supported these conclusions. With strong support from the Steering Committee, Data Centers were added as a niche area.

PEOPLE: OCCUPATIONAL ANALYSIS

Of the 2.67 million workers in Missouri, nearly 115,000 are employed in core occupations relevant to the Information Technology target. As shown in the following tables, this target is an asset to the State, with 82.4 percent of the evaluated occupations (covering 106,770 workers) offering average annual wages that significantly exceed Missouri's May 2009 average annual wage of \$39,250. In fact, 41 percent of the occupations (covering 72,740 workers) examined have both location quotients of 1.0 or greater and average annual wages that exceed the State average wage. These occupations include computer support specialists, network and computer systems administrators, computer programmers, computer specialists, database administrators, drafters, and general and operations managers.

Information Technology Occupational Target, May 2009

SOC Code	Occupation	Employment		Annual Mean Wage	
		Missouri	LQ	Missouri	United States
	Total, all Occupations	2,668,450	1.00	\$39,250	\$43,460
<i>Software and Computer Systems</i>					
151041	Computer Support Specialists	12,590	1.14	\$43,250	\$47,360
151031	Computer Software Engineers Applications	10,020	0.99	\$78,380	\$90,170
151051	Computer Systems Analysts	9,960	0.95	\$72,060	\$80,430
151071	Network and Computer Systems Administrators	8,700	1.26	\$67,220	\$70,930
151021	Computer Programmers	8,470	1.13	\$68,490	\$74,690
113021	Computer and Information Systems Managers	5,130	0.87	\$104,530	\$120,640
151032	Computer Software Engineers Systems Software	4,840	0.62	\$77,980	\$96,620
151099	Computer Specialists All Other	4,280	1.07	\$75,840	\$78,010
151081	Network Systems and Data Communications Analysts	3,850	0.83	\$80,490	\$76,560
151061	Database Administrators	2,840	1.29	\$65,320	\$74,290
439011	Computer Operators	1,710	0.88	\$36,020	\$37,540
439031	Desktop Publishers	580	1.24	\$38,170	\$38,960
173019	Drafters All Other	480	1.28	\$49,290	\$48,210
172061	Computer Hardware Engineers	230	0.17	\$93,910	\$101,410
151011	Computer and Information Scientists Research	*	*	\$69,460	\$105,370
<i>Data Centers</i>					
111021	General and Operations Managers	35,380	1.03	\$94,920	\$110,550
151041	Computer Support Specialists	12,590	1.14	\$43,250	\$47,360
151051	Computer Systems Analysts	9,960	0.95	\$72,060	\$80,430
439021	Data Entry Keyers	5,580	1.12	\$26,980	\$28,000
113021	Computer and Information Systems Managers	5,130	0.87	\$104,530	\$120,640
151032	Computer Software Engineers Systems Software	4,840	0.62	\$77,980	\$96,620
151099	Computer Specialists All Other	4,280	1.07	\$75,840	\$78,010
151081	Network Systems and Data Communications Analysts	3,850	0.83	\$80,490	\$76,560
151061	Database Administrators	2,840	1.29	\$65,320	\$74,290
439011	Computer Operators	1,710	0.88	\$36,020	\$37,540
<i>Technology Resource Centers</i>					
151041	Computer Support Specialists	12,590	1.14	\$43,250	\$47,360
151051	Computer Systems Analysts	9,960	0.95	\$72,060	\$80,430
151099	Computer Specialists All Other	4,280	1.07	\$75,840	\$78,010
151081	Network Systems and Data Communications Analysts	3,850	0.83	\$80,490	\$76,560
151061	Database Administrators	2,840	1.29	\$65,320	\$74,290

Source: U.S. Bureau of Labor Statistics. Data refers to May 2009.

Academic programs at two- and four-year public and private not-for-profit colleges and universities in the State of Missouri that support the Information Technology target include not only computer and information science-related programs, but also business, communications, and engineering programs. Between 2005 and 2009, computer and information sciences certificates and degrees (7,784) accounted for seven percent of IT-related degrees. With only 74 certificates conferred in communications technologies and

229 conferred in computer and information sciences supporting the Information Technology target, there may be an insufficient supply of programs supporting technical entry-level opportunities in this target. In fact, stakeholders commented that there is a shortage of IT personnel.

Missouri Degrees and Certificates Awarded in Information Technology Disciplines, 2005-2009

	Certificate below baccalaureate	Associate	Bachelor	Certificate above baccalaureate	Master	Doctorate/ Professional	TOTAL
Business, management, marketing, and related support services	1,062	3,698	46,378	419	32,422	82	84,061
Communications technologies/technicians and support services	74	265	275	-	-	-	614
Computer and information sciences and support services	229	1,394	4,474	254	1,390	43	7,784
Engineering technologies/technicians	1,411	1,954	1,505	10	170	-	5,050
Engineering	6	109	6,631	601	2,999	329	10,675
Grand total	2,782	7,420	59,263	1,284	36,981	454	108,184

Source: National Center for Education Statistics, IPEDS Database

Note: Included in this analysis are all two and four-year public and private, not-for-profit colleges and universities in the State of Missouri.

Programs specific to the Information Technology target cluster in Missouri include, but are not limited to, the following. Business degree areas are covered in the Financial and Professional Services target discussion.

Certificates and Associate Degree Programs

Computer, networking, and electronics programs below the baccalaureate level can be difficult to find in Missouri. The most robust offerings can be found at Metropolitan Community College in Kansas City and at Ozarks Technical Community College’s campuses. **Metropolitan Community College** offers certificate and Associate of Applied Science (AAS) programs in game programming, Cisco networking, web technologies, systems administration and engineering, and software development. AAS programs are offered in engineering technology with several specialization areas including electronics, and computers and electronics. **Ozarks Technical Community College** offers associate’s degrees in engineering, business technology, computer information science, networking technology. OTCC also has certification programs endorsed by CompTIA (A+, Network+, Security+), Microsoft (servers, certified technology specialists, certified IT professional) and Cisco as well as other general certificates in wireless network administration and PC building and repair.

Additional programs are also available at **Mineral Area College**, **North Central Missouri College**, and **Moberly Area Community College**; however, they offer limited degree and certificate offerings with just an AAS program in computer networking and electrical technology at Mineral, an AAS program in applied technology – electronics at North Central, and certificate and AAS degree programs in business and office technology, and computer information technology at Moberly.

Bachelor and Graduate Degree Programs

Many of Missouri's private colleges offer degree programs in computer science, networking, and information management. Notable assets include the following.

- **Washington University** has the most robust offerings among the State's private higher education institutions offering undergraduate degrees in electrical and systems engineering, electrical engineering, computer science, and computer engineering and graduate degrees in information management, robotics, electrical engineering, computer science and engineering, and systems science and math.
- **Missouri University of Science and Technology** offers bachelor's degrees in electrical engineering, computer engineering, engineering management, computer science, and information science and technology with master's and doctoral degrees offered in most of these areas.
- **Southeast Missouri State University** offers a robust array of bachelor's degree programs supporting this target, including computational systems, computer applications, computer information systems, computer networking, computer technology, computer science, computer systems, engineering technology, networking, engineering physics, and technology management. Graduate options, however, are limited to a master's degree in technology management.
- **Missouri Tech's** academic programs also strongly support the Information Technology target with associate's degree and/or bachelor's degree programs in network administration, IT, electronics engineering, electronics engineering technology, software engineering, and engineering management.
- **University of Central Missouri** students have available to them bachelor's degree tracks in computer information systems, computer science, engineering technology, and technology and master's degrees in computer information systems, computer science, information technology.
- **University of Missouri-Columbia** offers undergraduate programs in computer science, electrical engineering, computer engineering, and information technology

and graduate level degree programs in bioinformatics, computer engineering, computer science, electrical and computer engineering, and information science and learning technologies.

- **University of Missouri-Kansas City** offers bachelor's degree programs in computer science, electrical and computer engineering, and information technology.
- **Columbia College** offers associate's and bachelor's degree programs in computer information systems and bachelor's degrees in computer science and management information systems. **Fontbonne University** also has bachelor's degree programs in these two areas as well as a master's degree and graduate certificate in computer education.
- **Hannibal-Lagrange College** offers a bachelor's degree program in computer information systems, and **Lindenwood University** also offers bachelor's and master's degree programs in management information systems as well as a bachelor's degree in computer science.
- **Saint Louis University** offers undergraduate degrees in computer engineering and computer science.
- **Missouri Valley College** offers bachelor's degrees in computer information systems with specializations in software development, networking, and internet programming.
- **Park University** offers undergraduate programs in computer science and computer based information systems and associate's degree options in computer science.

PROSPERITY: BUSINESS SECTOR ANALYSIS

The following table shows Missouri's employment and wages for the Information Technology target business sectors in the fourth quarter of 2009. Statewide, there are nearly 95,500 jobs in Information Technology-specific sectors, representing nearly four percent of all jobs in the State. Many jobs in this target pay significantly higher than Missouri's fourth quarter 2009 average annual wage of \$42,434. In fact, the target's average annual wage is \$62,882, or 48 percent higher than the State's average annual wage. Furthermore, despite the Great Recession, the IT cluster has not shed jobs in recent years. Despite the recession, the target as a whole has grown jobs by over sixteen percent. As technology continues to advance and businesses increase their technological capacity,

this target will continue to prosper, and Missouri can increase its national competitive position in IT.

Missouri Information Technology Target: Private Employment (by business subsector), 4Q 2009

4- Digit Code	Description	Employment			Employment			Average Annual Wage		
					MO # Change, 04-09	MO % Change, 04-09	US % Change, 04-09	MO # Change, 04-09	MO % Change, 04-09	US % Change, 04-09
Total across Sectors		2,604,179	-	\$42,434	-62,293	-2.34%	-2.15%	\$5,587	15.16%	16.00%
Software, Hardware, and Systems Design										
5112	Software Publishers	2,792	0.55	\$77,476	399	16.68%	6.98%	\$803	1.05%	21.14%
5182	Data Processing, Hosting, and Related Services	10,769	2.15	\$86,033	-212	-1.93%	-6.61%	\$27,287	46.45%	23.20%
5324	Commercial & Industrial Machinery & Equipment Rental and Leasing	1,942	0.86	\$47,362	109	5.96%	4.52%	-\$897	-1.86%	16.40%
5414	Specialized Design Services	1,819	0.74	\$51,450	115	6.73%	-3.69%	\$8,473	19.72%	14.06%
5415	Computer Systems Design and Related Services	21,931	0.76	\$79,044	1,777	8.82%	20.92%	\$12,729	19.19%	14.56%
5416	Management, Scientific, and Technical Consulting Services	9,684	0.48	\$67,265	231	2.44%	21.19%	\$13,625	25.40%	16.84%
5417	Scientific Research and Development Services	10,094	0.79	\$109,573	2,271	29.03%	7.68%	\$13,527	14.08%	22.20%
Data Centers										
5182	Data Processing, Hosting, and Related Services	10,769	2.15	\$86,033	-212	-1.93%	-6.61%	\$27,287	46.45%	23.20%
5414	Specialized Design Services	1,819	0.74	\$51,450	115	6.73%	-3.69%	\$8,473	19.72%	14.06%
5415	Computer Systems Design and Related Services	21,931	0.76	\$79,044	1,777	8.82%	20.92%	\$12,729	19.19%	14.56%
5416	Management, Scientific, and Technical Consulting Services	9,684	0.48	\$67,265	231	2.44%	21.19%	\$13,625	25.40%	16.84%
5419	Other Professional, Scientific, and Technical Services	11,606	0.98	\$34,245	679	6.21%	9.93%	\$7,080	26.06%	26.79%
Technology Resource Centers										
5614	Business Support Services	24,860	1.51	\$31,710	8,003	47.47%	7.65%	\$5,531	21.13%	10.42%
5416	Management, Scientific, and Technical Consulting Services	9,684	0.48	\$67,265	231	2.44%	21.19%	\$13,625	25.40%	16.84%
5419	Other Professional, Scientific, and Technical Services	11,606	0.98	\$34,245	679	6.21%	9.93%	\$7,080	26.06%	26.79%

Source: U.S. Bureau of Labor Statistics via MERIC

Sectors related to Information Technology have strong multiplier effects in terms of creation of additional jobs and wealth. The following table highlights the economic impact of key Information Technology subsectors as indicated by NAICS code. Although telecommunications is not a component of this cluster, growth in this area supports the IT cluster through infrastructure and workforce development.

The Impact of 100 New Jobs in Missouri by Sector: Information Technology

NAICS and Description	Job Impact				GDP Impact in Millions			
	Jobs Multiplier	Direct Jobs	Indirect Jobs	Total Jobs	GDP Multiplier	Direct GDP	Indirect GDP	Total GDP
517 Telecommunications	3.72	100	272	372	2.04	\$20.8	\$21.5	\$42.3
518 Internet & Data Process Svcs	2.70	100	170	270	2.07	\$11.5	\$12.3	\$23.8
519 Other Information Services	3.52	100	252	352	2.44	\$13.4	\$19.3	\$32.7

Source: MERIC, IMPLAN Statewide Model.

Note: Impacts represent rounded statewide estimates and are for reference only. Impact estimates for individual projects will vary based on region, time period, detailed industry, and project information. GDP listed in the millions.

PLACE: MISSOURI’S DYNAMICS

Business Climate

The Missouri Partnership markets the State’s geographic advantages in Information Technology, including having the third lowest business energy costs in the U.S. (Small Business and Entrepreneurship Council), the fourth lowest commercial electricity costs in the U.S. (U.S. Energy Information Administration), and the fifth lowest corporate income tax rate in the U.S (Tax Foundation). With regards to Data Centers, Missouri currently has 15 million square feet of underground sites, offering natural climate control, enhanced security, and reduced vulnerability to natural disasters.

According to white papers submitted by Missouri Coalition for Data Centers and GreenM3 as part of this strategic planning process, neighboring states have become “data center friendly” by offering an array of incentives to land data centers for Google, Yahoo, Microsoft, and U.S. Bank (among others). These advantages include the following:

Nebraska

- Sales tax refund based on number of jobs created and investment
- Personal property tax exemption with a minimum investment

Iowa

- Sales tax exemption on computers and equipment
- Sales tax exemption on electricity
- Personal property tax exemption

Kansas

- Sales tax exemption on initial capital investment and subsequent investments (with required job creation)
- Personal property tax exemption

Oklahoma

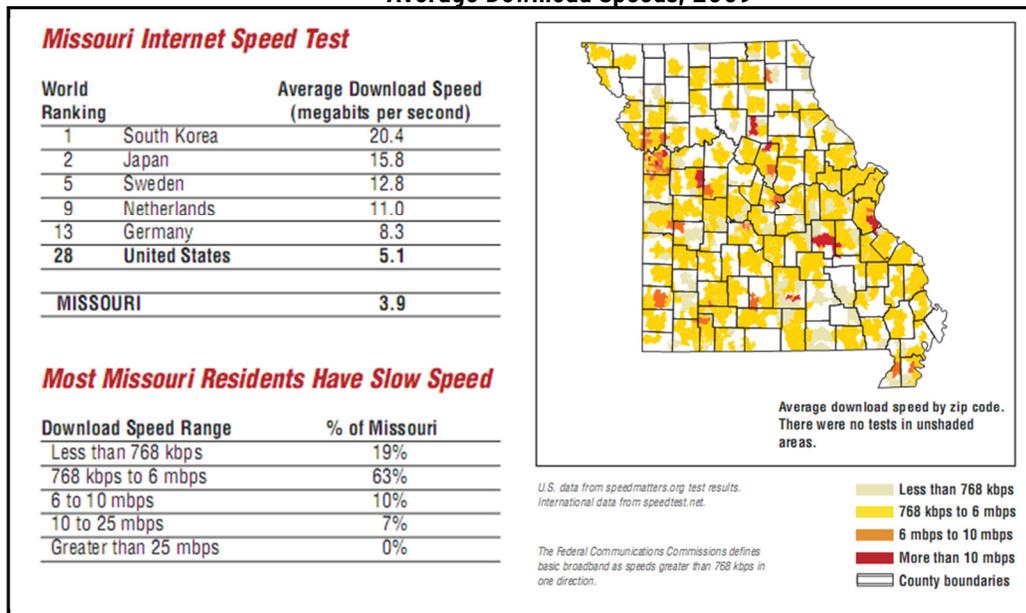
- Sales tax exemption on computers, equipment, and utilities

- Personal property tax abatement

Broadband Infrastructure

Broadband infrastructure is critical to Missouri’s overall competitiveness and especially pertains to the viability of the Information Technology cluster. Speed Matters is a project of the Communications Workers of America, a union for workers in communications, media, airlines, manufacturing, and public service. Speed Matters tracks broadband speed and investments and advocates for advancement of U.S. broadband infrastructure. According to Speed Matters, in 2009 the average download speed for the nation was 5,222 kilobytes (kbps) per second and the average upload speed was 1,126 kbps. Missouri’s infrastructure facilitates an average download speed of 3,878 kbps and upload speeds of 781 kbps. Missouri ranks 39th among the states for fastest download speeds, which is not favorable.

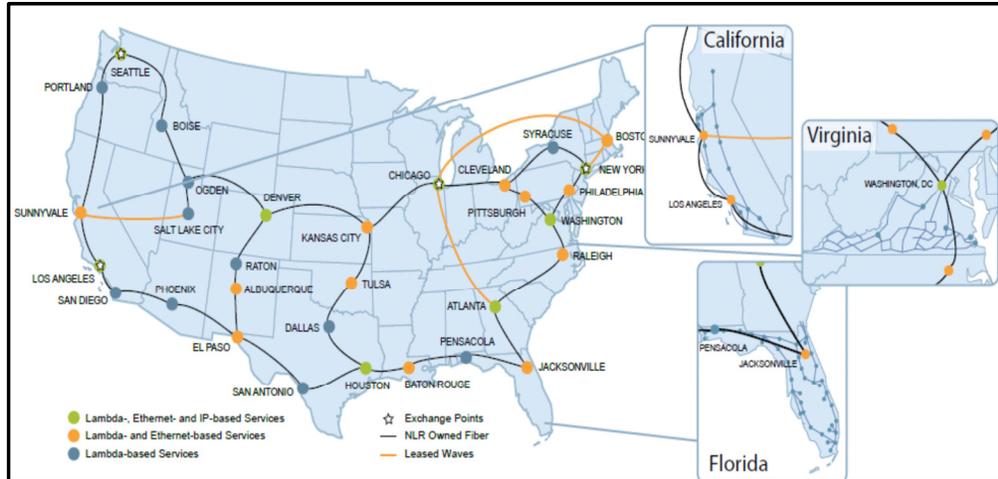
Average Download Speeds, 2009



Source: Speedmatters.org. Missouri figures based on 6,532 speed tests throughout the State.

