



**LYNCHBURG REGIONAL
BUSINESS ALLIANCE**
Chamber and Economic Development

TARGET SECTOR ANALYSIS

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INTRODUCTION

This is a critical time in the history of the Lynchburg region and its economic development activities. In 2015, the Lynchburg Regional Chamber of Commerce and the Region 2000 Economic Development Alliance merged to form the new Lynchburg Regional Business Alliance (herein referred to as “the Alliance” or “LRBA”). Shortly thereafter in early 2016 the Region 2000 Local Government Council convened a Steering Committee of key regional stakeholders to help guide a process that will result in an updated Comprehensive Economic Development Strategy (CEDS) for the region. This strategy will help define, in part, the program of work for the Alliance as it relates to regional economic development.

The CEDS process comprehensively evaluates the region and its competitiveness for jobs and talent, including a profile of the regional economy and the manner in which it has changed over time, by way of Regional Assessment. This document – a Target Sector Analysis – will complement the CEDS process and its Regional Assessment by evaluating the region’s economic composition in greater detail and focusing more narrowly on a specific issue: the Lynchburg region’s potential to create new jobs and wealth for its residents through targeted economic development activities.

For individuals and households, standards of living are closely linked with economic opportunities. If more workers at a variety of skill levels are able to find jobs and earn wages, levels of prosperity will rise. To that end, communities around the country are directing finite resources toward the development of “targeted” business sectors that have the greatest potential to grow jobs and attract investment. This Target Sector Analysis identifies and profiles the sectors that possess such potential in the Lynchburg region and although not a formal component of the CEDS process, will appropriately inform strategic recommendations and implementation guidelines.

Before presenting the identified target sectors and brief profiles of each, it is important to review a few key concepts and considerations in the process of identifying target sectors for the Lynchburg region. The remainder of this introductory section provides this additional context in addition to defining specific terms and methods that underpin the included analysis.

KEY CONCEPTS: CLUSTERS, TARGETS, AND STRATEGIC CONSIDERATIONS

CLUSTERS: Agglomerations – or “clusters” – represent groups of interrelated businesses that choose to co-locate. The historical growth of clustered economic activity in areas such as the Silicon Valley, Route 128 in Massachusetts, and the Research Triangle Park in North Carolina are well-developed case studies to which many other regions across the nation refer as they strive to develop similar agglomerations. But there are countless examples of such clusters around the country and the world. Clustering can occur among competing or cooperative firms for a variety of different reasons. For instance, a group of suppliers may choose to locate in proximity to a major manufacturer for research and development efficiencies and reduced transportation costs. Another example is the immense aerospace cluster that has developed around Boeing Defense, Space, and Security operations in St. Louis, Missouri. Other firms may co-locate in a specific area in order to take advantage of a specialized labor pool or to be in close proximity to specific infrastructure or assets, from ports to universities.

While the factors that have led to clustering vary tremendously by region and sector, such agglomerations occur over time because a location has an asset base that affords the sector and the companies that operate within them some form of competitive advantage. The competitive advantages derived by these firms often result in comparatively high potential for employment growth and wealth creation. As the cluster grows, so too do the benefits afforded to the companies within the cluster: the available workforce grows, the potential for collaboration expands, competition may drive down costs, and buyer and supplier networks expand, among other potential impacts.

TARGETS: A targeted sector – or simply a “**target**” – is any type of business activity that is strategically pursued by an economic development organization and its partners for growth and development. That is to say, a “target” is an area where financial and staff resources, and the programs and policies they support, are specifically focused. “Targets” are often those segments of an economy where competitive advantages exist, prospects for future growth are greatest, and return on investment is likely highest. A “target” can be a single business sector with high growth potential or a “cluster” of businesses in related sectors. Many communities choose to target business sectors that are not presently concentrated in their community or characterized by existing competitive advantages. This may be because such activities are rapidly expanding, exhibit potential to become clusters in the years and decades to come, or align with other strategic objectives of the community. The ultimate aim of “targeting” is not necessarily to create new clusters of business activity – communities with multiple clusters are rare and tend to be among the nation’s largest and most dynamic economies.

EXPORT-ORIENTATION: Regional economies are generally characterized by two broad types of activity: local-serving (also known as “non-basic”) activities and export-oriented (also known as “basic”) activities. Local-serving sectors are those that predominantly provide goods and services to a population in close proximity; that is to say, they are typically supported by expenditures from the local population, both businesses and residents. Retail, food service, healthcare, and education are among the business sectors which are considered to be predominantly local-serving in most communities and regions. There are certainly exceptions; for example, tourism-dependent regions such as Orlando and Las Vegas unquestionably have export-oriented retail and food service sectors while destination healthcare communities such as Rochester, Minnesota (home to the Mayo Clinic) attract health care expenditures from patients who come from all over the world. However, by and large, these sectors are predominantly local-serving in the majority of the nation’s communities and metropolitan areas. In this regard they effectively recycle income and wealth within a community. Export-oriented sectors produce value in a region and export that value to businesses and people located outside the region, thereby bringing new income and wealth into the community. The jobs within and the revenue generated by export-oriented sectors fuel economic growth within regional economies; they support jobs in predominantly local-serving sectors and fuel the expansion of regional economies by attracting new money that was not previously a part of the regional economy. Accordingly, communities and regions typically focus their targeted economic development efforts on those sectors that are export-oriented.

UNDERSTANDING YOUR ASSET BASE: Strategic targeting is predicated upon a solid understanding of a community's strengths and weaknesses, specifically as they relate to the needs of specific business sectors and the companies that operate within them. The factors that medium to large companies consider when evaluating a community as a potential location for a new facility are often referred to as site location factors, site selection factors, or site considerations. These factors vary tremendously by sector. For example, data center operations often seek locations with low natural disaster risk, affordable and abundant water necessary for cooling, and redundant and exceptional fiber-optic infrastructure, among other attributes. Corporate headquarters typically seek locations with an exceptionally well-educated workforce, immense passenger air connectivity, and abundant amenities. Accordingly, communities that are able to offer such characteristics are better positioned to attract these kinds of operations. Understanding the community's asset base – inclusive of a wide variety of these potential site location factors – is critical to understanding the community's competitiveness for various business sectors. Likewise, an understanding of its deficiencies in terms of such site location factors will help the community identify areas that need further investment if the community wishes to transform such deficiencies into future assets.

A HOLISTIC APPROACH: In many cases, targeted business sectors reflect existing clusters of establishments with similar business activities that have likely flourished in a community because of an asset base that aligns with that sector's primary site location considerations. Other sectors that share similar site location factors may not currently be concentrated in the community, but the aforementioned asset base could make the community an attractive location for these new activities. Accordingly, such sectors represent opportunities where the community may have a particularly high chance for success in marketing and recruitment efforts that seek to attract new corporate investments or relocations that would benefit from the community's existing asset base.

While the recruitment of new companies is an important component of any targeted economic development program, it is only one leg of the stool. The growth of regional economies and their target business sectors is overwhelmingly driven by existing businesses and entrepreneurs. While new investments generate ribbon cuttings and headlines, a variety of studies have shown that the majority of the country's job creation over various time periods has been attributable to the expansion of existing companies. Accordingly, targeted economic development efforts must focus upon the needs of existing businesses as well as entrepreneurs.

Holistic economic development must also focus on developing the asset base that supports the competitiveness of target business sectors and the companies that operate within them. This is necessary to alleviate barriers to expansion for existing companies and mitigate any potential risks that could lead to layoffs or business closures. But such strategies that focus on developing the community's asset base also contribute to long-term viability of the community as a location for a more diverse array of sectors, including sectors for which the community is not currently competitive in today's climate but which it hopes to develop in future decades.

TARGET SECTOR IDENTIFICATION: REGIONAL CONSIDERATIONS

Understanding that there are some foundational principles which apply to all communities and regions – notably the aforementioned assertion that effective economic development is holistic economic development – it is important to acknowledge that every community and region is unique in terms of what it has to offer existing and prospective businesses. No two regions have the same asset base, the same workforce, or the same business climate. Nor do they have the same aspirations, organizational capacity, or strategic needs. These differences influence the manner in which target sector identification is conducted and the manner in which target sector development is carried out.

In the case of the Lynchburg region, the expectations of and for the Lynchburg Regional Business Alliance influence both substantially. Specifically, **the process of identifying target sectors in this report has been driven by the desire of the Alliance and its regional partners in economic development to advance a more targeted approach to marketing and corporate recruitment activities undertaken by the Alliance on behalf of the region.** And so, while there is an understanding that the region also needs and desires an approach to economic development that is holistic and mindful of long-term opportunities, this Target Sector Analysis specifically seeks to identify those sectors within which the region is best positioned to effectively attract new companies by way of targeted marketing and recruitment efforts in the near-term (next five years). It also identifies and briefly discusses a few niche opportunities for long-term development that are related to the identified near-term target sectors. But again, with the understanding that the Alliance and its regional economic development partners seek the strongest possible return on investment related to their marketing and corporate recruitment activities, this Target Sector Analysis focuses on the identification of those sectors for which the region has a compelling story, marketable asset base, and/or available workforce which can support the region's immediate competitiveness for new economic development projects. And so, while other regions may seek to identify and target sectors that are undeveloped and within which they are not reasonably competitive for new economic development projects because they reflect aspirational sectors of their economy, this Target Sector Analysis for the Lynchburg region is more heavily influenced by the region's desire and relative sense of urgency to see immediate focus and results as opposed to other communities and regions that may be more heavily- influenced by a long-term vision for their economy.

That being said, this Target Sector Analysis will identify those sectors for which the region is most immediately competitive through the lens of marketing and corporate recruitment. The Comprehensive Economic Development Strategy (CEDS) that is being developed concurrently will help advance such marketing and corporate recruitment activities that support near-term target sector development, as well as more holistic economic development program components such as existing business support, entrepreneurship, workforce development, and asset base enhancement. Such other investments (i.e. air service enhancements, improvement in broadband connectivity, new workforce development resources, etc.) could help position the region for longer-term competitiveness in other sectors not presently identified in this Target Sector Analysis.

TARGET SECTOR IDENTIFICATION: APPROACH AND METHODS

There are many methods used by researchers to identify industry clusters and/or viable economic development targets. Many approaches are based on incomplete or strictly industry-focused (business sector-focused) methodologies. Such methodologies ignore a variety of important issues from workforce attributes to educational assets to geographic advantages, all of which are vital to businesses. Market Street's approach to target identification is rooted in a more complete examination of the region's strengths and opportunities, including talent – the occupational employment and skill sets that support the region's business activities. This comprehensive, interrelated approach stands in contrast to a more traditional "top-down" approach long utilized in cluster identification and analysis. It recognizes the importance of talent and workforce sustainability to the business community. It is complemented by an evaluation of the region's business climate, networks, infrastructure, research assets, educational programs, economic development product, and many other factors that influence site location decisions.

In addition, many approaches use rigid, predetermined groupings of business sectors to identify regional clusters or targets. Perhaps the most common application is the use of Michael Porter's predefined industry cluster definitions in evaluating a regional economy. These predefined groups of business sectors (defined by the North American Classification System, or NAICS) are evaluated for their relative concentration of employment within a given region. Those predefined groups with relatively high concentrations of employment are often assumed to be clustered activities and therefore possess some form of competitive advantage that make them a viable economic development target. One fundamental limitation of this approach is the application of a uniform set of target or cluster definitions to all regions. This can lead to the identification of what appear to be similar clusters in various regions across the country when in fact, the economic activities taking place in these sectors are actually quite different. As a result, this kind of top-down, uniform approach to target and cluster identification can result in regions failing to adequately communicate their true economic identity or unique economic attributes. For example, such a top-down, pre-defined approach may identify an Energy cluster in the Lynchburg, Portland, and Houston regions. A "bottom-up" approach that examines occupational composition and more closely examines the complementary research as well as the educational and other assets supporting the sector might more appropriately and specifically identify the niche attributes of their Energy specializations, permitting a more specific marketing message and more focused strategies for target sector development: Nuclear Technology in Lynchburg, Renewable Energy in Portland, and Oil and Gas in Houston.