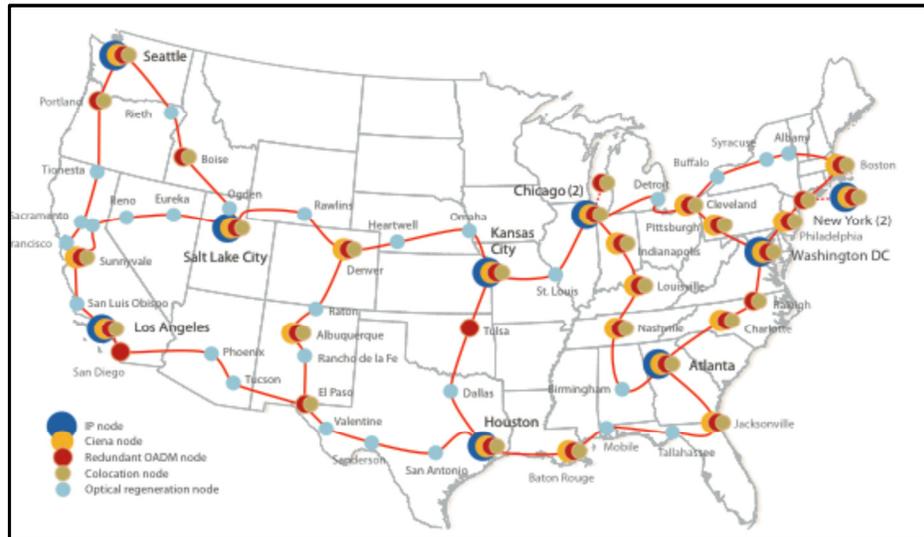
The State does benefit from the presence of the National LambdaRail (NLR) and Internet2, which are high-speed national networks connecting research institutions to enable fast exchange of data. The National LambdaRail (NLR) is a 12,000 mile, high-speed national network infrastructure that runs over fiber-optic lines. NLR is owned and operated by the research and education community; it has no restrictions on usage or bandwidth and no policies defining acceptable use. It supports some of the nation’s most demanding research projects. Based in Kansas City, Missouri, Internet2 is an advanced network consortia. Internet2 connects over 60,000 educational, research, government, and community institutions over their advanced fiber-optic, dynamic circuit network.

National LambdaRail Infrastructure



Source: National LambdaRail

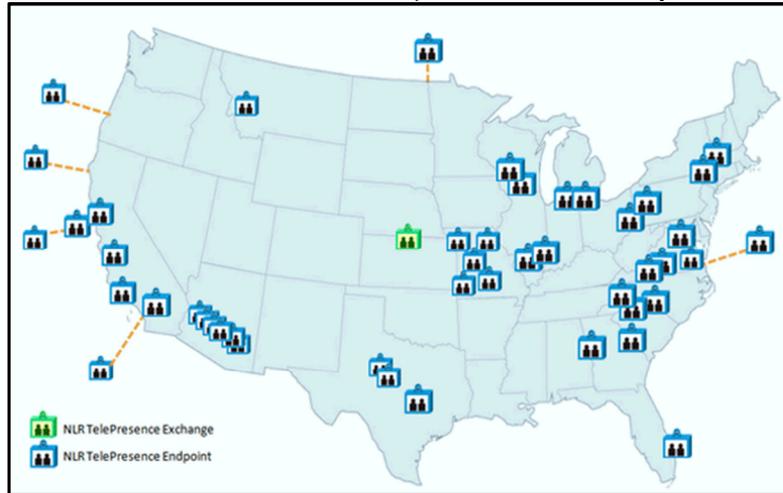
Internet2 Infrastructure



Source: Internet2

NLR and Internet2 Telepresence is a CISCO initiative that enables face-to-face meetings over a network. National LambdaRail and Internet2 have partnered to use this CISCO technology over their research and education networks to enable face-to-face meetings and collaboration between any of the research and educational institutions on either of their networks. Five of CISCO's 46 telepresence endpoints within this community are in Missouri.

NLR and Internet2 Telepresence Community



Source: National LambdaRail

Support for Entrepreneurs and Technology Commercialization

Additionally, Missouri benefits from the aforementioned Missouri Technology Corporation as well as the State’s university-affiliated Innovation Centers. However, as previously mentioned in this report, many stakeholders feel that technology transfer and commercialization, venture capital, and entrepreneur resources need to be enhanced to further optimize Missouri’ competitiveness.



An important resource in the state is the St. Louis IT Entrepreneur Network (ITEN), which is an initiative of the St. Louis IT Coalition and Innovate St. Louis. Created in 2008, ITEN’s purpose is “to be a catalyst for the emergence of a thriving and robust entrepreneurial community that creates successful IT ventures in the greater St. Louis Region.” The network currently includes 90 start-up IT companies and 60 mentors, and it offers member companies mentors with expertise in early stage IT ventures, More specifically, the initiative offers a Technology and Architecture Mentoring Program, which assists entrepreneurs with their technology platforms; an E-Commerce/Web Business Mentoring Program, which assists with online strategies; and a Mock Angel Training program, which provides assistance in investor relations. One program in the works is the Business Model Validation Program, which assists entrepreneurs with their business models.



TARGET CLUSTER: FINANCIAL AND PROFESSIONAL SERVICES

Justification	Target boasts high-wage jobs and opportunities for workers of all skill levels to gain point of entry into the field; target's average annual wage is \$55,304, or 30 percent higher than the State's average annual wage.
	Thousands of existing jobs in financial services, customer care, insurance, and professional services as well as a significant presence of Fortune 500 headquarters and major financial institutions.
	Business sectors in this target cluster account for 19.1 percent of Missouri's GDP, with banking, insurance, and professional services serving as cornerstones of many local economies within the State.
	Strong occupational location quotients, especially in financial services occupations, give Missouri a competitive advantage in terms of talent and skill concentration.
	Presence of nationally ranked degree programs in business, accounting, and law.
	Competitive business cost climate.
Challenges	The impacts of the Great Recession have been wide and deep in Missouri and nationwide with bank closures and severe losses in the nondepository credit intermediation sector (which includes credit card issuing and sales financing).
	Bringing more high-value jobs in this target cluster to rural areas of the State.
	Perceived weakness among Missouri's state-level support for start-up firms, entrepreneurs, and existing businesses among Regional Forum participants.
	While the vast majority of Regional Forum participants support the continued targeting of finance, navigating through this changed business landscape will be a key challenge.
	Surpluses of Class A office space, anti-competitive local air service, talent recruitment and retention issues, etc. will continue to challenge some regional development efforts.
Opportunities	Synergies with young professional recruitment and retention efforts, particularly those with degrees in business and liberal arts.
	Enhanced business retention and expansion (BRE) services can potentially lead to expansion of existing employers and identification of relocation prospects.
	Strong potential cross-target catalysts in Health Sciences and Services and Information Technology.
	Continuing opportunities related to the launch and growth of professional services firms through small business development programs.
	As Missouri and the nation continue to rebound from the recession, additional growth opportunities will arise as consumer confidence increases.

TARGET OVERVIEW

The Financial and Professional Services target encompasses three niches: **Financial Services**, **Professional Services**, and **Customer Care Centers**. The side graphic illustrates the various subsectors included in the target. Some types of Financial and Professional Services are natural growth areas of a local economy and thus, often grow without encouragement. However, there is benefit derived from targeting certain types of firms to ensure a comprehensive network of service providers is established in an economy. By focusing on these niches, the State of Missouri will create opportunities for talented local graduates and young professionals in areas such as consulting, finance, insurance, marketing, and legal services. Such opportunities provide quality entry-level positions and “C-level” opportunities to retain and attract top talent while adding emphasis on growing and retaining professional services small businesses.



The share of goods-producing employment in the United States has steadily declined in recent decades. Since 1970, its share has eroded from 31 percent to just 16 percent. Economic forces of globalization have forced many manufacturing jobs beyond U.S. borders; however, opportunities in service occupations have become more abundant and diverse. While this recession halted job growth, employment estimates from the Bureau of Labor Statistics show fewer net job losses nationwide in financial, professional, and technical service sectors than in manufacturing and construction.

In 2008, sectors encompassing this target cluster accounted for 19.1 percent of Missouri’s GDP, with banking, insurance, and professional services serving as cornerstones of many local economies within the State. While the Great Recession has affected nearly every sector of the economy, financial services, particularly banking and insurance, has experienced a high level of turmoil, uncertainty, and reconfiguration in the last two years. Bank closures have devastated many communities nationwide, and consolidation continues to restructure the finance and insurance sectors. Hundreds of thousands have lost their jobs, and millions of families have seen their accumulated wealth disappear. The impact of this recession has undoubtedly been felt in all regions of the State of Missouri. However, while 2.2 percent of jobs were lost nationwide in the depository credit intermediation business sector between the fourth quarters of 2004 and 2009, Missouri experienced job growth of 2.1 percent. Over the same period, Missouri lost 20.77 percent of its nondepository credit intermediation sector jobs and 4.1 percent of its insurance carrier sector jobs, compared to losses of -23.9 percent and -4.5 percent across the nation, respectively. The ways in which the financial services sector will change and adapt to an entirely different environment going forward are just beginning to be fleshed out.

Missouri has a significant finance and insurance business sector presence with major employers including Bank of America, National City, Regions Bank, U.S. Bancorp, Commerce Bank, UMB Bank, Thomson Reuters, Centene, MasterCard, Reinsurance Group of America, Scottrade, and Edward Jones. Missouri is the only state with two Federal Reserve Banks, in Kansas City and in St. Louis. In addition, many financial headquarters as well as other sector central offices, including those of other targets, are located in the State, creating a viable target cluster. This year, Missouri ranked 16th in the nation in the number of Fortune 500 company headquarters.

The **Financial Services** niche includes a spectrum of service banks; securities, commodities, and other investment firms; insurance carriers, agents, and brokers; and financial planners.

- Banks and Investment Firms: Banks are involved with accepting customer deposits; making mortgage, automobile, and real estate loans; and investing in securities. Investment firms are engaged with the underwriting, originating, and trading of securities.
- Insurance Carriers, Agents, and Brokers: This sector covers a wide array of services relating to insurance coverage including underwriting and issuance of insurance policies, and facilitation and investigation of individual and employee benefits and claims.
- Accounting: The accounting sector is composed of general accounting, tax preparation, bookkeeping, auditing, and payroll services. It also covers the development of accounting systems.
- Financial Planning Services: Financial planners assist their clients in meeting their financial goals by providing investment advice and portfolio management.

The **Professional Services** niche includes several subsectors including: legal services, advertising and public relations, and business support. Business support includes administrative work, human resources functions, marketing, sales, and many other functions companies need to maintain healthy operation.

- Legal: The legal industry is comprised of lawyers, paralegals, and notary public servicers. Firms in this industry may provide general legal services or specialized services, such as criminal law, corporate law, family and estate law, patent law, real estate law, and tax law.
- Advertising and Public Relations: Firms specializing in these areas promote the image and interests of their clients through the creation of paid print, video, and

social media advertising campaigns, press releases, and promotion of positive news coverage by other media outlets.

- Consulting Services: Consultants provide advice and assistance to businesses and organizations seeking to enhance their competitive position, efficiency, and services or products.
- Business Support: Companies would not be successful without the support structure to keep them functioning properly behind the scenes. Business support includes administrative work, human resources functions, marketing, sales, and many other functions companies need to maintain healthy operation.

The **Customer Care Centers** niche includes customer care centers, inbound call centers and other back office operations. These opportunities represent value-added services above and beyond the “typical” call center position and therefore pay higher average wages. Customer care staff require higher-level skills to manage customer complaints, concerns and issues and can frequently “up-sell” the customer to new products and services.

Within this target cluster, there are several **cross-target catalyst** opportunities that if recruited, expanded, or developed could provide entryways into multiple target areas. Some examples of cross-target catalysts relevant to Financial and Professional Services include, but are not limited to, the following:

- Data assurance
- IT support services
- Supply chain management
- Property/casualty insurance
- Health records management
- Venture capital firms

PEOPLE: OCCUPATIONAL ANALYSIS

Over 390,500, or nearly 15 percent, of the 2.67 million workers in Missouri are employed in core occupations relevant to the Financial and Professional Services target. As shown in the following tables, 65.6 percent of the evaluated occupations offer average annual wages that exceed Missouri’s May 2009 average annual wage of \$39,250. Of the occupations examined, 28.1 percent have both location quotients of 1.0 or greater and average annual wages that exceed the State average wage. Accountants and auditors; actuaries; chief executives; claims adjusters, examiners, and investigators; cost estimators; general and operations managers; insurance sales agents; insurance underwriters; loan officers and counselors; public relations managers are a few of these.

Financial and Professional Services Occupational Target: Financial Services, May 2009

SOC Code	Occupation	Employment		Annual Mean Wage	
		Missouri	LQ	Missouri	United States
	Total, all Occupations	2,668,450	1.00	\$39,250	\$43,460
<i>Financial Services</i>					
111021	General and Operations Managers	35,380	1.03	\$94,920	\$110,550
433031	Bookkeeping Accounting and Auditing Clerks	34,490	0.96	\$31,950	\$34,750
132011	Accountants and Auditors	26,170	1.16	\$58,800	\$67,430
433071	Tellers	13,730	1.17	\$22,480	\$24,780
413021	Insurance Sales Agents	8,240	1.24	\$53,850	\$61,330
131031	Claims Adjusters Examiners and Investigators	7,190	1.29	\$55,490	\$58,780
111011	Chief Executives	7,100	1.17	\$150,040	\$167,280
132072	Loan Officers	6,330	1.04	\$63,720	\$63,210
439041	Insurance Claims and Policy Processing Clerks	6,300	1.31	\$34,950	\$35,740
113031	Financial Managers	5,870	0.58	\$107,060	\$113,730
131041	Compliance Officers Except Agriculture Construction Health and Safety and Transportation	5,000	0.99	\$50,420	\$55,100
413031	Securities Commodities and Financial Services Sales Agents	4,660	0.84	\$92,420	\$91,390
131051	Cost Estimators	4,600	1.14	\$57,840	\$61,190
132052	Personal Financial Advisors	2,970	0.97	\$90,090	\$94,180
132051	Financial Analysts	2,800	0.58	\$73,520	\$85,240
132053	Insurance Underwriters	2,510	1.25	\$57,820	\$63,330
434011	Brokerage Clerks	2,440	1.91	\$35,600	\$42,750
132081	Tax Examiners Collectors and Revenue Agents	1,780	1.25	\$45,240	\$53,800
132099	Financial Specialists All Other	1,620	0.52	\$61,660	\$64,810
132031	Budget Analysts	1,320	1.06	\$64,320	\$69,240
433061	Procurement Clerks	1,280	0.80	\$35,120	\$36,430
132082	Tax Preparers	1,140	0.91	\$31,110	\$36,060
132041	Credit Analysts	1,020	0.73	\$56,460	\$67,230
132071	Loan Counselors	710	1.14	\$40,090	\$40,930
132061	Financial Examiners	700	1.32	\$76,240	\$79,070
434041	Credit Authorizers Checkers and Clerks	610	0.52	\$33,460	\$33,700
152011	Actuaries	440	1.20	\$88,780	\$97,450
131032	Insurance Appraisers Auto Damage	150	0.67	\$52,740	\$56,180

Source: U.S. Bureau of Labor Statistics. Data refers to May 2009.

**Financial and Professional Services Occupational Target:
Professional Services and Customer Care Centers, May 2009**

SOC Code	Occupation	Employment		Annual Mean Wage	
		Missouri	LQ	Missouri	United States
	Total, all Occupations	2,668,450	1.00	\$39,250	\$43,460
<i>Professional Services</i>					
131199	Business Operations Specialists All Other	15,570	0.74	\$60,450	\$65,960
231011	Lawyers	9,610	0.85	\$112,380	\$129,020
131111	Management Analysts	6,420	0.57	\$71,010	\$84,650
131073	Training and Development Specialists	5,440	1.30	\$49,590	\$55,310
433051	Payroll and Timekeeping Clerks	5,220	1.34	\$34,950	\$36,600
232011	Paralegals and Legal Assistants	4,430	0.88	\$44,920	\$50,080
112022	Sales Managers	4,420	0.66	\$107,150	\$111,570
436012	Legal Secretaries	4,410	0.88	\$38,880	\$42,940
131079	Human Resources Training and Labor Relations	4,220	0.94	\$55,980	\$59,070
131071	Employment Recruitment and Placement Specialists	3,970	0.98	\$46,260	\$54,530
113011	Administrative Services Managers	3,720	0.75	\$75,620	\$81,530
434161	Human Resources Assistants Except Payroll and	3,350	1.01	\$37,200	\$37,840
413011	Advertising Sales Agents	2,960	0.95	\$49,650	\$53,190
112021	Marketing Managers	2,580	0.75	\$104,750	\$120,070
131072	Compensation Benefits and Job Analysis Specialists	2,300	1.01	\$51,490	\$58,520
232093	Title Examiners Abstractors and Searchers	1,550	1.34	\$30,470	\$42,960
112031	Public Relations Managers	1,130	1.04	\$88,310	\$101,850
113049	Human Resources Managers All Other	1,110	0.86	\$101,150	\$105,510
232099	Legal Support Workers All Other	790	0.98	\$50,690	\$58,630
112011	Advertising and Promotions Managers	630	0.86	\$77,100	\$97,670
232092	Law Clerks	630	0.95	\$31,760	\$41,960
113042	Training and Development Managers	510	0.85	\$84,410	\$94,360
113041	Compensation and Benefits Managers	470	0.65	\$96,760	\$95,230
231022	Arbitrators Mediators and Conciliators	100	0.60	\$70,230	\$63,250
<i>Customer Care Centers</i>					
434051	Customer Service Representatives	45,630	1.02	\$30,870	\$32,410
151041	Computer Support Specialists	12,590	1.14	\$43,250	\$47,360
433011	Bill and Account Collectors	12,060	1.46	\$29,190	\$32,560
413099	Sales Representatives Services All Other	11,810	1.06	\$53,900	\$59,250
419041	Telemarketers	9,490	1.51	\$24,070	\$24,760
433021	Billing and Posting Clerks and Machine Operators	9,290	0.92	\$30,520	\$32,900
439021	Data Entry Keyers	5,580	1.12	\$26,980	\$28,000
434151	Order Clerks	4,330	0.93	\$25,980	\$29,890
432011	Switchboard Operators Including Answering Service	2,930	0.98	\$24,580	\$26,000
434141	New Accounts Clerks	2,740	1.64	\$30,350	\$31,490
439011	Computer Operators	1,710	0.88	\$36,020	\$37,540
432021	Telephone Operators	310	0.69	\$31,590	\$32,410

Source: U.S. Bureau of Labor Statistics. Data refers to May 2009.

Approximately 80 percent of all graduates with degrees that support the Financial and Professional Services target are from business, management, or marketing programs, as shown in the following table. Degrees imperative to the Financial and Professional Services target are highly concentrated at the bachelor's level (55.4 percent), with another important concentration at the master's level (33.5 percent). In fact, nearly 94 percent of business-related degrees are bachelor's or master's level. For these and other reasons, many communities and states have found that pursuing growth in professional, technical, and financial service jobs coalesces nicely with young professional recruitment and retention. These types of employers demand educated, communicative, adaptable employees and often turn to local colleges and universities to mine pools of their business school and liberal arts graduates.

Missouri Degrees and Certificates Awarded in Financial and Professional Services Disciplines, 2005-2009

	Certificate below baccalaureate	Associate	Bachelor	Certificate above baccalaureate	Master	Doctorate/ Professional	TOTAL
Business- management- marketing- and related support services	1,062	3,698	46,378	419	32,422	82	84,061
Communications technologies/technicians and support services	74	265	275	-	-	-	614
Computer and information sciences and support services	229	1,394	4,474	254	1,390	43	7,784
Legal professions and studies	399	452	306	100	634	2,439	4,330
Visual and performing arts	171	566	7,171	22	933	45	8,908
Grand total	1,935	6,375	58,604	795	35,379	2,609	105,697

Source: National Center for Education Statistics, IPEDS Database

Note: Included in this analysis are all two and four-year public and private, not-for-profit colleges and universities in the State of Missouri.

Nearly every public and not-for-profit college and university in Missouri offers an array of degree programs supporting the Financial and Professional Services target. Highlights include the following.

- Washington University Olin Business School:** A world-class business school, *Businessweek's* 2010 rankings of U.S. undergraduate and graduate business schools rank Olin at 13th and 40th, respectively. At the undergraduate level, students can major in accounting, finance, health care management, entrepreneurship, marketing, operations and supply chain management, organization and human resources, marketing, economics and strategy, and international business. At the graduate level, full-time, professional, and executive MBA programs are available in addition to a Master of Accounting (MACC) and Master of Science programs in supply chain management and finance.

- **University of Missouri Robert J. Trulaske, Sr. College of Business:** Ranked 71st by *Businessweek* for its undergraduate business programs, degree areas are limited to a Bachelor of Science in Business Administration, but the college requires students to select an emphasis area among the following: accountancy, economics, finance and banking, international business, management, marketing, and real estate. A combined Bachelor of Science/Master of Accountancy is also offered in addition to a standalone master's degree in accountancy. The Crosby MBA program offers dual degree programs in law, health services, and industrial engineering. Doctoral programs are also available in business and accountancy. Additionally, the 2009 Public Accounting Report's *Annual Survey of Accounting Professors* ranks University of Missouri-Columbia's undergraduate accounting program 20th and its graduate program 19th nationwide.
- **St. Louis University John Cook School of Business:** Ranked 82nd nationally by *U.S. News and World Report* for its MBA program, dual degrees are available in law, public health, medicine, and education and public service. Additional graduate programs include master's degrees in accounting, supply chain management, and international business. At the undergraduate level, the Bachelor in Business Administration program can be completed with concentrations in accounting, economics, entrepreneurship, finance, information technology management, international business, leadership and change management, and marketing.
- **Missouri State University's College of Business Administration** has robust undergraduate degree offerings in accounting, advertising and promotion, business education, entrepreneurship, facility management, finance, general business, human resources management/industrial relations, industrial management, international management, international marketing, legal studies, logistics and supply chain management, management, marketing, operations management, real estate, retailing/management, risk management and insurance, selling, and technology management. Master's degrees are offered in accountancy, business administration, computer information systems, health administration, and project management.
- **Rockhurst University** offers undergraduate programs in accounting, business administration, business communication, management, marketing, international business, nonprofit leadership, and organizational leadership. Additionally, an MBA program is available at its Herzberg School of Management.
- **Southeast Missouri State University (SEMO)** provides robust bachelor's degree offerings supporting the Financial and Professional Services target, many in its

Donald L. Harrison College of Business, including accounting, administrative systems management, advertising, business administration, business economics, business and marketing education, corporate communication, graphic design/illustration, finance, financial economics, industrial management, international business, marketing, organizational administration, organizational leadership, technical computer graphics, computer and multimedia graphics, and technology management. SEMO also offers graduate programs in accounting, entrepreneurship, environmental management, financial management, general management, industrial management, and international business.

- **Truman State University School of Business** offers a Master of Accountancy and bachelor's degrees in economics, and business administration with concentrations in finance, international business, management, and marketing.
- **University of Central Missouri Harmon College of Business:** Among smaller colleges, University of Central Missouri's graduate program is ranked 10th nationally by the 2009 Public Accounting Report's *Annual Survey of Accounting*. Undergraduate majors are available in accounting, computer information systems, economics, finance, management, and marketing; master's degree programs include business administration, IT, and accounting.
- **University of Missouri – Kansas City Henry W. Bloch School of Management** offers students undergraduate degrees in accounting and business administration with concentration areas in enterprise management, entrepreneurship, finance, and marketing. At the graduate level, MBA, Master of Public Administration, and Master of Science in Accounting programs are available along with dual degree options in law.
- **University of Missouri – St. Louis's College of Business Administration** offers Bachelor of Science programs in business administration, accounting, and information systems with emphasis areas available in finance, international business, management, marketing, and logistics and operations management. Graduate level degrees are offered in accounting, business administration, economics, business administration – information systems, and business administration – supply chain management and logistics.

PROSPERITY: BUSINESS SECTOR ANALYSIS

While many of Missouri's Financial and Professional Services firms are small businesses and entrepreneurs, the State is also home to many large corporations and assets, including Bank of America, the Federal Reserve Bank of St. Louis, the Federal Reserve Bank of

Kansas City, State Farm, United Healthcare, American Family, H&R Block, PricewaterhouseCoopers, National City, U.S. Bancorp, MasterCard Worldwide, Scottrade, Savvis, and Convergys.

The following table shows Missouri's employment and wages for the Financial and Professional Services target business sectors in the fourth quarter of 2009. Statewide, there are nearly 216,900 jobs in financial and professional business sectors, representing 8.3 percent of all jobs in the State. Nearly 70 percent of the business sectors in this target pay higher than Missouri's fourth quarter 2009 average annual wage of \$42,434. The target's average annual wage is \$55,304, or 30 percent higher than the State's average annual wage. Despite the recession and its effect on banks, this target experienced net job growth in Missouri of 4.4 percent between the fourth quarters of 2004 and 2009. Over the same period, annual average wages increased by 15.1 percent.

Financial and Professional Services Target: Private Employment (by business subsector), 4Q 2009

4- Digit Code	Description				Employment			Average Annual Wage		
					# Change, 04-09	MO %Change, 04-09	US %Change, 04-09	# Change, 04-09	MO %Change, 04-09	US %Change, 04-09
	Total across Sectors	2,604,179	-	\$42,434	-62,293	-2.34%	-2.15%	\$5,587	15.16%	16.00%
Financial Services										
5211	Monetary Authorities-Central Bank	-	-	-	-	-	0.95%	-	-	41.80%
5221	Depository Credit Intermediation	41,028	1.18	\$44,053	831	2.07%	-2.21%	\$6,111	16.11%	13.32%
5222	Nondepository Credit Intermediation	13,155	1.11	\$54,332	-3,448	-20.77%	-23.88%	\$2,396	4.61%	6.81%
5231	Securities & Commodity Contracts Intermediation & Brokerage	11,186	1.19	\$92,824	4,093	57.70%	-5.00%	\$4,098	4.62%	5.33%
5239	Other Financial Investment Activities	5,301	0.79	-	1,354	34.31%	18.73%	-	-	23.86%
5241	Insurance Carriers	23,334	0.94	\$60,679	-990	-4.07%	-4.51%	\$7,929	15.03%	14.88%
5242	Agencies, Brokerages, & Other Insurance Related Activities	19,431	1.09	\$55,855	382	2.01%	1.41%	\$8,791	18.68%	14.11%
5251	Insurance and Employee Benefit Funds	1,330	1.22	\$67,973	266	24.95%	11.37%	\$11,212	19.75%	7.48%
5412	Accounting, Tax Preparation, Bookkeeping, & Payroll Svcs	17,159	0.96	\$48,286	-1,588	-8.47%	7.81%	\$6,990	16.93%	19.09%
Professional Services										
5411	Legal Services	20,746	0.91	\$67,783	-456	-2.15%	-3.95%	\$10,012	17.33%	19.38%
5614	Business Support Services	24,860	1.51	\$31,710	8,003	47.47%	7.65%	\$5,531	21.13%	10.42%
5416	Management, Scientific, and Technical Consulting Services	9,684	0.48	\$67,265	231	2.44%	21.19%	\$13,625	25.40%	16.84%
5418	Advertising, Public Relations, and Related Services	7,733	0.93	\$56,155	-1,245	-13.87%	-6.65%	\$7,084	14.44%	15.62%
Customer Care Centers										
5614	Business Support Services	24,860	1.51	\$31,710	8,003	47.47%	7.65%	\$5,531	21.13%	10.42%
5415	Computer Systems Design and Related Services	21,931	0.76	\$79,044	1,777	8.82%	20.92%	\$12,729	19.19%	14.56%

Source: U.S. Bureau of Labor Statistics via MERIC

The following table highlights the economic impact of key target subsectors as indicated by NAICS code. These impact estimates are provided by MERIC and are only available at the three-digit NAICS code granularity level. Jobs in these services sectors have lower multiplier effects than other target subsectors, particularly those in manufacturing and

research and development. Often times, jobs in Financial and Professional Services are induced through economic growth in other areas and continued population growth.

The Impact of 100 New Jobs in Missouri by Sector: Financial and Professional Services

NAICS and Description	Job Impact				GDP Impact in Millions			
	Jobs Multiplier	Direct Jobs	Indirect Jobs	Total Jobs	GDP Multiplier	Direct GDP	Indirect GDP	Total GDP
521 Monetary Authorities	1.94	100	94	194	1.49	\$13.4	\$6.6	\$20.0
522 Credit Intermediation & Related	2.07	100	107	207	1.79	\$9.9	\$7.9	\$17.8
523 Securities & Other Financial	2.48	100	148	248	2.60	\$6.8	\$10.9	\$17.7
524 Insurance Carriers & Related	2.53	100	153	253	2.18	\$9.7	\$11.5	\$21.2
541 Professional, Scientific & Tech Svcs	2.04	100	104	204	1.88	\$8.2	\$7.2	\$15.3
551 Management Of Companies	2.77	100	177	277	1.77	\$16.3	\$12.5	\$28.8
561 Admin Support Svcs	1.42	100	42	142	1.69	\$4.1	\$2.8	\$6.8

Source: MERIC, IMPLAN Statewide Model

Note: Impacts represent rounded statewide estimates and are for reference only. Impact estimates for individual projects will vary based on region, time period, detailed industry, and project information. GDP listed in the millions.

PLACE: MISSOURI’S DYNAMICS

As Missouri and the nation emerge from the Great Recession, financial and professional services employment will likely see gradual gains as investment ramps up in real estate, construction, bank lending, and other components of the economy. Missouri’s strong concentration of employment, workers, and training in this sector positions it to capture these opportunities as they arise.

Business Climate

Missouri has positively leveraged its attractive communities, quality of life options, and low costs of living and doing business to its advantage in job and talent recruitment and retention. According to the Missouri Partnership, “In a recent study by the Boyd Company, Inc. — an independent site selection consulting service — the State’s two largest metropolitan areas, St. Louis and Kansas City, both ranked among the 25 markets in the nation for lowest costs of operating headquarters.” As illustrated in previous occupational tables, occupations relevant to the Financial and Professional Services cluster pay average annual wages that are lower than the national averages. While this is an advantage for employers, it can sway talent to locate in other regions.

However, Missouri’s comparatively low cost of living offsets these wage disparities in most cases. C₂ER (formerly ACCRA), a national community and economic development research organization, publishes quarterly cost of living indices for states. According to their Q1 2010 index, which sets the national average cost of living at 100, Missouri is well below this

with an index score of 92.7, lower than nearby Iowa (93.2) and Illinois (96.7), and slightly higher than Arkansas (91.2), Nebraska (91.5), Kansas (90.6), and Oklahoma (90.2). None of Missouri’s metro areas have a composite cost of living higher than the national average.

Cost of Living Index, Q1 2010

	Composite Index	Grocery	Housing	Utilities	Transportation	Health Care	Misc Goods & Services
State of Missouri	92.7	96.1	81.2	94.9	95.3	94.7	99.8
Columbia, MO	91.3	95.1	80.6	93.0	91.4	97.8	98.1
Jefferson City, MO	89.9	92.3	74.2	94.6	94.8	92.2	99.6
Joplin, MO	87.1	82.8	75.3	102.9	83.7	83.9	96.5
Kansas City, MO	95.9	94.6	88.7	89.6	97.6	96.7	104.2
St. Joseph, MO	95.8	98.4	87.5	97.8	92.8	103.7	101.6
St. Louis, MO	89.7	99.5	78.2	86.0	94.1	98.5	94.4
Springfield, MO	89.0	97.3	79.8	79.0	92.3	94.7	95.3

Source: The Council for Community and Economic Research
(100 = National Average)

Percentage in each category contributes to overall cost of living: Total (100%), Grocery (13%), Housing (28%), Utilities (10%), Transportation (10%), Health care (4%), and Miscellaneous good and services (35%).

Air service is a key competitive issue for many firms in Financial and Professional Services. Missouri has four main airports: Lambert-St. Louis International Airport, Kansas City International Airport, Springfield-Branson National Airport, and Columbia Regional Airport. St. Louis ranks 33rd in the nation for passenger traffic, Kansas City ranks 38th, Springfield ranks 125th, and Columbia is unranked by the Airport Council International. Because many communities in Missouri are within a two hour drive of Lambert and Kansas City International, which are both served by at least one low-cost carrier and offer competitive flight schedule and price options, Missouri’s smaller regional airports struggle to compete.

As referenced in the Appendix, current data on the economic development site location search engine LOIS indicate that there is an ample supply of office space in most regions throughout the State, with lower overall available square footages in the North and Southeast regions. However, many places have a glut of office inventory on the market. While not available for all areas of the State, according to CB Richard Ellis’s third quarter *Market View* report for St. Louis, “The St. Louis office market continues to see a relatively slow pace of activity, with the exception of a few strong submarkets, such as Clayton. Meanwhile, struggling markets such as Downtown continue to face challenges. With few new tenants or expanding tenants in the market, the St. Louis area continues to see lease renewals constitute the majority of transactions.” Office vacancy rates in downtown St. Louis are at 23.2 percent; only about 50,000 square feet of vacant space has been absorbed in the year as of the date of the report. The situation is a bit better in Kansas City. According to the report, “There has been positive job growth in the office sector. Professional and business services have added jobs and layoffs have decreased. There have

been several offices that have moved south from the downtown area. Because of this the Kansas City office absorption is -43,500 and vacancy stands at 16.81 percent.” High vacancy rates can further shake business and consumer confidence. Shuttered businesses and empty office space are issues most communities face in the aftermath of any recession.

Another key issue related to the competitiveness is the potential changes to the State’s tax credit programs. The State of Missouri’s tax incentives were reviewed by a commission assembled by Governor Jay Nixon in the fall of 2010 in order to identify ways to rein in its 61 tax credit programs in the face of tough budget decisions. Recommendations include cutting tax credits by 40 percent and will be considered by the Legislature this spring. The committee has recommended a 2-year sunset on the following Banking and Insurance Tax Credit programs:

- Bank Franchise
- Bank TC for S Corp
- Exam Fee
- Health Insurance Pool
- Life and Health Insurance Guaranty
- Property and Casualty Insurance Guaranty

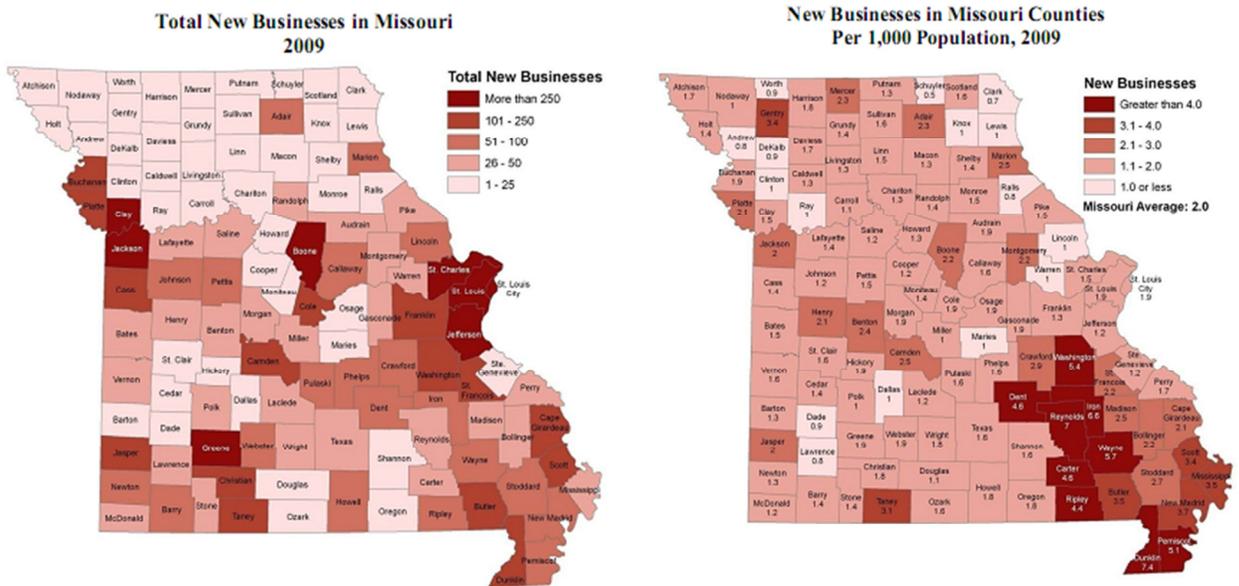
Innovation Assets

Washington University’s business school is a key partner for Missouri’s corporate community. Its Center for Experiential Learning connects business faculty/student consulting teams with area corporations to help them find strategic, cost effective solutions to their business’ challenges. The Institute for Innovation and Growth provides a platform for corporate-funded interdisciplinary research to advance business practices. Academic research centers which promote business best practices, process optimization, and next-generation management practices include the Center for Finance and Accounting Research and the Center for Research in Economics and Strategy. Areas of faculty research interest include industrial organization, business strategy, game theory, organization and incentive design, pricing, and industry evolution.

University of Missouri’s Missouri Training Institute and MBA Consulting Project both connect university faculty and students with Missouri businesses to provide real-world, implementable solutions for their challenges, including those related to operations, sales, marketing, product/service development, human resources, strategic planning, and other areas.

Programmatic Support

When stakeholders were asked to vote on Missouri’s greatest competitive weakness, the largest proportions of responses were received for entrepreneur development. A lack of focus on start-up companies was also voted to be the State’s second largest threat, behind weak existing business services. According to a MERIC report on the State’s 2009 new business formations, professional and technical services accounted for the second highest proportion of growth (10.9 percent of all new firms), behind private household employment (24.7 percent). Finance, insurance, and real estate accounted for 6.5 percent. The following maps show the distribution of these firms around the State.



Continuing to enhance the State’s programs and effectively communicating available resources to constituents should be a priority for Missouri’s economic developers, particularly at the state level.