And so, Market Street's approach attempts to provide greater flexibility in identifying target sectors, such that niche specializations can be identified and more prominently communicated when appropriate and such that more broad and general sector definitions can be applied when a region has no such niche identity. This ground-up approach – which focuses on the region's workforce attributes and other assets that are conducive to specific types of economic activity – reveals opportunities and challenges and forms the basis for determining where the Lynchburg region should be directing its economic development resources.

Our team has extensively evaluated employment composition and trends in nearly 800 detailed occupations and more than 900 detailed business sectors. This analysis is complemented and supported by the input received from more than 1,100 businesses and workers as part of the regional Comprehensive Economic

Development Strategy (CEDs) process, and the findings of the CEDs Regional Assessment. Additional research into the economic composition and supportive assets of neighboring communities and regions was also conducted. Additional research also examined inter-industry expenditures/linkages, degree completions supporting relevant skill sets, and a variety of other factors that influence the location decisions of specific sectors (from water and sewer capacity to natural disaster risk to passenger air connectivity). Finally, a review of the region's economic development product (specifically, its available sites and buildings), its recent economic development prospect and project activity, and the identified targets of local and state partners have also informed this analysis.

Before presenting the identified target sectors and a brief profile of each, this section will discuss and define some important technical concepts that are relevant to or referenced throughout the remainder of this document.

CLASSIFICATION: Our approach does not define targets strictly based on North American Industry Classification System (NAICS) codes or Standard Occupational Classification (SOC) codes. Though these codes are used to help quantify important trends and activity in sectors that may be related to, or capture, the relevant economic activities in the region. They should not be interpreted as rigid definitions of the composition of economic activity within a given target sector. Classification systems do not adequately capture certain niche technologies and economic activities that define today's modern economy and which may deserve strategic attention in certain communities and regions.

GEOGRAPHY: The research related to business sector and occupational composition within this report is based on analysis of trends observed in Lynchburg, VA MSA, which includes Amherst County, Appomattox County, Bedford County, Campbell County, and the City of Lynchburg.

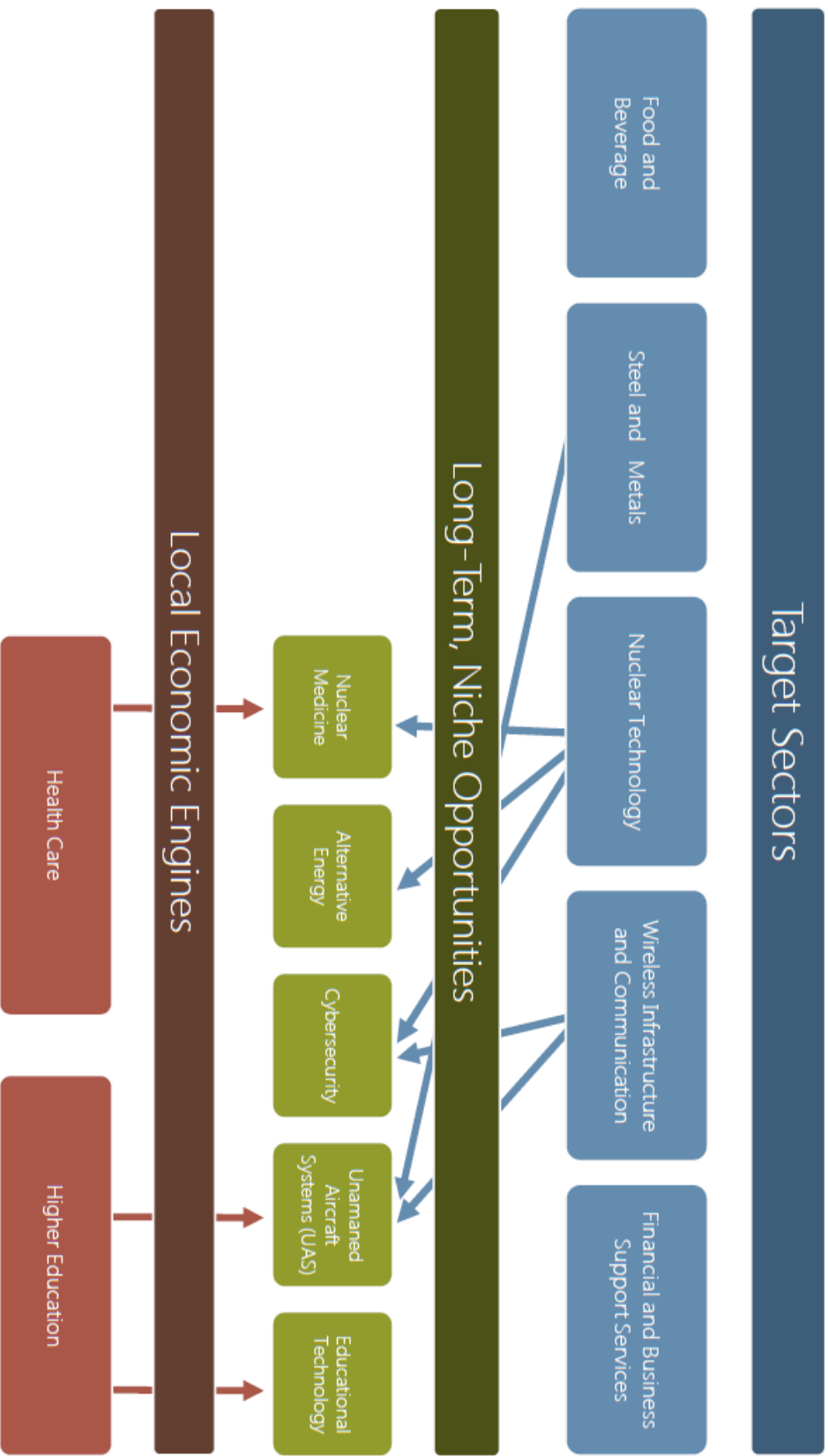
LOCATION QUOTIENTS: Location quotients (LQs) are used to measure the relative concentration of local employment in a given business sector or occupation. When applied to business sector employment, they measure the ratio of a business sector's share of total local employment to that business sector's share of total national employment. A business sector with LQ of 1.0 is exactly the same share of total local employment as that business sector's share of national employment. When a local business sector has a location quotient greater than 1.0, it signals that the sector is more heavily concentrated locally than it is nationwide. Those sectors with high LQs are often assumed to benefit from one or more sources of local competitive advantage. Location quotients can also be applied to occupational employment in the same manner that they are applied to business sector employment, helping to determine which occupations and corresponding skill sets – irrespective of the business sectors that employ them – are highly concentrated in the local workforce.