TARGET CLUSTER: TRANSPORTATION AND LOGISTICS

Justification	The transportation, warehousing, and wholesale trade sectors account for 10.2 percent of statewide GDP, representing the 10 th highest proportion among all states.
	Nine out of ten economic regions in the State of Missouri are currently targeting some form of Transportation and Logistics.
	Input from Regional Meetings indicates broad support for continuing a state-level pursuit of this target cluster.
	Seventeen percent of Missouri workers are employed in core occupations relevant to the Transportation and Logistics target.
	Most subsectors pay above the State average annual wage meaning growth in this target cluster will help to boost wealth in Missouri.
	Transportation and Logistics employment is not vulnerable to outsourcing to lower-cost nations.
Challenges	Impacts of the Great Recession affected a full spectrum of areas related to logistics, including manufacturing outputs, store inventories, and consumer confidence, resulting in employment decline in many subsectors.
	Few certificates conferred in transportation and materials moving programs in the State’s schools, pointing to a potential program development need.
	Missouri’s two largest logistics hubs, St. Louis and Kansas City, are multi-state metro areas, which can complicate permitting, infrastructure development coordination, and recruitment and retention efforts.
	Despite a very friendly tax climate for logistics and manufacturing, Missouri ranks very low for venture capital and productivity and innovation in these areas.
	Low proportion of Missouri’s minor highways and bridges are in “good condition” as classified by MoDOT.
Opportunities	Stimulating foreign trade opportunities via development of air cargo and multi-modal distribution hubs.
	Several cross-target catalyst opportunities that provide growth potential in this and other recommended clusters.
	Potential to expand foreign trade zone designations in Missouri metros.
	Low-cost land and development sites in rural areas provide Transportation and Logistics development opportunities in non-metro jurisdictions.
	Enhanced Transportation and Logistics capacity and competitiveness improves the State’s prospects for growth in manufacturing and other target sectors/niches.

TARGET OVERVIEW

The Transportation and Logistics target includes three niches: **Freight Hauling**, **Warehousing**, and **Wholesalers**. The side graphic illustrates the various components of this target.

Logistics is the core of strategic supply chain management. An effective supply chain network is critical to profitability for businesses across all sectors because just-in-time inventory strategies are now commonplace among most national retailers, manufacturers, and service providers. To maintain lean operations, businesses have decreased the volume of in-process inventory and instead rely on express just-in-time shipments from suppliers to improve flexibility, efficiency, and return on investments. Current technology allows businesses to track the location of individual vehicles via satellite and use refrigerated units to provide computerized feedback on specific operational times and temperatures.

Advanced in-house technology and handheld wireless devices in the field also greatly streamline inventory maintenance operations and expand the more traditional field of transportation and warehousing to include scheduling, supply chain management, fleet management, network optimization, and other processes.

Missouri has sizable existing employment in this target, with major employers such as Wal-Mart, Con-Way Truckload, Anheuser-Busch International, Yellow Freight, DHL Worldwide Express, and FedEx. With the State’s competitive infrastructure and location, it is no surprise that nine of the ten economic regions in Missouri have Transportation and Logistics or Supply Chain Management as target clusters: St. Louis, Kansas City, Ozark, Central, Northeast, South Central, Southeast, Southwest, and West Central. Input from Regional Forums indicates broad support for the continuing State pursuit of this target cluster.

In addition to Missouri’s central location within the U.S. and proximity to major economic markets, the capacity and connectivity of its railways, roadways, waterways, and airports alongside its competitive tax climate gives the State a distinct advantage. Missouri has several economic development opportunities in the three niches within this target cluster.

The **Freight Hauling** niche includes a wide variety of commodities which are palletized and transported in a container. These businesses provide a combination of supply chain management activities, including local pickup and delivery, sorting, and line-haul. Included modes of transportation are air, rail, water, and trucking.

- Freight Trucking: These firms haul a wide variety of commodities which are palletized and transported in a container. These businesses provide a combination



of supply chain management activities, including local pickup and delivery, sorting, and line-haul.

- Air Cargo: This area includes establishments primarily engaged in providing air transportation of cargo without transporting passengers.
- Rail: This mode of transportation includes line-haul railroads, which move freight cargo over long distances within a rail network, and short line railroads, which move cargo over a short distance on local rail lines.
- Inland Water Ports: This area includes firms that provide inland water transportation of freight cargo on lakes, rivers, and intracoastal waterways.

The **Warehousing** niche includes warehouses and storage facilities, logistics management companies, and container manufacturing firms.

- Warehousing and Storage: This subsector includes establishments that operate merchandise warehousing and storage facilities. While some firms provide specialized facilities, such as those that are refrigerated or accommodate farm products, most firms in this area provide general storage for boxes, barrels, drums, equipment, and pallets.
- Logistics Management: These firms provide assistance to businesses in manufacturing operations improvements, productivity improvement, production planning, quality assurance, inventory management, distribution networks, warehouse use and operations, and materials management.
- Container Manufacturing: This business subsector is comprised of firms that manufacture shipping containers and parts for shipping containers. Included are products made from wood, such as boxes, barrels, crates, and pallets; shipping pads and shaped cushioning made of polystyrene foam and other foam plastics; and light and heavy gauge metal containers used for air cargo, ammunition, etc.

The **Wholesalers** niche encompasses wholesalers and brokers of the merchandise central to the supply chain. Included are firms engaged in the wholesale trade of both durable and non-durable goods.

- Non-durable goods are new or used products with less than a three-year life span, such items would include clothing, personal products, and food.
- Durable goods include items such as motor vehicles, furniture, construction materials, sporting goods, and recyclable materials.

Within this target cluster, there are opportunities that if recruited, expanded, or developed could provide entryways into multiple target areas. For example, a supply chain management firm could provide valuable recruitment leads for both this target and the

Corporate Services target. Similarly, a worker trained in supply chain management has the skills to find employment within firms central to both target clusters. These **cross-target catalysts** provide linkages between target clusters and help to maximize economic development efforts by increasing workforce capacity, recruitment lead potential, and vertical integration within clusters. Some examples of cross-target catalysts germane to Transportation and Logistics include, but are not limited to, the following:

- Supply chain management/ Third-party logistics recruitment (3PL)
- Telematic technologies including global positioning software (GPS) and radio frequency identification (RFID) software and devices
- Bio-logistics (handling of sensitive biomaterials)
- Clean diesel, aerospace design, biofuels, and other technologies that improve fuel efficiency and emissions of trucks, tankers, and airplanes
- Inventory management software design, development and device manufacture (tablet PC, handheld wireless scanners, etc.)
- Engine and battery, transportation equipment manufacturing

As U.S. consumer confidence is projected to improve with brighter economic prospects and shipments of durable and nondurable goods increase to pre-recession levels, growth in Logistics subsectors, particularly freight haulers, is expected to remain relatively strong in the long term. According to the U.S. Census Bureau, in 2008 (the most recent year for which data are available), purchases of goods and services in transportation, wholesale trade, and warehousing comprised 8.7 percent of the Gross Domestic Product (GDP), or \$1.23 trillion. In the State of Missouri, these sectors account for 10.2 percent of State GDP, representing the tenth highest proportion among all 50 states. In terms of total GDP size, Missouri ranks 18th, with transportation, wholesale trade, and warehousing accounting for 24 billion in GDP.

Logistics will continue to play a key role in the national economy as well as in the State of Missouri due to its location and despite the Great Recession's impacts on short-term growth dynamics. According to a 2010 PricewaterhouseCoopers report, Transportation and Logistics is a \$506 billion (U.S. \$) industry in China, which has exhibited quarterly growth rates of 20 percent or more since 2006. Many regional markets in Missouri are aggressively pursuing trade opportunities with China (and other foreign markets). Most notably, St. Louis is working on developing a Chinese cargo hub at Lambert Airport to capture inbound shipments.

The price of oil affects the profitability of firms within this target. According to the U.S. Energy Information Administration, crude oil prices climbed between 2000 and 2008 from less than \$20 per barrel to more than \$135 per barrel. The Great Recession caused prices to come down, but prices are expected to rise with economic recovery. In September

2010, crude oil was priced at \$72 per barrel. Drastic price fluctuations and increases at the fuel pump greatly affect Transportation and Logistics employers. According to the American Trucking Association, when oil prices reached record levels in 2008, for the first time, carriers in some cases reported that fuel costs exceeded labor costs. These costs are tied into product pricing and passed back to consumers. However, as will be discussed later, the State of Missouri has among the lowest average fuel costs, providing a distinct advantage over other higher-cost locations.

Another issue that has come to the forefront is safety. After the September 11th attacks, U.S. Homeland Security has placed increased scrutiny on the safety of cargo moving into the country via roadways, airplanes, and sea ports. More rigorous inspection standards and the use of technology, including radio frequency identification tags, are being employed to insure greater safety. However, due to the sheer volume of goods that are moved in, out, and throughout the nation on a daily basis, there remain serious concerns about cargo security within the Transportation and Logistics sector.

PEOPLE: OCCUPATIONAL ANALYSIS

Nearly 446,000 of the 2.67 million workers in Missouri are employed in core occupations relevant to the Transportation and Logistics target. In other words, 17 percent of Missouri workers exercise the skills needed in this target. As shown in the following tables, 61 percent of the evaluated occupations offer average annual wages that exceed Missouri's May 2009 average annual wage of \$39,250. Nearly 23 percent of the occupations examined have both location quotients of 1.0 or greater and average annual wages that exceed the State average wage. These high-paying occupations include railroad occupations; pilots and avionics technicians; sales representatives; auto, bus, and truck mechanics; diesel engine specialists; production planning and expediting clerks; and computer programmers.

Transportation and Logistics Occupational Target: Warehousing and Wholesalers, May 2009

SOC Code	Occupation	Employment		Annual Mean Wage	
		Missouri	LQ	Missouri	United States
	Total, all Occupations	2,668,450	1.00	\$39,250	\$43,460
Warehousing					
111021	General and Operations Managers	35,380	1.03	\$94,920	\$110,550
537062	Laborers and Freight Stock and Material Movers Hand	36,540	0.84	\$25,340	\$25,290
435081	Stock Clerks and Order Fillers	34,010	0.89	\$22,900	\$23,460
435071	Shipping Receiving and Traffic Clerks	12,590	0.86	\$29,320	\$29,840
151031	Computer Software Engineers Applications	10,020	0.99	\$78,380	\$90,170
151021	Computer Programmers	8,470	1.13	\$68,490	\$74,690
435061	Production Planning and Expediting Clerks	5,740	1.03	\$42,210	\$43,260
499041	Industrial Machinery Mechanics	5,370	0.95	\$43,260	\$46,160
113021	Computer and Information Systems Managers	5,130	0.87	\$104,530	\$120,640
151032	Computer Software Engineers Systems Software	4,840	0.62	\$77,980	\$96,620
434151	Order Clerks	4,330	0.93	\$25,980	\$29,890
493021	Automotive Body and Related Repairers	3,450	1.27	\$43,190	\$41,020
172112	Industrial Engineers	3,160	0.74	\$73,650	\$77,090
531021	First-Line Supervisors/Managers of Helpers Laborers and Material Movers Hand	2,720	0.76	\$43,950	\$45,250
537063	Machine Feeders and Offbearers	1,900	0.72	\$30,570	\$27,430
113071	Transportation Storage and Distribution Managers	1,690	0.90	\$78,860	\$85,470
537011	Conveyor Operators and Tenders	890	1.13	\$29,450	\$30,350
152031	Operations Research Analysts	830	0.67	\$65,900	\$75,370
173026	Industrial Engineering Technicians	800	0.60	\$44,470	\$49,030
Wholesalers					
414012	Sales Representatives Wholesale and Mfg Except Technical and Scientific Products	32,830	1.14	\$58,310	\$61,400
411011	First-Line Supervisors/Managers of Retail Sales Workers	21,910	0.92	\$37,780	\$39,130
537064	Packers and Packagers Hand	12,350	0.86	\$21,660	\$21,780
413099	Sales Representatives Services All Other	11,810	1.06	\$53,900	\$59,250
414011	Sales Representatives Wholesale and Mfg Technical and Scientific Products	7,390	0.89	\$72,670	\$81,370
411012	First-Line Supervisors/Managers of Non-Retail Sales Workers	3,460	0.65	\$70,750	\$79,610
131022	Wholesale and Retail Buyers Except Farm Products	3,440	1.44	\$44,820	\$55,480
113061	Purchasing Managers	1,060	0.80	\$94,800	\$96,910
419011	Demonstrators and Product Promoters	1,050	0.64	\$28,830	\$26,640
435111	Weighers Measurers Checkers and Samplers Recordkeeping	870	0.61	\$30,640	\$28,860
419031	Sales Engineers	640	0.44	\$73,050	\$90,540

Source: U.S. Bureau of Labor Statistics. Data refers to May 2009.

Transportation and Logistics Occupational Target: Freight Hauling, May 2009

SOC Code	Occupation	Employment		Annual Mean Wage	
		Missouri	LQ	Missouri	United States
	Total, all Occupations	2,668,450	1.00	\$39,250	\$43,460
Freight Hauling					
533032	Truck Drivers Heavy and Tractor-Trailer	42,130	1.33	\$38,810	\$39,260
499042	Maintenance and Repair Workers General	27,740	1.07	\$34,630	\$36,520
493023	Automotive Service Techs and Mechanics	14,970	1.21	\$35,290	\$37,880
537051	Industrial Truck and Tractor Operators	14,410	1.24	\$29,700	\$31,240
533033	Truck Drivers Light or Delivery Services	14,200	0.83	\$30,190	\$31,120
533031	Driver/Sales Workers	10,880	1.47	\$24,600	\$26,690
537061	Cleaners of Vehicles and Equipment	8,990	1.47	\$21,720	\$22,110
474051	Highway Maintenance Workers	6,010	2.11	\$31,010	\$35,310
493031	Bus and Truck Mechanics and Diesel Engine Specialists	5,720	1.20	\$39,610	\$41,590
499021	Heating Air Conditioning and Refrigeration Mechanics and Installers	4,000	0.80	\$41,600	\$43,670
531031	First-Line Supervisors/Managers of Transportation and Material-Moving Machine and Vehicle Operators	3,540	0.84	\$52,750	\$54,750
493093	Tire Repairers and Changers	2,540	1.35	\$24,270	\$24,610
533099	Motor Vehicle Operators All Other	2,220	1.48	\$21,960	\$31,100
493011	Aircraft Mechanics and Service Technicians	1,990	0.87	\$51,810	\$52,970
534011	Locomotive Engineers	1,600	1.80	\$56,340	\$53,590
435011	Cargo and Freight Agents	1,550	0.92	\$40,940	\$38,940
534021	Railroad Brake Signal and Switch Operators	1,480	2.99	\$54,890	\$49,600
534031	Railroad Conductors and Yardmasters	1,370	1.61	\$56,490	\$54,900
499043	Maintenance Workers Machinery	780	0.58	\$39,650	\$39,570
536051	Transportation Inspectors	640	1.29	\$55,460	\$61,110
493043	Rail Car Repairers	630	1.48	\$40,270	\$46,430
532012	Commercial Pilots	600	1.01	\$69,420	\$73,060
535011	Sailors and Marine Oilers	470	0.72	\$33,040	\$37,310
499011	Mechanical Door Repairers	460	1.47	\$35,210	\$36,270
492091	Avionics Technicians	380	1.04	\$54,400	\$50,330
493022	Automotive Glass Installers and Repairers	320	0.98	\$31,090	\$33,980
537199	Material Moving Workers All Other	310	0.47	\$26,400	\$34,220
532021	Air Traffic Controllers	300	0.60	\$99,150	\$106,990
535021	Captains Mates and Pilots of Water Vessels	290	0.47	\$67,490	\$70,740
474061	Rail-Track Laying and Maintenance Equipment Operators	250	0.82	\$45,700	\$46,000
536099	Transportation Workers All Other	200	0.25	\$27,360	\$35,240
499097	Signal and Track Switch Repairers	100	0.76	\$51,610	\$50,520
536041	Traffic Technicians	80	0.60	\$41,650	\$43,470
531011	Aircraft Cargo Handling Supervisors	50	0.46	\$50,260	\$48,790
499096	Riggers	40	0.15	\$33,870	\$43,990
532022	Airfield Operations Specialists	40	0.26	\$43,490	\$43,250
537121	Tank Car Truck and Ship Loaders	40	0.17	\$38,220	\$40,530

Source: U.S. Bureau of Labor Statistics. Data refers to May 2009.

Academic programs at two- and four-year public and private not-for-profit colleges and universities in the State of Missouri that support the Transportation and Logistics target cover the full spectrum of supply chain execution—from factory floor to executive office. Schools in the State offer more programs that train managers and business professionals than for any other position in Transportation and Logistics. Approximately 74 percent of all graduates with degrees that support this target are from business, management, or marketing programs, as shown in the following table. Other degrees with notable recipient volumes are engineering (10,675), computer and information sciences and support services (7,784), engineering technologies (5,050), and mechanic and repair technologies/technicians (3,083). With only 910 certificates and degrees accounting for only 0.8 percent of degrees supporting the Transportation and Logistics target, there may be an insufficient supply of transportation and materials moving programs in the State’s schools.

Degrees imperative to the Transportation and Logistics target are highly concentrated at the bachelor’s level, with another important concentration at the master’s level. In fact, nearly 94 percent of business-related degrees are bachelor’s or master’s level. Ninety percent of engineering degrees and 75 percent of computer and information sciences degrees are bachelor’s or master’s level. Mechanic and repair technologies degrees, construction trades degrees, precision production degrees, and engineering technologies and technician degrees are skewed toward the certificate and associate’s degree levels.

Missouri Degrees and Certificates Awarded in Transportation and Logistics Disciplines, 2005–09

	Certificate below baccalaureate	Associate	Bachelor	Certificate above baccalaureate	Master	Doctorate/ Professional	TOTAL
Business, management, marketing, and related support services	1,062	3,698	46,378	419	32,422	82	84,061
Computer and information sciences and support services	229	1,394	4,474	254	1,390	43	7,784
Construction trades	402	404	-	-	-	-	806
Engineering technologies/technicians	1,411	1,954	1,505	10	170	-	5,050
Engineering	6	109	6,631	601	2,999	329	10,675
Mechanic and repair technologies/technicians	1,226	1,821	36	-	-	-	3,083
Precision production	383	302	-	-	-	-	685
Transportation and materials moving	542	-	233	-	135	-	910
<i>Grand total</i>	5,261	9,682	59,257	1,284	37,116	454	113,054

Source: National Center for Education Statistics, IPEDS Database

Note: Included in this analysis are all two and four-year public and private, not-for-profit colleges and universities in the State of Missouri.

Descriptions of important Transportation and Logistics-specific degree programs in the State follow. Please note this is not an exhaustive list of Missouri's Transportation and Logistics educational assets.