INTER-INDUSTRY LINKAGES: Data covering inter-industry purchases provides insight into the degree to which firms benefit from co-location and the ability to purchase products and services from local suppliers. When firms purchase goods from suppliers outside the region, money is leaving the region. When this leakage is reduced, employment and income multipliers rise. That is to say, when leakage is reduced and clustered firms are sourcing locally, the economic impact of each new job created is maximized.

DATA SOURCES: Unless otherwise noted, all quantitative data contained in this report is sourced from Economic Modeling Specialists International (EMSI), an industry-leading provider of proprietary data, aggregated from public sources such as the U.S. Census Bureau, the U.S. Bureau of Labor Statistics, the U.S. Bureau of Economic Analysis, the National Center for Education Statistics, CareerBuilder, and many others.

TARGET SECTOR ANALYSIS

Based on the aforementioned analysis of the Lynchburg region and the various inputs to target sector identification, *Market Street* believes that the region can effectively market itself and compete for economic development projects in the next five years across five target sectors. These five target sectors are complemented by two local economic engines which have the potential to produce more long-term opportunities born from cross-sector collaboration or leveraging the skill sets and resources supporting multiple sectors.



The five targets shown in the preceding graphic are reflective of the Lynchburg region's economic sectors that are supported by a sufficient set of marketable assets or attributes capable of differentiating the region and/or qualifying it as competitive for new economic development projects. In the middle of the graphic are various long-term opportunities, connected to both the target sectors and the region's two primary local economic engines. These opportunities are less likely to produce substantive near-term employment gains but represent emerging sectors or technologies that leverage existing strengths (both target sectors and local economic engines) and could help evolve and further differentiate the region's economic identity.

The remainder of this report includes target profiles that delve into a few key findings from the analysis, helping to illuminate some of the key strengths as well as the key weaknesses or threats facing each target sector. A brief discussion of the long-term opportunities are also included following those profiles. Data tables covering key trends in related subsector and occupational employment are included in an Appendix.

The brief summaries that follow, and which precede the more detailed profiles, recap each target's inclusion.

- ✓ Exporting over \$1 billion annually, the **Food and Beverage** target includes a spectrum of activities related to producing foods and beverages and bringing them to market. The region's most noteworthy niche areas within this target are snack food manufacturing and dairy product manufacturing. The region is competitive for business attraction because of its geographic location and close proximity to multiple major markets, its tremendous supply of water, and its favorable business tax climate for manufacturing. In addition to regional marketing efforts, LRBA could work with inter-regional partners in surrounding regions, including Roanoke, to leverage a larger suite of assets since Food and Beverage Manufacturing is a common target sector.
- ✓ The **Steel and Metals** target focuses on companies engaged in smelting and refining various materials as well as manufacture metal alloys and superalloys by introducing other chemical elements to pure metals. The Lynchburg region has the second highest location quotient and employment levels in plate work manufacturing in the nation as well as high concentrations in power boiler and heat exchange manufacturing, iron foundries, fabricated structural metal manufacturing, and ball and roller bearing manufacturing. This is a lucrative target because average earnings are over double the regional average and because it provides opportunities for career paths for workers at various levels of skills and knowledge. Completions in precision metal working educational programs have increased rapidly, a sign that labor supply for key metalworking occupations may be expanding. As mentioned previously, the region is well-positioned for additional attraction as well as filling supply chain linkages because of several factors that support manufacturing.
- ✓ The **Nuclear Technology** target captures regional anchors, AREVA Inc. and BWX Technologies, Inc., and the many manufacturers and related firms that have located near them. The Lynchburg Region has a long history of strength in Nuclear Technology, evidenced by significant location quotients in key business sectors as well as several supportive occupations, despite employment losses over the ten-year period examined in this report. Additionally, this target supports regional goals of increasing wages with higher than average wages for workers related to this target. In terms of workforce development, there are ample training opportunities for area workers and students, with valuable degree programs in the region. In addition to marketing efforts, business retention and expansion

(BRE) and efforts leveraging the region's existing or potential supply chain linkages (either targeted recruitment or import substitution) are strategies that merit consideration.

- ✓ The **Wireless Infrastructure and Communications** target includes firms in the Lynchburg region that leverage technology as their principal product or service as well as both manufacturers of components and final products related to wireless communications and carriers. The region's strength primarily lies in producing the infrastructure necessary to support IT and wireless communications. The target has experienced competitive employment growth from 2005 to 2015 and has a high concentration of high-paying engineering and technical occupations. However, consistent with Financial and Business Support, low wages across the target compared to national averages present a challenge for the retention and attraction of skilled talent. Additionally, while there are educational programs supportive of the target, there is room for additional curriculum to support more traditional IT fields, such as software design and development and computer programming.
- ✓ The **Financial and Business Support Services** target captures the region's strengths in insurance – including its financial workforce capacity – the region's viability as a location for business support services (back office functions, shared services, and professional services). The target has experienced employment growth over the ten-year period examined, and ample higher educational programs supportive of the target exist for a region of its size, with "business administration, management, and operations" the field of study with the second highest number of completions in the region. The region may struggle to compete with more highly-educated and well-connected metropolitan areas (particularly via air service) for certain professional service and "white-collar" opportunities but supportive service functions that require less formal education and are less reliant on air service are a better fit for the region's near-term recruitment efforts.

Food and Beverage

DEFINITION AND OVERVIEW: The Food and Beverage Manufacturing target encompasses an array of production and supply chain activities related to food and beverages, from lower-wage activities such as crop production and animal slaughtering to the more specialized food manufacturing activities that relate to specialty foods and beverages, such as craft brewing and spice and extract manufacturing. While opportunities may exist to better connect the region's agriculture community to its existing or prospective future food and beverage producers, animal slaughtering and meat processing should be excluded from the region's targeted pursuits given the relatively limited potential of job opportunities in the sector to elevate incomes in the region.