Bachelor's Level and Higher

The **University of Central Missouri** is the only publicly funded university in the State that offers a Bachelor of Science and a Master of Science in Aviation. The Department of Aviation is one of fewer than 30 schools nationwide that is Aviation Accreditation Board International (AABI) accredited and has one of only three Federal Aviation Administration (FAA) certified Fourteenth Code of Federal Regulations (14 CFR) Part 141 flight schools in Missouri. The University of Central Missouri offers FAA certificates, bachelor's degrees in four majors (Professional Pilot, Airport Management, Flight Operations Management, and Aviation Maintenance Management 2+2), and a master's degree in Aviation Safety, which is offered on campus in Warrensburg as well as on the weekends in Kansas City, St. Louis, and Springfield.

Saint Louis University's Park College of Engineering, Aviation, and Technology offers a wide array of undergraduate majors, including aviation management and flight science, a Master of Aviation degree, and a Doctor of Aviation degree. The flight science curriculum is AABI accredited, and its flight portion is approved by the FAA under Part 141.

The College of Business Administration at the **University of Missouri-St. Louis** offers undergraduate degree minors in logistics and operations management and transportation studies. The College also offers MBA programs in logistics and supply chain management and operation management, a Ph.D. in Business Administration in Logistics and Supply Chain Management, and a graduate certificate in logistics and supply chain management.

Additional programs in the State are:

- **Missouri State University**
 - Bachelor of Science in Logistics and Supply Chain Management

- **Washington University in St. Louis**
 - Bachelor of Science in Business Administration with major or minor in operations and supply chain management
 - MBA with concentration in Supply Chain Management and Consulting
 - Master of Science in Supply Chain Management

Associate's Level and Certificates

Crowder College outside of Joplin offers several associate's degree and certificate programs relevant to the Transportation and Logistics target. Among them are its Professional Truck Driver School and its Career Institute, which offers Associate of Applied Science degrees in majors in automotive technology and diesel technology and a Heavy Equipment Operator program.

St. Louis Community College has four campuses and across them, several certificate and degree programs. Those that are pertinent to the Transportation and Logistics target are:

- Associate in Applied Science degree, Certificate of Proficiency, and Certificate of Specialization in Automotive Technology at the Forest Park campus
- Associate in Applied Science degree, Certificate of Proficiency, and Certificate of Specialization in Diesel Technology at the Forest Park campus
- Certificate of Specialization in Maintenance Mechanic at the Florissant Valley campus

Linn State Technical College (outside of Jefferson City) provides several academic programs important to this target. They include:

- Associate of Applied Science and two certificates (Refinishing and Non-Structural Repair; Structural and Mechanical Repair) in Automotive Collision Technology
- Three Associate of Applied Science degrees (General Option; High Performance Option; Light-Duty Option) and four certificates (Automotive Transmission/Transaxle; Maintenance and Light Repair; Engine Performance; General Automotive) in Automotive Technology
- Associate of Applied Science and two certificates (Powerplant; Airframe) in Aviation Maintenance
- Associate of Applied Science in Heavy Equipment Technology – General Option
- Associate of Applied Science in Heavy Equipment Technology through the CAT Dealer Service Technician Program, which is a partnership with Caterpillar and Caterpillar Dealers to prepare candidates for entry level positions in Caterpillar dealerships as service technicians.
- Certificate in Heavy Equipment Operations
- Associate of Applied Science in Medium/Heavy Truck Technology

While there is an ample supply of community and technical colleges with mechanic and repair training programs throughout the State, there are few programs focused specifically on transportation, supply chain management, and materials moving. However, through the Missouri Department of Elementary and Secondary Education, this target is well on its way

to receiving connections throughout the talent pipeline. In 2009, Missouri Career Education identified Transportation, Distribution, and Logistics as one of its 16 career clusters, providing a platform for curriculum design and transition from secondary education to postsecondary education and career.

PROSPERITY: BUSINESS SECTOR ANALYSIS

Missouri has a well-established supply of Transportation and Logistics employers. Top employers include American Railcar Industries, Burlington Northern Santa Fe Railroad, Con-way Freight, Ditzfeld Transfer, Inc., Dollar General Distribution Center, Leggett and Platt, Norfolk Southern, RockTenn, SRC Logistics, Target, Tri-State Motor Transit Co., Union Pacific Railroad, Wal-Mart, and Western Dairy Transport.

Missouri has long considered Transportation and Logistics an important cluster. In 2007, MERIC identified Freight Haulers, Warehousing, and Wholesale as the State's key strengths, which remain viable focus areas for State economic development efforts. In MERIC's 2007 report, most of the subsectors examined experienced solid five-year growth over the 2001-2006 period. Current five-year performance of Transportation and Logistics subsectors has not been favorable given the widespread and deep impacts of the Great Recession on manufacturing, consumer confidence, and store inventories.

In addition to the previously identified NAICS-defined subsectors, some have been added. Within Warehousing, other wood product manufacturing and plastics product manufacturing have been added. The additional manufacturing subsectors enhance packaging manufacturing as well as take advantage of the high concentration of these businesses in the State. Within Wholesalers, furniture wholesalers, professional and commercial equipment wholesalers, and other categories of wholesalers have been omitted from the current definition because of their low concentration in the State.

Growth in Missouri's Transportation and Logistics sector has a strong multiplier effect in terms of creation of additional jobs and wealth. The following table highlights the economic impact of key Transportation and Logistics subsectors as indicated by NAICS code.

The Impact of 100 New Jobs in Missouri by Sector: Transportation and Logistics Cluster

NAICS and Description	Job Impact				GDP Impact in Millions			
	Jobs Multiplier	Direct Jobs	Indirect Jobs	Total Jobs	GDP Multiplier	Direct GDP	Indirect GDP	Total GDP
42 Wholesale Trade	2.11	100	111	211	1.67	\$11.8	\$7.9	\$19.7
481 Air Transportation	2.71	100	171	271	2.00	\$11.3	\$11.3	\$22.6
482 Rail Transportation	2.90	100	190	290	1.57	\$22.8	\$13.1	\$35.9
483 Water Transportation	4.83	100	383	483	2.64	\$16.6	\$27.3	\$43.9
484 Truck Transportation	1.85	100	85	185	1.86	\$6.6	\$5.7	\$12.3
485 Transit & Ground Passengers	1.25	100	25	125	1.60	\$2.9	\$1.7	\$4.7
486 Pipeline Transportation	3.61	100	261	361	2.15	\$15.8	\$18.1	\$33.9
492 Couriers & Messengers	1.34	100	34	134	1.45	\$5.1	\$2.3	\$7.4
493 Warehousing & Storage	1.45	100	45	145	1.52	\$5.9	\$3.1	\$9.0

Source: MERIC, IMPLAN Statewide Model

Note: Impacts represent rounded statewide estimates and are for reference only. Impact estimates for individual projects will vary based on region, time period, detailed industry, and project information. GDP listed in the millions.

The following table shows Missouri's employment and wages for the Transportation and Logistics target business sectors in the fourth quarter of 2009. Statewide, there are nearly 198,000 jobs in Transportation and Logistics-specific sectors, representing approximately nine percent of all jobs in the State. Many jobs in this target pay higher than Missouri's fourth quarter 2009 average annual wage of \$42,434. In fact, the target's average annual wage is \$49,639, or 17 percent higher than the State's average annual wage. Impacts of this recession include job losses across the Warehousing and Wholesalers niches. While overall employment in these subsectors has experienced a decline of 5.8 percent, the State has a significant number of Transportation and Logistics firms (approximately 19,000) as well as nine regions with this as a regional target. When, as expected, consumer confidence returns to pre-recession levels, this target will leverage the State's employment concentrations in sectors like manufacturing and retail, which have strong synergies with transportation, warehousing, and wholesale trade.

As the economy slowly returns to pre-recessionary levels, the State and its regions should focus on infrastructure development opportunities, business retention and expansion efforts, opportunities to capitalize on growing foreign inbound shipments, and alignment and expansion in workforce development.

Missouri Transportation and Logistics Target: Private Employment (by business subsector), 4Q 2009

NAICS	Description	4Q09			Employment Change 4Q04 - 4Q09			Average Annual Wage Change 4Q04-4Q09		
		4Q09 Emp	Location Quotient	4Q09 Average Annual Wage	MO	MO	US	MO	MO	US
					# Change	% Change	%Change	# Change	% Change	% Change
Total across Sectors		2,604,179	-	\$42,434	-62,293	-2.3%	-2.1%	\$5,587	15.2%	16.0%
Freight Hauling										
4811	Scheduled Air Transportation	4,476	0.54	\$55,797	-1,795	-28.6%	-12.1%	\$1,426	2.6%	2.2%
4812	Nonscheduled Air Transportation	262	0.30	\$64,507	-218	-45.4%	-2.8%	\$28,344	81.1%	28.1%
4821	Rail Transportation	24	2.08	\$29,575	-	-	27.6%	-	-	28.0%
4832	Inland Water Transportation	841	1.70	\$69,418	364	76.4%	16.0%	\$22,790	48.9%	31.5%
4841	General Freight Trucking	24,461	1.39	\$42,182	-4,034	-14.2%	-10.5%	\$3,108	8.0%	7.9%
4842	Specialized Freight Trucking	13,102	1.72	\$35,305	401	3.2%	-7.8%	\$3,556	11.2%	13.4%
4881	Support Activities for Air Transportation	3,669	0.90	\$40,432	-211	-5.4%	-0.6%	-\$407	-1.0%	5.2%
4882	Support Activities for Rail Transportation	728	1.64	\$44,263	68	10.3%	3.6%	\$9,213	26.3%	20.0%
4883	Support Activities for Water Transportation	536	0.28	\$50,604	100	23.0%	-9.0%	\$10,276	25.5%	14.4%
4884	Support Activities for Road Transportation	1,420	0.69	\$28,146	209	17.3%	0.7%	\$3,159	12.6%	11.8%
4885	Freight Transportation Arrangement	3,093	0.91	\$44,540	137	4.6%	-4.0%	\$4,933	12.5%	14.2%
4921	Couriers and Express Delivery Services	6,863	0.67	\$41,857	-1,267	-15.6%	-5.5%	\$7,476	21.7%	11.3%
Warehousing										
3219	Other Wood Product Manufacturing	4,448	1.10	\$29,192	-1,915	-30.1%	-37.1%	\$3,313	12.8%	6.5%
3261	Plastics Product Manufacturing	11,548	1.15	\$39,960	-2,908	-20.1%	-21.9%	\$3,095	8.4%	13.3%
3324	Boiler, Tank, and Shipping Container Manufacturing	2,087	1.24	\$53,701	-282	-11.9%	-8.6%	\$5,759	12.0%	17.1%
4931	Warehousing and Storage	12,481	0.96	\$39,161	-826	-6.2%	10.4%	\$3,988	11.3%	12.7%
5416	Management, Scientific, and Technical Consulting Services	9,684	0.48	\$67,265	231	2.4%	21.2%	\$13,625	25.4%	16.8%
Wholesalers										
4231	Motor Vehicle & Motor Vehicle Parts & Supplies Merchant Wholesalers	8,971	1.44	\$41,243	-1,279	-12.5%	-9.1%	\$4,516	12.3%	8.6%
4233	Lumber and Other Construction Materials Merchant Wholesalers	4,055	1.04	\$48,428	-894	-18.1%	-21.9%	\$3,370	7.5%	6.4%
4235	Metal & Mineral (except Petroleum) Merchant Wholesalers	2,322	1.04	\$58,475	-289	-11.1%	-9.5%	\$7,809	15.4%	8.8%
4236	Electrical and Electronic Goods Merchant Wholesalers	6,151	0.97	\$57,111	45	0.7%	-8.9%	\$5,479	10.6%	10.9%
4237	Hardware & Plumbing/Heating Equip. & Supplies Merchant Wholesalers	4,671	1.04	\$50,846	-312	-6.3%	-6.8%	\$5,572	12.3%	12.8%
4238	Machinery, Equipment, & Supplies Merchant Wholesalers	14,264	1.15	\$53,566	-585	-3.9%	-6.7%	\$5,572	11.6%	14.5%
4241	Paper and Paper Product Merchant Wholesalers	3,922	1.52	\$54,373	-573	-12.8%	-15.7%	\$4,757	9.6%	14.4%
4244	Grocery and Related Product Merchant Wholesalers	12,000	0.83	\$47,755	-493	-3.9%	3.1%	\$4,375	10.1%	13.7%
4245	Farm Product Raw Material Merchant Wholesalers	2,502	1.61	\$48,453	-297	-10.6%	1.7%	\$19,964	70.1%	37.5%
4246	Chemical and Allied Products Merchant Wholesalers	2,827	1.15	\$59,681	126	4.7%	-6.3%	\$6,091	11.4%	15.0%
4247	Petroleum and Petroleum Products Merchant Wholesalers	2,254	1.16	\$45,992	-123	-5.2%	-5.0%	\$10,693	30.3%	28.2%
4248	Beer, Wine, and Distilled Alcoholic Beverage Merchant Wholesalers	3,519	1.07	\$50,998	344	10.8%	13.7%	\$5,315	11.6%	10.2%
4249	Miscellaneous Nondurable Goods Merchant Wholesalers	6,919	1.05	\$39,987	-891	-11.4%	-8.7%	\$5,549	16.1%	15.2%
4251	Wholesale Electronic Markets and Agents and Brokers	23,577	1.45	\$75,716	4,995	26.9%	11.5%	\$15,862	26.50%	22.22%

Source: U.S. Bureau of Labor Statistics via MERIC

PLACE: MISSOURI'S DYNAMICS

Missouri has a clear competitive advantage in the Transportation and Logistics target by virtue of its central U.S. geography. Charged with maintaining the assets spurred by the State's geographic centrality, the Multimodal Operations Division of the Missouri Department of Transportation oversees statewide planning, grant administration, and technical assistance for the State's aviation, transit, freight, and waterways. In regards to rail, MoDOT has regulatory responsibility over railroads. DED has a longstanding collaborative relationship with these agencies.

There are opportunities in this target for communities throughout the State. Business facilities ranked Jefferson City and Joplin among its top 10 emerging locations (for small cities with population less than 500,000) for logistics in 2010. However, it is undeniable that Missouri's two largest metro areas grew to their current size and influence largely because of their ability to leverage their central locations to become prominent transportation and cargo hubs. First river-borne traffic and, later, air and highway shipping have continued to factor greatly into St. Louis and Kansas City's economic wellbeing. Metro Kansas City shares many similar infrastructural benefits with Greater St. Louis, including the intersection of three (and soon to be four) interstate highways, riverside cargo ports, extensive Class I rail networks and multi-modal distribution capacity.

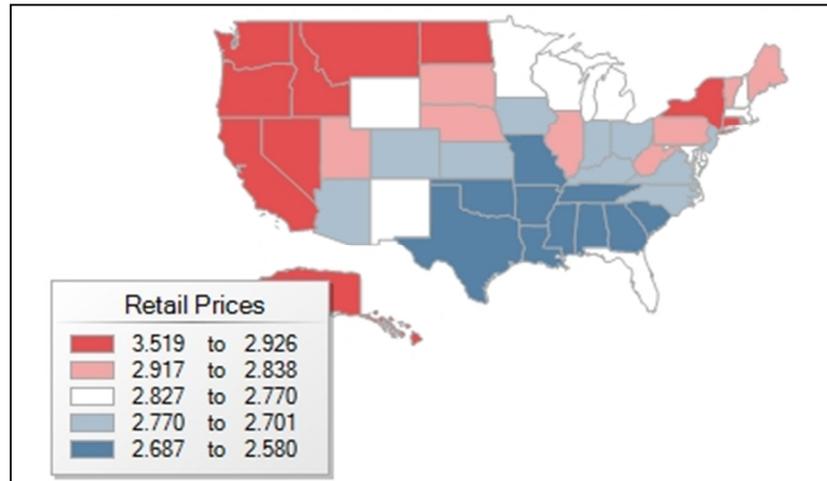
Where the Kansas City region has excelled is in the branding, marketing and development of its SmartPort, a national best practice in multi-modal logistics infrastructure. Helping to spur SmartPort growth is the fact that Kansas City has more designated Foreign Trade Zone acreage than any other U.S. city (10,000+ acres). One particularly unique initiative spurred by SmartPort is the development the region's Trade Data Exchange (TDE). The TDE allows users to track the status of shipments along multiple modes of transportation using a single interface, rather than having to use multiple sources to track shipments at various points of transfer and with various providers of transportation and shipping services. In addition to the TDE, SmartPort has driven a regional supply chain education initiative, connecting the private sector with education providers to identify educational and training needs of the labor force.

Business Costs

A 2010 study from Conexus and Ball State University recently ranked Missouri number three in the nation for logistics competitiveness, citing the State's tax climate as a key advantage. However, the State ranked low for venture capital and productivity and innovation in logistics and manufacturing. These areas (measured by industry R&D, patent activity per capita, productivity growth, and per capita venture capital) provide opportunities to significantly enhance Transportation and Logistics output if effectively strengthened. In addition to the State's tax climate for logistics firms, its low fuel and electricity costs provide advantages for firms located in the State. As shown in the following map,

Missouri’s average retail fuel prices for October 2010 were in the lowest quintile in the nation at \$2.50 - \$2.687 per gallon (inclusive of diesel, regular, and premium fuel).

Average Retail Fuel Prices by State, October 2010



Source: AAA Fuel Gauge Report

According to the U.S. Department of Energy, average electricity costs have gone up in most states across all sectors (commercial, industrial, residential, and transportation). Despite this, Missouri’s average electricity costs remain below U.S. averages in each sector, notably in transportation. However, the State’s average costs across all sectors have shown a sizable increase between July 2009 and July 2010, dropping the State from #17 to #25 in terms of low-cost states. While this is a concern, many local utilities continue to provide incentives which further lower costs beyond the retail price for heavy users.

Thus, Missouri’s low cost of electricity, as shown in the following table, is another key business cost advantage related to Transportation and Logistics development. Commercial, industrial and transportation electricity costs to consumers are all lower in Missouri than adjacent states.

**Average Retail Price of Electricity to Ultimate Customers by End-Use Sector,
West North Central Region States, July 2010 and 2009 (Cents per Kilowatthour)**

	Residential		Commercial		Industrial		Transportation		All Sectors	
	Jul-10	Jul-09	Jul-10	Jul-09	Jul-10	Jul-09	Jul-10	Jul-09	Jul-10	Jul-09
South Dakota	9.85	9.32	8.01	7.33	6.1	5.68	--	--	8.31	7.7
Missouri	10.53	9.62	8.85	8.13	6.58	6.27	8.99	8.39	9.29	8.51
Kansas	10.62	9.98	8.7	8.24	6.59	6.28	--	--	9.02	8.46
North Dakota	9.43	8.92	7.72	7.16	6.69	6.28	--	--	7.88	7.37
Iowa	11.26	10.92	9.16	8.8	6.55	6.41	--	--	9.07	8.74
Nebraska	10.35	9.95	8.29	8.06	6.85	6.63	--	--	8.48	8.19
Minnesota	10.9	10.44	9.04	8.53	6.72	6.81	7.68	7.75	9.07	8.75
West North Central Region	10.66	10.03	8.78	8.24	6.64	6.46	8.3	8.06	9	8.48
U.S. Total	12.01	11.9	10.7	10.63	7.31	7.13	11.59	11.41	10.5	10.37

Source: Department of Energy, Energy Information Administration

Note: The industrial sector encompasses the following types of activity manufacturing (NAICS codes 31-33); agriculture, forestry, fishing and hunting (NAICS code 11); mining, including oil and gas extraction (NAICS code 21); and construction (NAICS code 23). The commercial sector includes service-providing facilities. The transportation sector consists of all vehicles whose primary purpose is transporting people and/or goods from one physical location to another. Included are automobiles; trucks; buses; motorcycles; trains, subways, and other rail vehicles; aircraft; and ships, barges, and other waterborne vehicles.

A key supportive tool for Transportation and Logistics growth related to business costs is Missouri's foreign-trade zones (FTZs). Currently, the State features three zones, the Greater Kansas City Foreign Trade Zone (FTZ #15), the St. Louis County Port Authority (FTZ #102), and the City of Springfield's zone (FTZ #225). FTZs enhance capacity for international-focused trade by allowing delayed or reduced duty payments on foreign merchandise, as well as other savings.

St. Louis County Executive Charlie Dooley and Mayor Francis Slay recently signed a letter addressed to the U.S. Department of Commerce that asks to expand the city's trade zone under the Alternative Site Framework option. The expansion is a key element of the city's attempts to create a multi-state shipping hub for China, a task that has been the work of the Midwest-China Hub Commission. If successful, St. Louis' China hub would be a transformative asset for the region's—and State's—competitiveness in the Transportation and Logistics sector.

Expansion of FTZs could also serve as a key strategy to broaden regional assets for this sector and move Missouri to the forefront of U.S. states effectively utilizing the FTZ designation to spur growth in Transportation and Logistics employment.

Roads and Highways

The State of Missouri has 33,677 lane-miles. According to the Missouri Department of Transportation, approximately 87 percent of major highways are in good condition. However, only 60.4 percent of minor highways and 64.5 percent of bridges are in good condition. For many rural areas of the State, the condition and capacity of minor highways is a critical competitive concern. Despite the heightened awareness that the 2007 I-35W bridge collapse in Minneapolis brought to maintenance needs of bridges nationwide, many states (including Missouri) are still behind in enhancing bridge safety and capacity.

In addition to several regional projects, there are four ongoing statewide Transportation Improvement Plan projects, including I-44 Planning for Progress, Better Roads Brighter Future, Improve I-70, and Safe and Sound Bridge Improvement Program.

MoDOT Inventory

Lane-Miles	
Number of lane-miles	33,677
Percent of major highways in good condition	86.6%
Percent of minor highways in good condition	60.4%
Bridges	
Number of bridges	7,049
Percent of bridges in good condition	64.5%

Source: Missouri Department of Transportation

A major highway reconstruction project in St. Louis, the re-build of Interstate-64 through the city, was completed in 2009. Missouri, working closely with Illinois departments, has now begun construction on what is being called the “Mississippi River Bridge” project connecting downtown St. Louis and southwestern Illinois. It is the first bridge built to connect these territories in over 40 years. As a component of this project, Interstate-70 will be relocated onto the new span from its existing route along the Poplar Street Bridge. The new bridge is expected to lessen congestion, conserve fuel and result in fewer vehicular crashes. In the western portion of the State, Kansas City is currently undergoing major construction projects along I-35, I-70 and I-435.

A great deal of transportation improvement projects across the State funded by the American Recovery and Reinvestment Act have either been completed or are in various stages of completion. These projects will further enhance the State’s already competitive capacity relative to highway infrastructure.

Rail

According to Association of American Railroads, Missouri ranks tenth in total rail miles (4,078 rail miles). Missouri ranked fourth in total rail tons carried (411,946,400 rail tons). Missouri ranked third in total rail carloads carried (8,071,910 rail carloads).

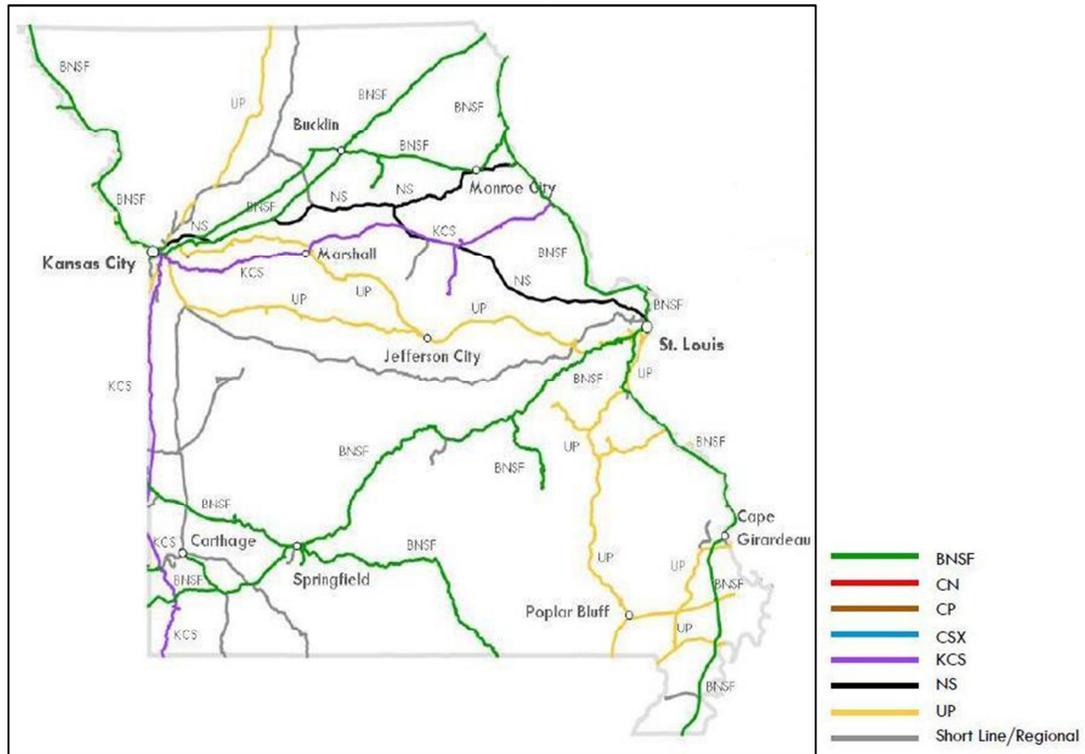
In 2008, 13,228,482 rail tons originated in the State of Missouri, landing the State at #31 in the ranking. In the same year, 71,287,602 rail tons terminated in the State of Missouri, ranked #8. In 2008, Missouri ranked #24 in rail carload originations, with 370,583 rail carloads originating from the State; and #10 in rail carload terminations, with 840,428 terminating in the State.

In terms of freight rail employment, Missouri ranks seventh, employing 7,167 workers. Missouri ranks fifth in total freight rail wages paid; in 2008, \$530.3 million was paid to Missouri's freight rail workers.

Missouri has 17 freight railroads covering 4,917 miles (including trackage rights):

- Five Class I railroads,
 - BNSF Railway Company
 - CSX Transportation
 - Kansas City Southern Railway Co.
 - Norfolk Southern Corporation
 - Union Pacific Railroad Co.
- Two regional freight railroads,
 - Iowa, Chicago, & Eastern Railroad
 - Missouri & Northern Arkansas Railroad
- Three local railroads, and
 - Arkansas & Missouri Railroad
 - Kaw River Railroad
 - Ozark Valley Railroad, Inc.
- Seven switching and terminal railroads.
 - Central Midland Railway
 - Columbia Terminal
 - Manufacturers Railway Co.
 - Missouri & Valley Park Railroad Corporation
 - Missouri North Central Railroad
 - Semo Port Railroad, Inc.
 - Terminal Railroad Association of St. Louis

Missouri Railroad Map



Source: 2008 National Transportation Atlas Database, U.S. Bureau of Transportation Statistics

Ensuring that Missouri’s competitive array of Class I and short-line railroads continues to upgrade and optimize its capacity will be a critical component of a target-development strategy in Transportation and Logistics. So too will be the linking of existing and future rail lines with highways, airports and river ports to provide multi-modal distribution access for the State’s companies and customers.

Air Cargo

Missouri has four main airports: Lambert-St. Louis International Airport, Kansas City International Airport, Springfield-Branson National Airport, and Columbia Regional Airport. St. Louis ranks #33 in the nation for passenger traffic and 36th for cargo capacity. Kansas City ranks 38th in passengers and 42nd in cargo. Springfield ranks 125th in passengers and 107th in cargo. Columbia is unlisted by the Airport Council International, which publishes the rankings.

As was discussed earlier in this section, St. Louis’ attempts to leverage Lambert Airport as the lynchpin of a strategy to create a hub for shipments to and from China would significantly add to Missouri’s prospects for Transportation and Logistics growth.

Leveraging the hub to ship products back to China opens up a wealth of opportunities for State and regional businesses to increase exports to China and Southeast Asia.

Airport Cargo Capacity and Rankings, 2006 & 2009

Airport	Ranking			Freight Cargo (metric tons)		
	2006	2009	Change, 2006-2009	2006	2009	% Change, 2006-2009
St Louis, MO (STL)	40	36	4	134,948	110,551	-18.1%
Kansas City, MO (MCI)	58	42	16	85,551	88,673	3.6%
Springfield, MO (SGF)	102	107	-5	21,538	11,437	-46.9%

Source: Airport Council International
 Note: Columbia Regional has no air cargo.

Development of St. Louis’ China hub would also reverse recent trends that find the region’s share of freight cargo shipments declining 18 percent from 2006 to 2009. Kansas City, however, has seen its freight tonnage increase 3.6 percent in this period, notable in the context of recessionary declines across the State and nation. This increase is testament to the effective marketing of the Kansas City region’s SmartPort, detailed at the beginning of this target section.

Waterways

Missouri’s waterways move an average of \$4.1 billion of cargo annually. Each of Missouri’s port authorities provide a range of cargo transfers and storage and have land ripe for industrial development. Missouri has eleven ports:

- **Howard/Cooper County**
 - Site includes:
 - Storage capacity of 250,000 bushels of grain and 4 million gallons of liquid chemicals
 - 35 prime industrial acres available for development
 - Site located within one mile of the Missouri Pacific Railroad and adjacent to US Highway 40, Missouri Highway 5 and 87, and Interstate-70
- **Jefferson County**
 - This port is currently undergoing Phase II of a port feasibility study that will determine the viability of expanding the port’s capacity, taking advantage of currently unused water frontage.
 - Union Pacific and Burlington Northern Santa Fe serve Jefferson County.
- **Kansas City**

- One of the largest storage and distribution centers serving the Missouri River
- Site features:
 - An intermodal facility, including barge, rail, and truck
 - Storage capacity of approximately 60,000 tons of covered bulk space
 - 145 acres available for industrial or retail development
- Site served by the Union Pacific Railroad and has immediate access to Interstate-70, Interstate-35, Interstate-29, and Highway 71.
- **Mid-America**
 - The site features bulk freight capacity with Container-on-Barge capability
- **New Bourbon**
 - Currently under development, this site will feature:
 - Ability to accommodate inbound and outbound products
 - 100 foot sheet pile deck area, material storage areas, loading and unloading cells around the harbor, handling facilities, scale house, and wetland mitigation area
 - Site is close to U.S. Highway 61 and Interstate-55, and Burlington Northern-Santa Fe Railroad is one mile from site.
- **New Madrid County**
 - Site features:
 - Location within the 4,200 acre St. Jude Industrial Park
 - A Designated Enterprise Zone, with local property tax abatements and State income tax credits available
 - 30 acres available for leasing
 - Site is ½ mile away from Interstate-55.
- **Pemiscot County**
 - Site features:
 - 16 acres of port-owned building sites available
 - A Designated Enterprise Zone, with local property tax abatements and State income tax credits available
 - Site is 3 miles from I-55 and US Highway 412, 60 miles from US Highway 60 and I-57, and 70 miles from I-40. Site is 25 miles from Blytheville-Gosnell Airport Authority. Local air traffic served by Caruthersville Municipal Airport. Rail access is Burlington Northern-Santa Fe Railroad.
- **St. Joseph**
 - Site features:
 - Union Pacific rail spur with complete transloading services

- Close proximity to 31 acres in redeveloped Stockyards Industrial Park
 - Incentive packages provided by St. Joseph's Economic Development partnership
 - Site is accessible to I-29, I-229, Highway 36, I-435, I-70, and Highway 71. It is 35 minutes from Kansas City International Airport and 10 minutes from St. Joseph Rosecrans Memorial Airport. The site is also accessible to Union Pacific and Burlington Northern Santa Fe Railroads.

- **St. Louis City**
 - This port is the third largest inland port in the Midwest.
 - Site features:
 - Unimpeded river expressway between St. Louis and New Orleans
 - Over 100 docking facilities with 16 public terminals
 - Site has immediate access to I-64, I-55, I-44, I-70, and other major interstates as well as several rail lines.

- **Southeast Missouri**
 - Site currently has 70 acres leased to existing businesses and has 30 acres available.
 - Site features an 1800 feet slackwater harbor.
 - Site's location can provide same day truck service to St. Louis, Nashville, Memphis, and Kansas City and next day truck service to Chicago, Atlanta, and Dallas.

- **Mississippi County**
 - Site features 18 acres with nearly 1,900 feet of river frontage.
 - Service capacity includes ability to carry up to 12 regular-sized vehicles, 18-wheelers, and large farm equipment.

Missouri Port Authorities



Source: Missouri Department of Transportation

As Missouri’s waterways and the ports established to capitalize on river-borne cargo shipping have defined the State’s history, so too do they have the opportunity to enhance the State’s future competitive position as rail and highways become increasingly congested with cargo and passengers.

CONCLUSION

The practice of cluster development in today's economy involves multiple strategies coordinated among states and their local and regional partners. No longer is the practice of marketing and recruitment the sole strategy for building critical mass in key sectors. Among the components of a best-practice program are:

- Supporting existing businesses by understanding their needs and addressing the obstacles to their growth and expansion.
- Establishing or enhancing communication networks to allow information and idea exchange within the cluster.
- Identifying and addressing gaps in education and training programs.
- Fostering entrepreneurship by ensuring that the support infrastructure—such as financing, one-stop shops, and mentors—is meeting the needs of entrepreneurs.
- Creating a living and working environment that is attractive to both businesses and workers within the cluster.

Market Street has recommended refining rather than overhauling Missouri's target clusters. Seven targets have been selected, each of which includes specific niches and subsectors for further honing the initiative: Advanced Manufacturing, Energy Solutions, Biosciences, Health Sciences and Services, Information Technology, Financial and Professional Services, and Transportation and Logistics. These clusters are meant to focus the State's resources on the business sectors that have strongest opportunities for growth, provide good wages and opportunities for workers at all skill levels, and leverage Missouri's existing assets. However, having target clusters does not mean ignoring other opportunities that come along. Creating a positive business environment includes factors like education and workforce development, infrastructure, business costs, and quality of life. Promoting a strong business climate in all of Missouri's regions will attract and create opportunities for growth in many business sectors.

As this strategic planning process moves forward, strategic recommendations will address how the State of Missouri can position itself to maximize opportunities outlined in this *Target Cluster Analysis*.

APPENDIX: REGIONAL MAPS

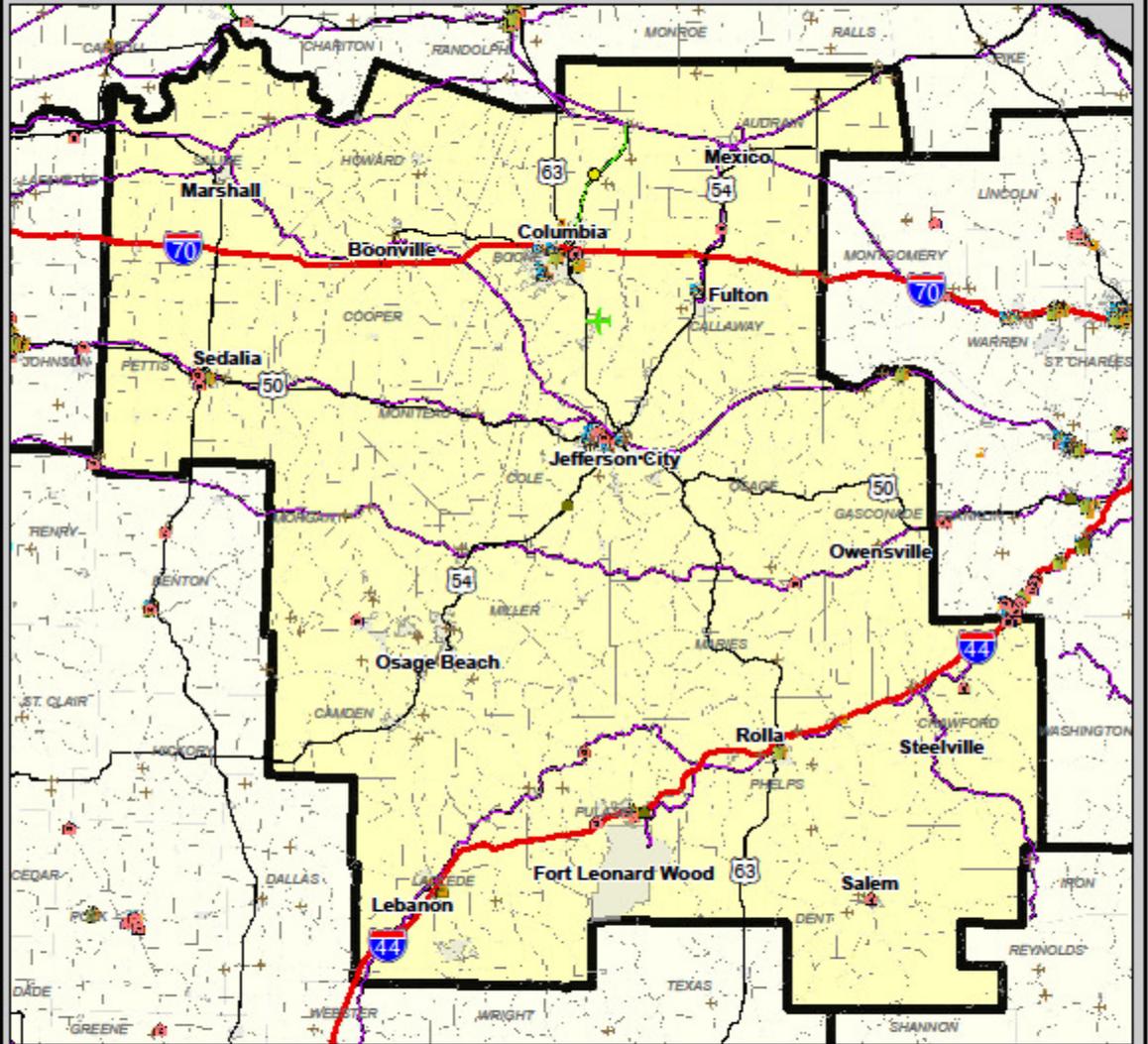
Market Street partnered with Springfield-based planning and engineering firm Great River Associates to provide several maps for the *Demographic and Economic Analysis* presented at the Regional Forums. In addition to maps related to demographic changes and socioeconomic status of residents by region, Great River also provided a high-level analysis of Missouri’s infrastructure capacity, buildings, and sites as they relate to these recommended target sectors. This Appendix includes regional maps which were produced with publicly available GIS files and Location One Information Systems (LOIS), an economic development building, site, and community database system.