LOCAL COMPANIES: The Lynchburg region is home to companies such as Central Virginia Foods, Frito-Lay, Inc., Westover Dairy Co., Bimbo Bakeries USA, Seven Hills Food, LLC, and Flowers Baking Co. In addition, Abbot, a global pharmaceutical manufacturer, produces nutritional products in the region, and in some respects is more a food and beverage operation than a traditional pharmaceutical operation.

NATIONAL TRENDS: As a largely water- and labor-intensive sector, the availability and cost of both resources will continue to separate the most competitive communities for broad food and beverage production. An increasingly health conscious consumer market will drive demand in the United States, as concerns over animal welfare and scrutiny of genetically-modified organisms (GMOs) continue to alter how food is manufactured. Similar health dynamics will impact beverage manufacturing as well since the days of the market being driven by demand for carbonated soft drinks are long gone. A growing segment of the beverage manufacturing industry that continues to gain steam is the craft brewing industry, a subsector that is less reliant on abundant, affordable labor than many other subsectors which pay lower wages (such as meat processing). In the first half of 2015, U.S.-based craft brewers increased their production by 15 percent over the same period in 2014. The growing popularity of craft brewing has led to tourism marketing opportunities for many communities looking to capitalize on passionate brewery tourists. The same can be said to some degree for the local food movement. Consumer preferences for locally-sourced ingredients are fueling stronger local economic connections between the agricultural community and the restaurants that supply them, providing opportunities for regions to leverage the buying power of a predominantly local-serving sector (restaurants) in supporting the growth of a predominantly export-oriented sector (agriculture).

STRENGTHS AND OPPORTUNITIES

- ✓ **Lynchburg's existing strengths in Food and Beverage Manufacturing include other snack food manufacturing (LQ= 14.2) and dry, condensed, and evaporated dairy product manufacturing (LQ = 43.1),** accounting for 905 employees combined. Both subsectors provide average annual wages well above the regional average of \$37,153, notable since food and beverage manufacturing is often associated with low wage employment opportunities. The region has the opportunity to expand its specialty food and beverage product base, particularly in an era where consumers are becoming increasingly conscientious of the ingredients within the products they eat and drink.

- ✓ **Food and Beverage Manufacturing firms are the source of \$1.24 billion in exports annually.** In 2013, the top three business sectors related to Food and Beverage Manufacturing were dairy product manufacturing (\$556 million), other food manufacturing (\$322 million), and bakeries and tortilla manufacturing (\$213 million).
- ✓ **The target is supported by agribusiness and agriculture strengths across the region.** According to the Bedford County Office of Economic Development, Bedford County has over 1,400 farms and 200,000 acres of farmland. The Bedford Agricultural Economic Development Advisory Board has launched the Bedford Grown Program, which encourages and promotes locally grown produce. The Strategic Plan for the Agriculture and Forestry Economy in Virginia's Region 2000 published in July 2014 identifies several additional agricultural resources and partners, including multiple locations of the Virginia Cooperative Extension and county farm bureaus. The goals of the Strategic Plan support target growth with focused objectives to coordinate regional marketing and outreach, strengthen resources for producers, and promote career and small business development opportunities, which will help LRBA with efforts to strengthen the target's supply chain.
- ✓ **In terms of the food manufacturing supply chain, there is ample opportunity to amplify linkages to local suppliers.** There is only one subsector from which over half of total purchases are sourced within the in-region: dairy product manufacturing (53.7 percent of purchases are from suppliers in the Lynchburg MSA). Additional subsectors with supplier capacity building potential include crop production (1.7 percent), grain and oilseed milling (2.2 percent), animal slaughtering and processing (2.3 percent), bakeries and tortilla manufacturing (6.4 percent), other food manufacturing (8.8 percent), sugar and confectionery product manufacturing (9.2 percent), and beer, wine, and distilled alcoholic beverage merchant wholesalers (33.4 percent). There are also many cross-target supplier opportunities, including converted paper product manufacturing (10.9 percent), wholesale electronic markets and agents and brokers (13.4 percent), plastics product manufacturing (13.5 percent), and management of companies and enterprises (40.1 percent).
- ✓ **The Lynchburg region's central location in the Mid-Atlantic proximate to major metro areas in both the Northeast and Southeastern United States is ideal for certain consumer products that often need to reach their market quickly, such as Food and Beverage manufacturing.** The Lynchburg region is less than a day's drive to some of the most populous metro areas in the country, including: Washington, DC; New York City, NY; Boston, MA; Charlotte, NC; Atlanta, GA; and many others. The region's location on the East Coast is especially attractive for prospective craft beer manufacturers. The craft beer industry is concentrated in West Coast and Mountain West states, but more and more craft breweries are increasing their brand presence and production along the East Coast to further penetrate the domestic market, with many facilities opening in the Blue Ridge and Appalachian mountains to take advantage of available water in the region.
- ✓ **The Lynchburg region possesses excellent water capacity that is more than adequate to serve the region's needs into the future.** The Pedlar Reservoir and the James River provide an ample water supply for business operations, a key consideration for many beverage manufacturers. However, it is important that the City of Lynchburg's aging water infrastructure be well-maintained if this competitive advantage is to be leveraged over the long term. The Lynchburg 2030

Comprehensive Plan noted that over 135 miles of water lines are over 80 years old and have essentially reached the end of their reliable service life.

- ✓ KPMG in collaboration with the Tax Foundation released a comparative analysis of state tax costs on business in 2015 for various types of businesses and sectors. **The report reveals Virginia's favorable business tax climate.** Regarding mature firms located in Virginia, the Commonwealth ranked 20th for capital-intensive manufacturing companies, and 2nd for labor-intensive manufacturing companies. This supports Virginia's competitiveness for relatively labor-intensive manufacturing operations such as many Food and Beverage establishments.
- ✓ The labor profile of a region can have a significant impact on opportunities to recruit manufacturers. The burgeoning manufacturing sectors in "right-to-work" states, primarily in the Southeastern U.S., provide evidence of the importance placed on this factor when analyzing the overall labor availability and costs of a region. **In the eyes of many a manufacturing company, Virginia benefits from its right-to-work status and the perception of a relatively favorable labor cost environment that such a distinction affords.**
- ✓ **Because of synergies with nearby regions, LRBA should consider working with inter-regional partners for marketing.** The Roanoke Regional Partnership also targets food and beverage manufacturing, and the region's strengths lie in soft drink manufacturing, commercial bakeries, flour milling, and food product machinery manufacturing. There is a distinct opportunity to connect the supply chain for the two regions' sectors.
- ✓ **Craft breweries are of special interest in Commonwealth economic development marketing efforts.** YesVirginia.org has created a microsite (<http://spatialserver1.yesvirginia.org/craftbeer/>) dedicated to the burgeoning craft brewing sector in Virginia. The site contains a map of all breweries in the Commonwealth as well as various statistics for prospective firms and tourism information for prospective visitors. The region has received some food and beverage leads from the Virginia Economic Development Partnership (VEDP) in the recent past, and it is reasonable to expect such opportunities to continue in the broader food and beverage sector, and potentially among microbreweries. A handful of craft breweries have made Lynchburg home and taking advantage of dedicated state resources may help LRBA continue building on the growth it has already begun to witness.
 - Because breweries typically locate in urban settings and often serve as catalyst redevelopment projects in old mills and repurposed industrial buildings, this is an excellent opportunity for ongoing downtown efforts in Amherst, Bedford, and Lynchburg. In order to identify potential reuse projects, the region should inventory existing facilities in downtowns that could be viable for a microbrewery and compile a sector-specific marketable inventory.

WEAKNESSES AND THREATS

- ✓ **The overall target has contracted in the region, losing 160 jobs over the 10-year period examined, compared to a modest increase of 1.8 percent nationwide.** Since the end of the Great Recession, the region experienced two major closures of Trident Seafood Corporation, a manufacturer of frozen food products, and Golden West Foods, a supplier of frozen foods to restaurant chains. According to EMSI projections, nationally, the Food and Beverage sector is expected to experience similarly modest employment growth of 2.2 percent over the next ten years. Likewise, the number of workers in several related occupations has decreased during the decade. Of the 17 occupations for which historical wage data were available, 10 experienced a decline in jobs. However, job posting data reveals that this finding is not necessarily due to lack of talent, but lack of demand of companies for these positions.
- ✓ **Relative to many peer regions, the Lynchburg region is not as competitively positioned in its ability to offer an impressive portfolio of industrial parks and shovel-ready (or “pad-ready”) industrial sites that fit in-line with the needs of many in the manufacturing community.** Topographical challenges in any mountainous region represent an inherent obstacle to overcome in developing the large industrial sites that are necessary to attract many prospective manufacturing companies. According to the Property Search tool available on the Virginia Economic Development Partnership’s YesVirginia.org website, there are 27 industrial properties with space available. Seven of these properties each feature 15,000 square feet of space or less. Ten feature between 20,000 to 37,000 square feet of space, with one expandable to 60,000 square feet. Six of these properties feature between 50,000 and 90,000 square feet of space, with one expandable to 119,600 square feet. There are only four buildings with more than 100,000 but less than 160,000 square feet of space available, with one expandable to 282,000 square feet. **The region is most well-positioned for small to medium manufacturers who are looking for readily available space. However, input from regional economic development practitioners indicates that available properties are often outdated or do not meet the physical requirements (such as ceiling/clear heights) of many modern manufacturers.**
 - In terms of craft breweries, few actually seek out locations in greenfield industrial parks and opt for urban settings because they want visitors/foot traffic and some visibility for their operations by potential consumers.
- ✓ Microbreweries are seemingly targeted by an ever-increasing number of communities. Many of these projects have few jobs, or take many, many years for substantive job creation to be realized. It is also an industry characterized by immense startup activity, growth, and then acquisition. In this regard it is no different than other sectors; many of the fastest-growing and most successful craft brands get acquired by major companies, such as the case of Terrapin, the pride of Athens, Georgia, purchased this week by MillerCoors. Given the relatively low employment figures associated with most microbrewery projects, it may not provide the best return on investment on certain types of marketing activities (i.e. expensive travel) even though it is exciting. If craft breweries are to be pursued as a targeted subsector, they need to be considered for their potential impact on quality of life and/or quality of place, not just economic impact.

- ✓ A strong road transportation network is a necessity for most manufacturing companies. **The Lynchburg region's lack of direct interstate connectivity may be an obstacle for certain prospective manufacturers.** Finished food and beverage products are primarily transported by freight truck, which is the most efficient means of transportation for highly perishable products that have a relatively low value and low weight. The perishable nature of the product requires that manufacturers locate close to their consumers and have access to efficient transportation infrastructure in order to keep distribution costs low. As a related aside, currently, the region has no employment in refrigerated warehousing and storage. Adding capacity in this area would provide an added layer of support for this target.

Steel and Metals Manufacturing

DEFINITION AND OVERVIEW: The Steel and Metals Manufacturing target focuses on companies engaged in smelting and refining various materials as well as manufacture metal alloys and superalloys by introducing other chemical elements to pure metals. This target is dependent on a spectrum of occupational areas, from production to engineering. With over \$1.2 billion in exports, the Lynchburg region has strong existing foundation for continued success. Most manufacturers in the sector take raw materials and convert them into intermediate goods or finished products to be used in the assembly of other final goods.

LOCAL COMPANIES: Among its significant presence of Steels and Metals manufacturing firms are Griffin Pipe Products Company (manufacturer of ductile iron pipes and fittings), Automated Conveyor Systems, Inc. (creation of devices using state-of-the-art CNC-controlled laser cutting equipment), Banker Steel Company, L.L.C. (fabricator of structural steel), Wexco Corporation (cylinders, castings, barrels and machining), Flowserve (a manufacturer of pumps, valves, seals, and actuators), and Stamptec Inc. (metal stamping).