Region	Primary Building Type	Square Footage Marketed on LOIS
North	Commercial	149,791
	Industrial	24,440
	Office	22,782
	Retail	66,773
	Warehouse & Distribution	11,450
Kansas City	Commercial	678,961
	Industrial	339,960
	Office	1,715,336
	Retail	1,149,320
	Warehouse & Distribution	308,168
Central	Commercial	119,426
	Industrial	57,225
	Office	128,734
	Retail	60,291
	Warehouse & Distribution	16,350

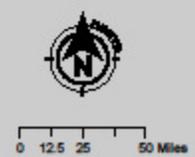
Region	Primary Building Type	Square Footage Marketed on LOIS
St. Louis	Commercial	402,428
	Industrial	1,270,278
	Office	5,835,208
	Retail	5,215,113
	Warehouse & Distribution	1,531,021
Southwest	Commercial	631,365
	Industrial	155,781
	Office	317,367
	Retail	76,185
	Warehouse & Distribution	50,590
Southeast	Commercial	233,993
	Industrial	19,600
	Office	21,110
	Retail	26,200
	Warehouse & Distribution	11,500

Potential Development Buildings

CENTRAL REGION

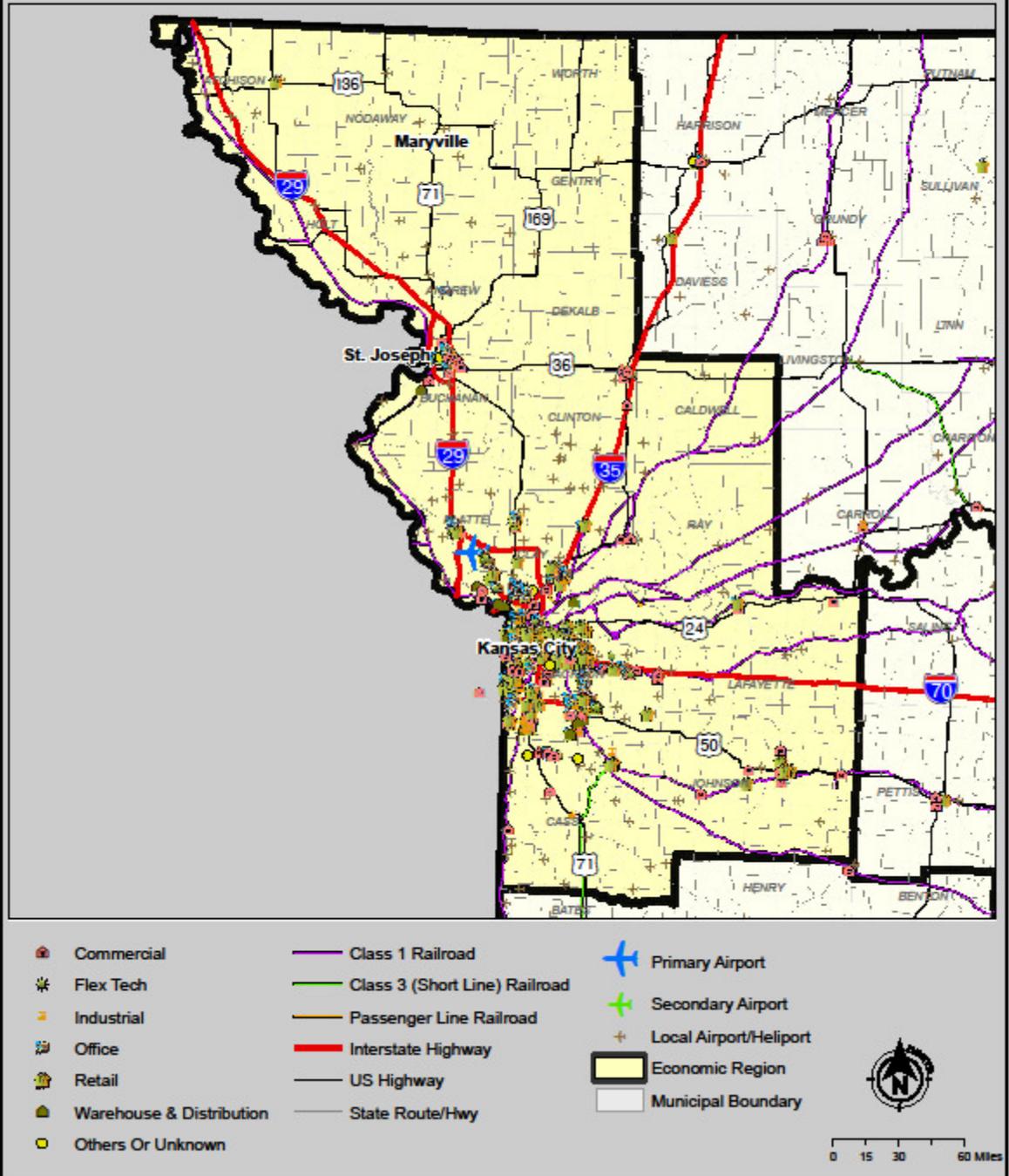


- | | | |
|--------------------------|-------------------------------|------------------------|
| Commercial | Class 1 Railroad | Primary Airport |
| Flex Tech | Class 3 (Short Line) Railroad | Secondary Airport |
| Industrial | Passenger Line Railroad | Local Airport/Heliport |
| Office | Interstate Highway | Economic Region |
| Retail | US Highway | Municipal Boundary |
| Warehouse & Distribution | State Route/Hwy | |
| Others Or Unknown | | |



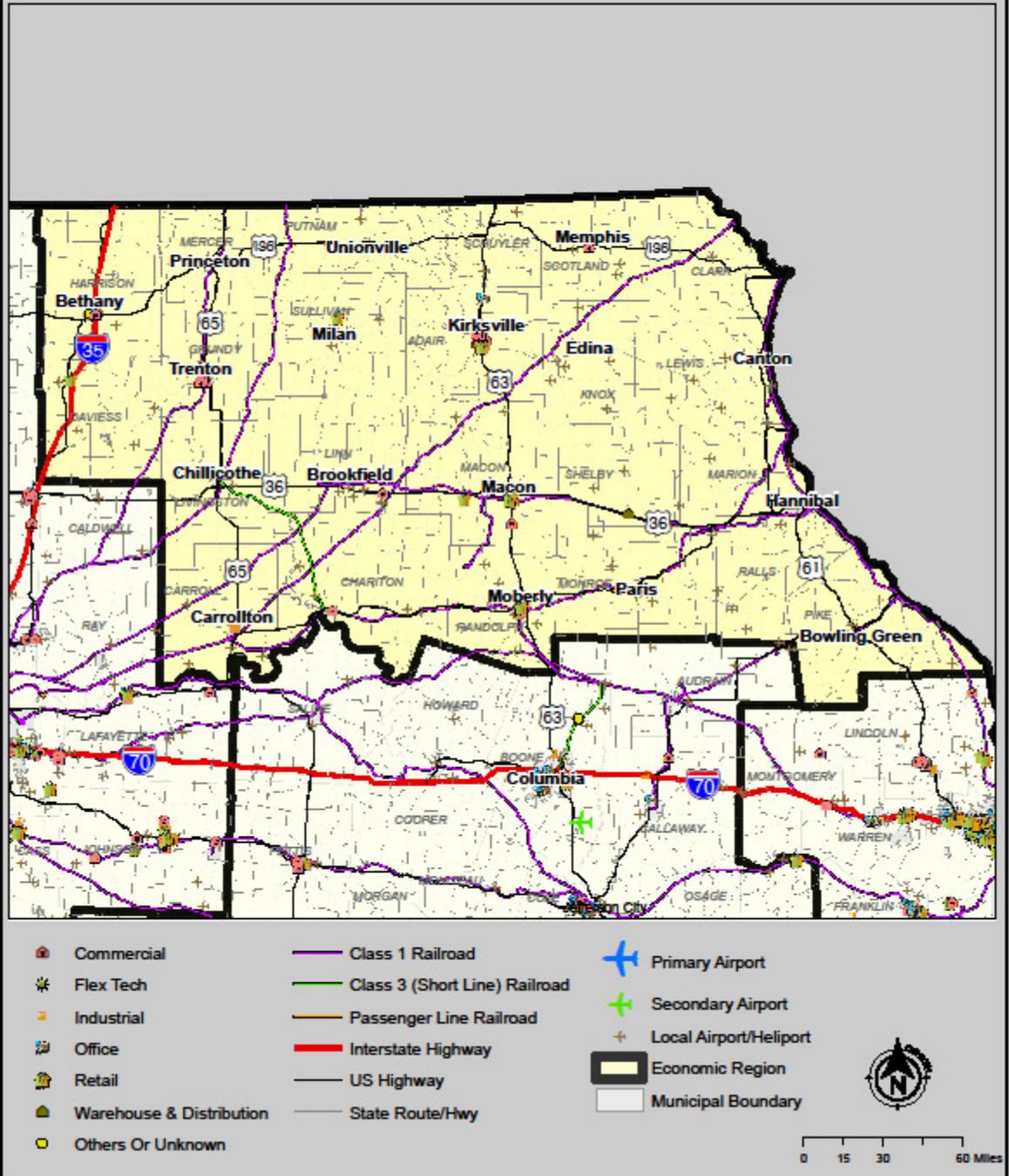
Potential Development Buildings

KANSAS CITY REGION

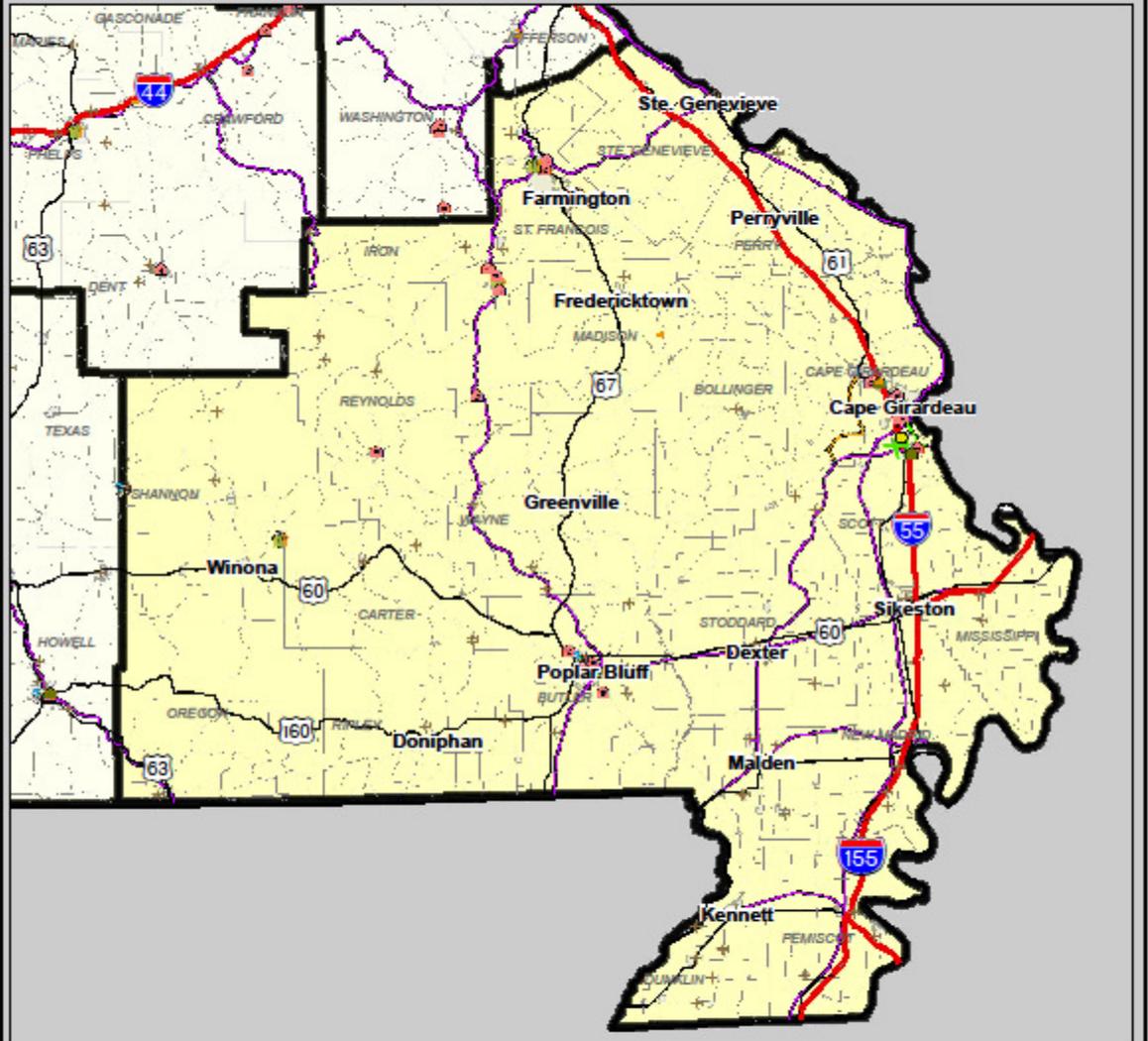


Potential Development Buildings

NORTH REGION



Potential Development Buildings SOUTH-EAST REGION



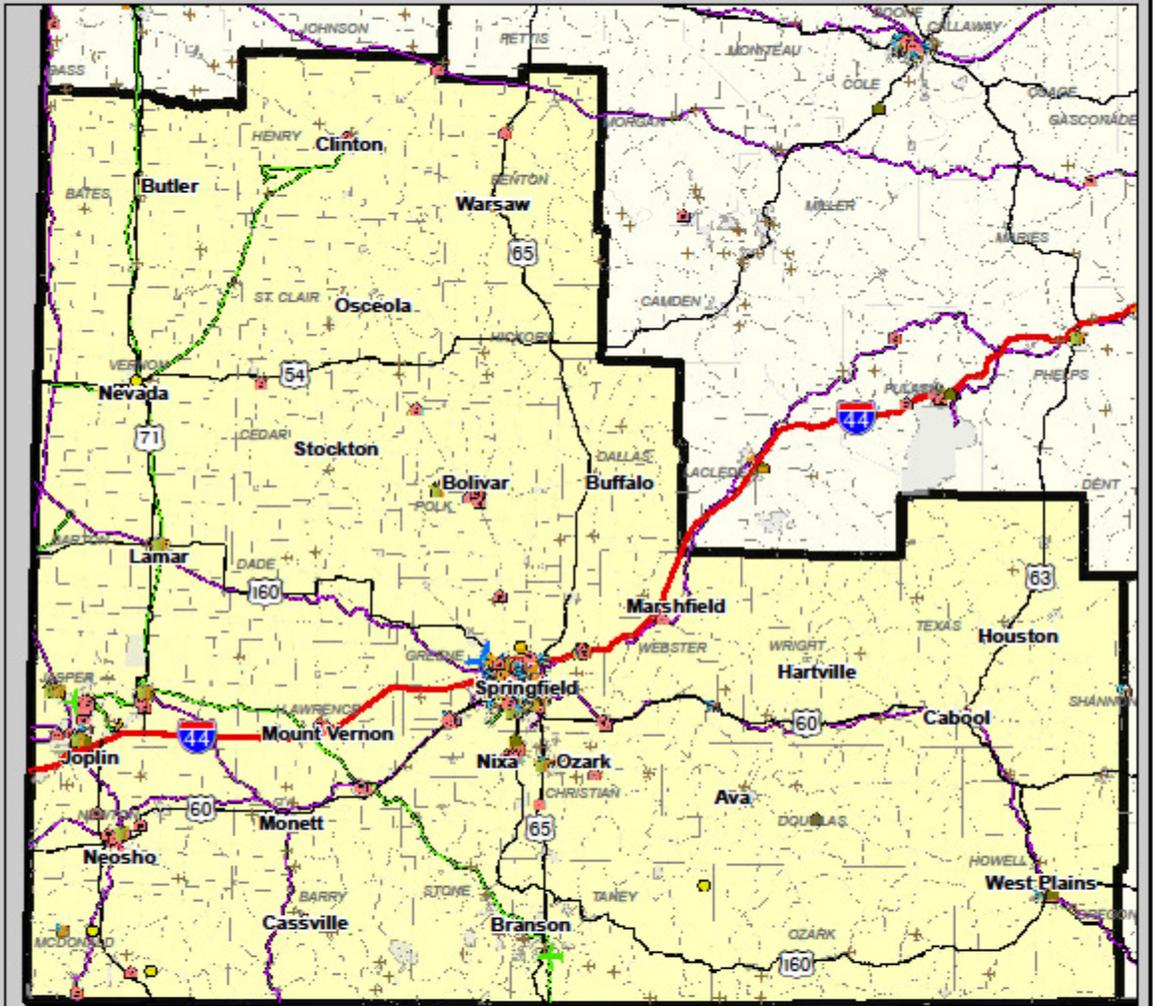
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|--------------------------|-------------------------------|------------------------|
| Commercial | Class 1 Railroad | Primary Airport |
| Flex Tech | Class 3 (Short Line) Railroad | Secondary Airport |
| Industrial | Passenger Line Railroad | Local Airport/Heliport |
| Office | Interstate Highway | Economic Region |
| Retail | US Highway | Municipal Boundary |
| Warehouse & Distribution | State Route/Hwy | |
| Others Or Unknown | | |