NATIONAL TRENDS: The Primary Metal (NAICS: 331) and Fabricated Metal Product (NAICS: 332) manufacturing sectors were among the hardest hit manufacturing sectors during the Great Recession, losing almost 400,000 jobs from 2007 to 2010. Employment remains below pre-recession levels, despite growing by 15 percent since 2010. The steel and metals manufacturing sectors – and the broader manufacturing sector as a whole – will face significant issues with respect to workforce sustainability in coming years that will impact future growth prospects. According to a 2015 joint report from the Manufacturing Institute and Deloitte, there will be an estimated 3.5 million manufacturing openings in the United States, 2.7 million of which will be due to Baby Boomers retiring from the workforce. The report estimates that two million of these jobs will go unfilled due to a shortage of skilled workers due to factors such as “loss of embedded knowledge due to movement of experienced workers, a negative image of the manufacturing industry among younger generations, lack of STEM (science, technology, engineering and mathematics) skills among workers, and a gradual decline of technical education programs in public high schools.” Addressing this worker sustainability issue is perhaps the preeminent threat facing heavy manufacturing industries.

STRENGTHS AND OPPORTUNITIES

- ✓ **Steel and Metals manufacturing is significantly concentrated in the Lynchburg region—over four times that nationwide.** Plate work manufacturing is Lynchburg’s most concentrated subsector (of all subsectors, even those outside of this target), with a location quotient of 62.3. In fact, this is the second highest concentration of plate work manufacturing in the nation’s metros, following only Auburn, Indiana MSA, which has a location quotient of 77.8. Additionally, Lynchburg ranks second of all metros in sheer numbers of workers in the sector (2,242 employees), second to only the Houston-The Woodlands-Sugar Land, Texas, with 4,657 employees. This subsector is primarily driven by AREVA and Aerofin, manufacturers of finned tube heat exchanger coils and related heat transfer equipment and accessories. Other notable subsectors, in terms of location quotients, are power boiler and heat exchanger manufacturing (LQ = 12.9), iron foundries (LQ = 6.4), fabricated structural metal manufacturing (LQ = 4.9), and ball and roller bearing manufacturing (LQ = 3.7).

- ✓ Nationwide, the target is projected to add jobs at a rate of 5.1 percent between 2015 and 2025.
- ✓ **This is a lucrative area in the region—the annual average earnings are \$73,271, over double the regional average.** All except one of the region’s significantly concentrated subsectors offer high average wages. Notably, wages in Lynchburg outpace wages nationwide, a major competitive advantage, particularly in regards to talent attraction.
- ✓ **Median hourly earnings for the target (\$20.52) are above the regional median of \$17.21.** Hourly earnings vary widely, from \$9.94 for helpers of production workers to \$46.32 for industrial production managers. There are opportunities for workers of all skills levels, and it is important that workers can identify career paths that will allow them to pursue higher-wage opportunities within the target as they gain experience and additional training.
- ✓ Consistent with earlier industrial manufacturing targets in this document, **one major strength that supports the Steel and Metals Manufacturing target is the region’s ample supply of water.** This is essential to this target as it is used for cooling and in the steel- and metal-making process.
- ✓ The labor profile of a region can have a significant impact on opportunities to recruit manufacturers. The burgeoning manufacturing sectors in “right-to-work” states, primarily in the Southeastern U.S., provide evidence of the importance placed on this factor when analyzing the overall labor availability and costs of a region. **In the eyes of many a manufacturing company, Virginia benefits from its right-to-work status and the perception of a favorable labor cost environment that such a distinction affords.**
- ✓ **Central Virginia Community College is a strong asset in the region, offering training programs that support the target:** diplomas in machine tool and machine tool/quality, a certificate in machine shop, and a career services certificate in welding.
 - Although there are not many degree and certificate programs designed specifically for this target, it is noteworthy that **completions in precision metalworking have tripled from 2009 to 2014.** In 2009, there were 13 completions in this field, compared to 54 in 2014. This growth is important since occupations have experienced a decline over time, as indicated in the next section.
- ✓ **Nearly 80 percent of the region’s need for steel and metals materials and products is fulfilled outside of the region.** The fact that 98.8 percent of the region’s demand for plate work manufacturing, 98 percent of demand for ball and roller bearing manufacturing, and 85.3 percent of demand for power boiler and heat exchanger manufacturing is met inside the region underscores the strength of these subsectors. Increasing the percentage of regional requirements in the subsectors in which there is already some significant presence would be a boost to the target’s overall strength and growth.
- ✓ **This target has relevant applications that could be competitive in the region.** Although the region does not have the full suite of assets to target aerospace or automobile parts manufacturing as standalone sectors, it does have the workforce to support these Steel and Metals-heavy subsectors.

WEAKNESSES AND THREATS

- ✓ **The target has shed a significant percentage of jobs (36.6 percent, or 2,251 jobs) between 2005 and 2015, ten times higher than national job losses.** As noted earlier in this report, business retention and expansion will continue to be a vital strategy to ensuring that existing companies are thriving and satisfied in the Lynchburg metro. Closures have included Intermet Archer Creek Plant, one of the region's oldest and largest industrial companies, which closed permanently after its parent company filed bankruptcy. The region is also shedding its workers in its supportive occupations at a faster pace than the nation. Despite this, there is still some concentration in several key occupations. As advances in automation of production processes are developed, employment is expected to continue to decline and consolidations will continue to increase.
- ✓ **While high wages are a competitive advantage for attracting talent, it presents a challenge to prospective firms in terms of labor costs.** Rising labor costs alongside limited talent availability continue to be top challenges for manufacturers, so it will be important to ensure that regional productivity is comparatively high and that manufacturers have easy access to available talent in the region.
- ✓ **Relative to many peer regions, the Lynchburg region is not as competitively positioned in its ability to offer an impressive portfolio of industrial parks and shovel-ready (or "pad-ready") industrial sites that fit in-line with the needs of many in the manufacturing community.** Topographical challenges in any mountainous region represent an inherent obstacle to overcome in developing the large industrial sites that are necessary to attract many prospective manufacturing companies. According to the Property Search tool available on the Virginia Economic Development Partnership's YesVirginia.org website, there are 27 industrial properties with space available. Seven of these properties each feature 15,000 square feet of space or less. Ten feature between 20,000 to 37,000 square feet of space, with one expandable to 60,000 square feet. Six of these properties feature between 50,000 and 90,000 square feet of space, with one expandable to 119,600 square feet. There are only four buildings with more than 100,000 but less than 160,000 square feet of space available, with one expandable to 282,000 square feet. **The region is most well-positioned for small to medium manufacturers who are looking for readily available space. However, input from regional economic development practitioners indicates that available properties are often outdated or do not meet the physical requirements (such as ceiling/clear heights) of many modern manufacturers.**