0 15 30 60 Miles

Potential Development Buildings

SOUTH-WEST REGION



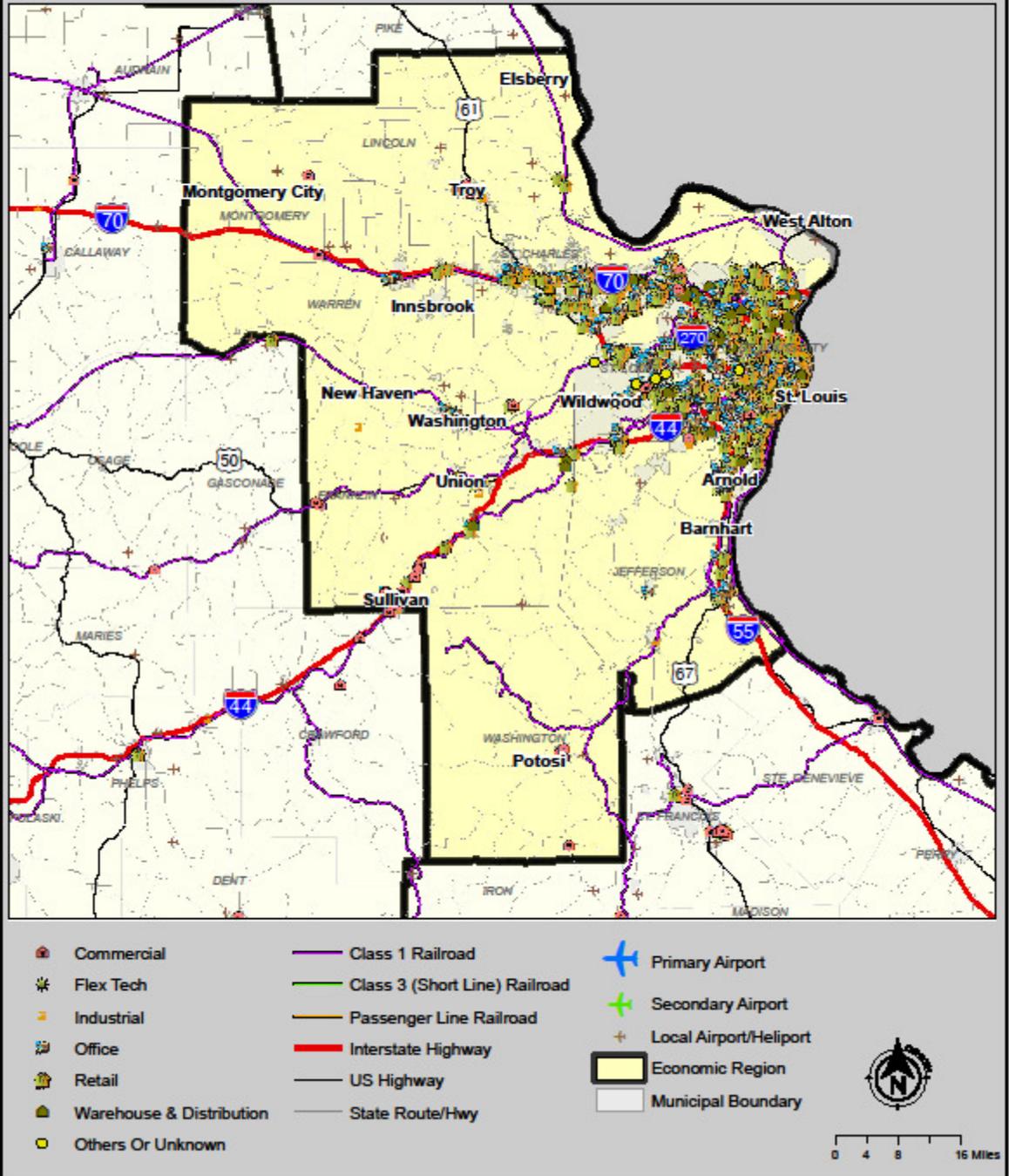
- | | | |
|--------------------------|-------------------------------|------------------------|
| Commercial | Class 1 Railroad | Primary Airport |
| Flex Tech | Class 3 (Short Line) Railroad | Secondary Airport |
| Industrial | Passenger Line Railroad | Local Airport/Heliport |
| Office | Interstate Highway | Economic Region |
| Retail | US Highway | Municipal Boundary |
| Warehouse & Distribution | State Route/Hwy | |
| Others Or Unknown | | |



0 15 30 60 Miles

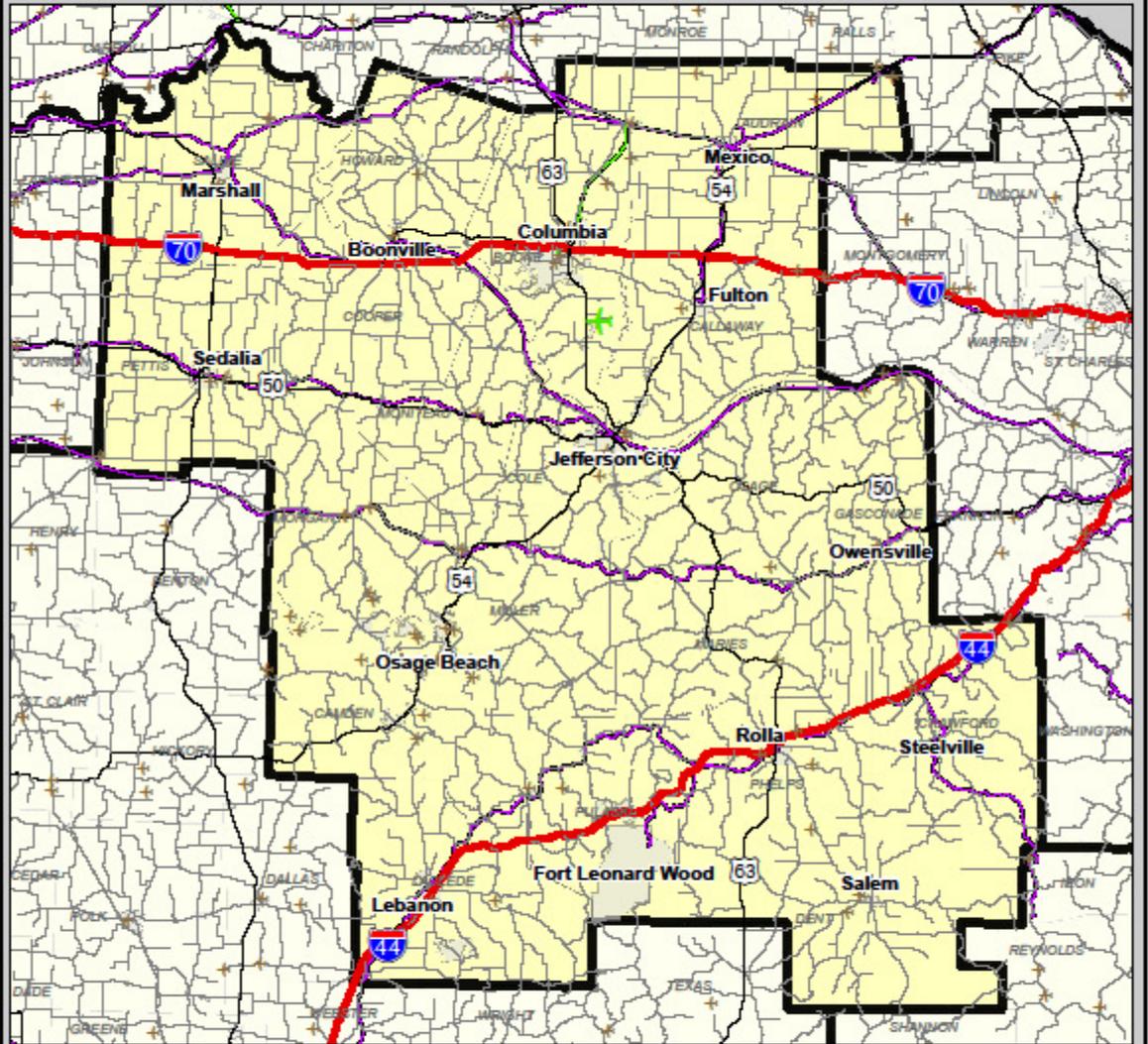
Potential Development Buildings

ST. LOUIS REGION



Transportation

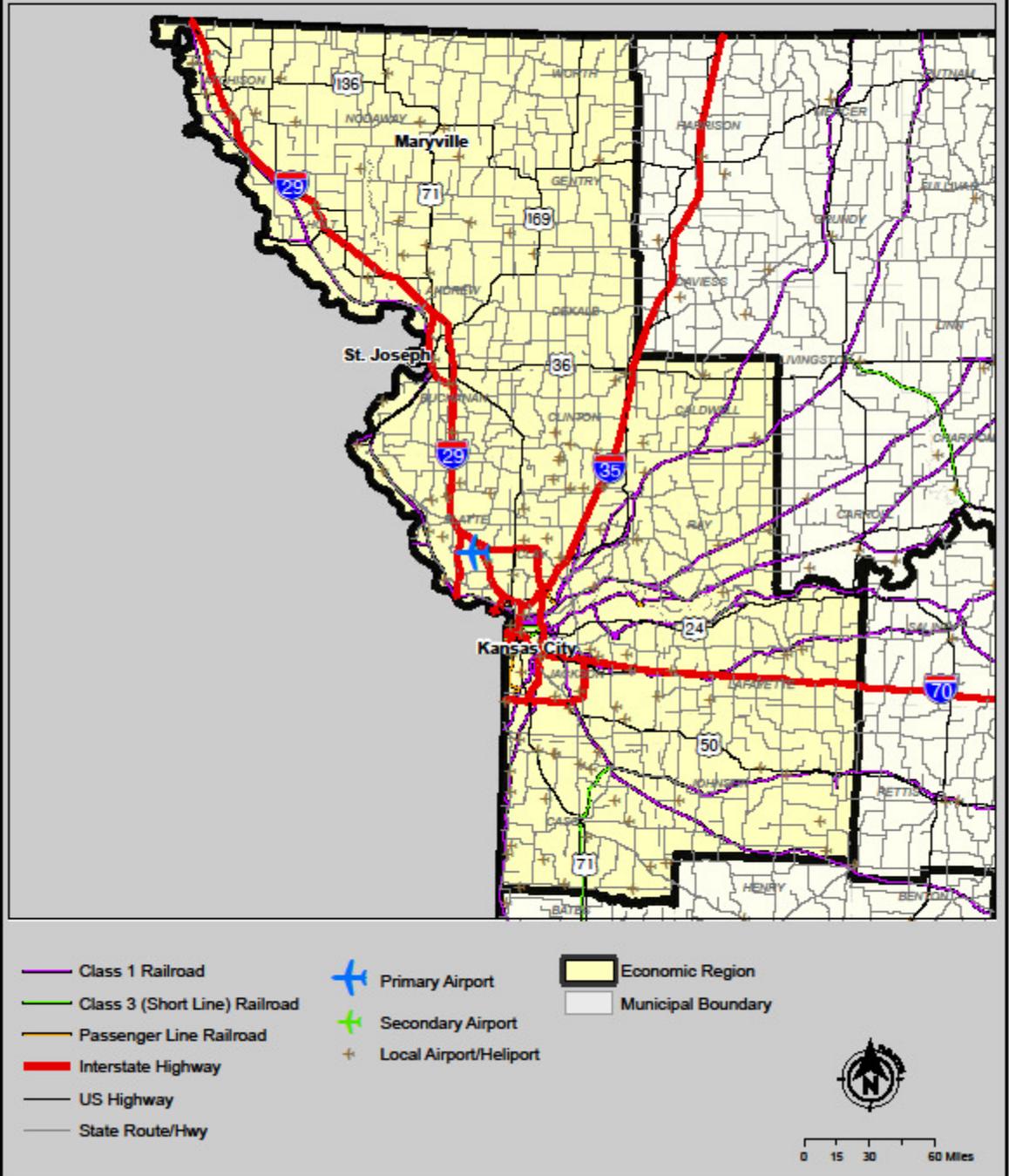
CENTRAL REGION



0 15 30 60 Miles

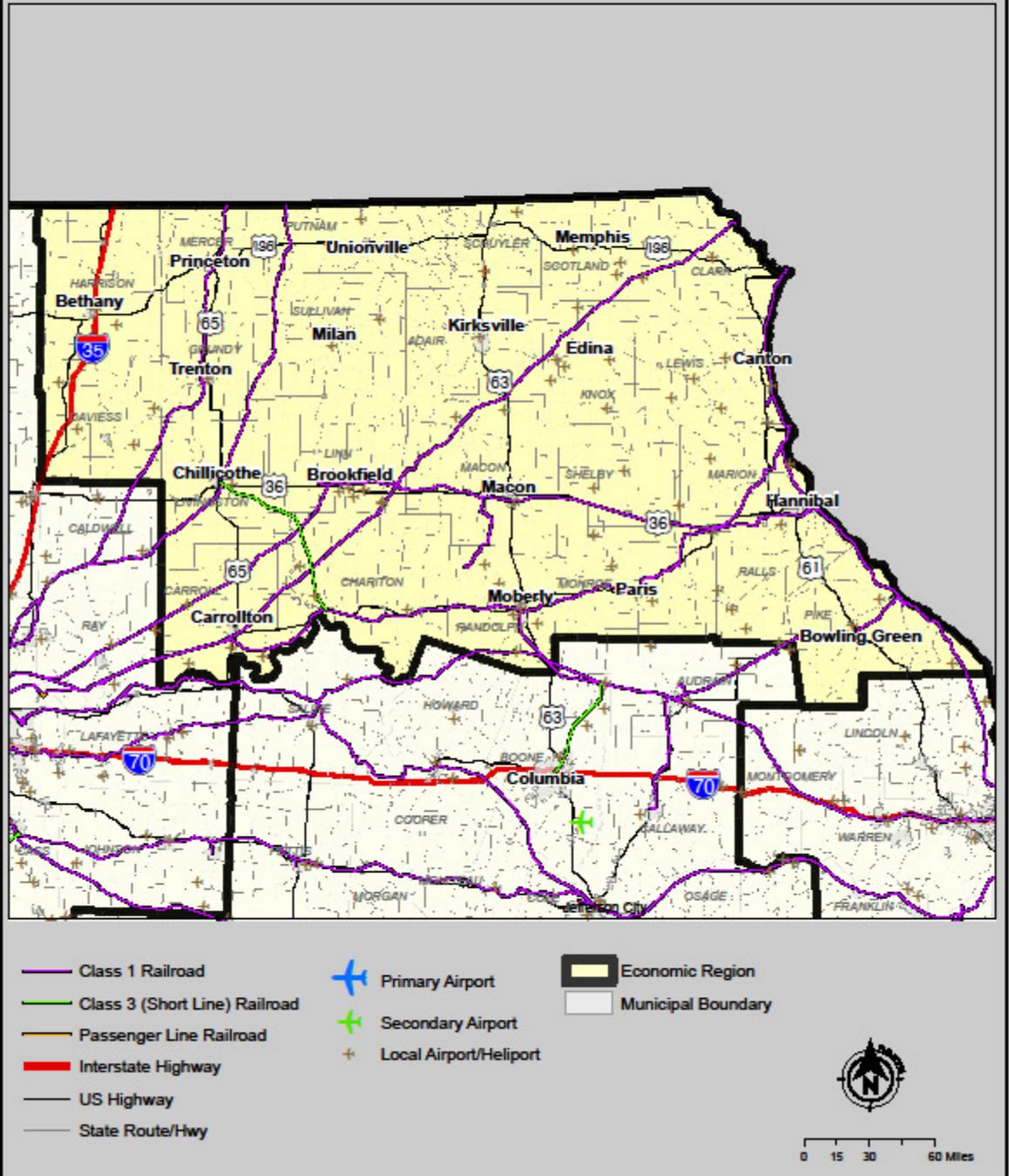
Transportation

KANSAS CITY REGION



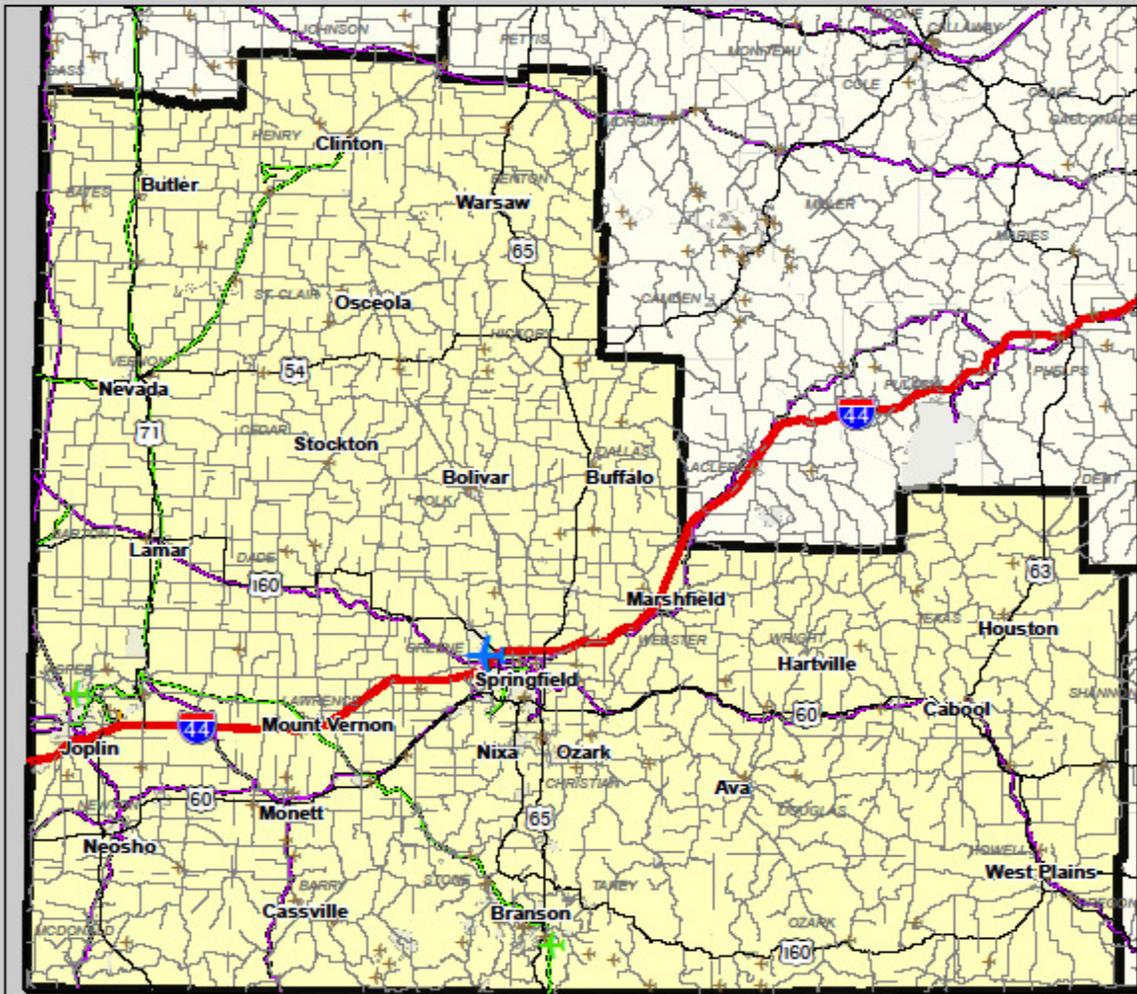
Transportation

NORTH REGION



Transportation

SOUTH-WEST REGION



- Class 1 Railroad
- Class 3 (Short Line) Railroad
- Passenger Line Railroad
- Interstate Highway
- US Highway
- State Route/Hwy
- ✈ Primary Airport
- ✈ Secondary Airport
- + Local Airport/Heliport
- Economic Region
- Municipal Boundary



0 15 30 60 Miles