Nuclear Technology

DEFINITION AND OVERVIEW: The Nuclear Technology target is comprised of establishments that produce the technology and machinery required to manufacture nuclear energy. The Lynchburg region has had a long history of nuclear power operations since 1955, when Babcock and Wilcox (B&W) opened a 100,000 square foot factory in Campbell County to manufacture equipment for nuclear power plants. In 1989, Framatome (now Areva), a French nuclear company, invested \$50 million in a partnership with B&W and later located its Operational Center of Excellence for Nuclear Products and Services in North America in Lynchburg. Over the years, these companies have remained relevant and successful and have attracted businesses across the supply chain that have created a strong and viable economic cluster in the region. In 2015, Babcock & Wilcox spun off its power generation business to allow BWX Technologies to focus on government and nuclear operations. Both AREVA and BWX have continued to make investments in the Lynchburg region.

LOCAL COMPANIES: Local companies include, but are not limited to, AREVA Inc., BWX Technologies, Inc., Delta Star, Inc. (a manufacturer of power transformers and mobile substations), Flowserve (a manufacturer of pumps, valves, seals, and actuators), Parker Hannifin Manufacturers (manufacturer of polymetric sealing systems), and Wiley|Wilson (an architectural and engineering firm).

NATIONAL TRENDS: The 2011 earthquake and accompanying meltdown of nuclear reactors in Fukushima, Japan resulted in a tapering off of new nuclear reactor construction in many countries, including the United States. Still, the immense around-the-clock power generation capabilities afforded by nuclear energy and the lack of corresponding carbon emissions make nuclear energy a highly-coveted energy source for the future. According to the International Energy Agency (IEA), the world needs 40 percent of its electricity to come from zero-emissions sources in order to combat the effects of climate change, and renewable energy sources alone will not be able to meet this steep demand. Making nuclear energy more cost-efficient and environmentally-friendly can drive the overall sector's future growth. The burden of addressing environmental concerns associated with nuclear energy – like how to better dispose of nuclear waste – are increasingly being addressed by nuclear tech startup companies.

STRENGTHS AND OPPORTUNITIES

- ✓ **Lynchburg's main strengths are in four classified subsectors:** Power, Distribution, and Specialty Transformer Manufacturing (LQ = 14.9); Power Boiler and Heat Exchanger Manufacturing (LQ = 12.9); Hydroelectric Power Generation (LQ = 4.1); and Engineering Services (LQ = 2.5).
- ✓ Because of Lynchburg's overall strength in manufacturing and its long history in nuclear technology development, **the region has strong concentrations of employment in several supportive occupations.** The strongest of these are mechanical engineers (LQ = 3.1), which are more than three times as heavily concentrated in the Lynchburg workforce than the average American community. Others include nuclear engineers (LQ = 2.1), industrial machinery installation, repair, and maintenance workers (LQ = 2.1), and electrical and electronics engineers (LQ = 1.9).

- ✓ **This target offers high earnings for Lynchburg workers that are competitive with national wages.** The regional median hourly wage across all sectors in the Lynchburg MSA is \$17.21, as compared to \$23.20 for Nuclear Technology-related occupations. Of the 35 most common occupations supporting the target for which wage data is available, 30 feature median wages greater than the regional median for all occupations, implying that above-median earning opportunities are not concentrated in a few high-skill, high-wage positions. Many of the occupations, particularly those requiring higher levels of skills training, are comparable to the national median wage for the same occupation, a potential competitive advantage in talent attraction because the cost of living index for the Lynchburg urban area is 91.9 (compared to the national average of 100).
- ✓ **With the region's historical strength due to the presence of its anchor firms, AREVA and BWX, comes an available talent pool as well as trusted training programs at local institutions.** Central Virginia Community College has an Associate of Applied Science degree program in Nuclear Technology as well as a Nuclear Tech Training Program that is available specifically to AREVA employees. Although the Lynchburg region lacks the physical presence of a four-year engineering school, Central Virginia Community College's partnerships with nearby four-year institutions and local employers represent a strategic advantage to growing the nuclear technology sector. Under an agreement with UVA and Virginia Tech, CVCC's Associate of Science in Engineering curriculum satisfies the prerequisites for third-year entry into the Schools of Engineering at the respective nearby four-year institutions. This partnership with UVA allows students to earn their Bachelor of Science degree in engineering without relocating away from the region.
 - Additionally, Liberty University has several relevant degree programs, including undergraduate degrees in electrical, industrial, and mechanical engineering. The university works with dozens of companies globally to secure internships for students, including locally at nuclear technology companies.
 - From 2009 to 2014, 2,142 degrees or certificates related to nuclear technology, engineering, sciences, and other supportive fields were conferred in the Lynchburg region. For a region its size, this is an impressive number of completions. In 2014, there were 450 completions, equivalent to 1.74 completions per 1,000 residents. It is important to note that this figure does not include degrees obtained at the Commonwealth Graduate Engineering Program (discussed later in this section). Comparatively, there were 0.68 completions per 1,000 residents in this subset of degree programs in the Roanoke MSA, 0.99 in the Richmond MSA, and 1.04 in the Virginia Beach-Norfolk MSA (which is home to Naval nuclear operations and proximate to the Surry County Nuclear Facility). As an example outside the commonwealth, in the Raleigh, NC MSA, home of the Shearon Harris Nuclear Power Plant and a metro with significant university capacity, 1,905 degrees or certificates in these related fields were conferred in 2014, or 1.53 completions per 1,000 residents.
- ✓ **Another important asset to the region's Nuclear Technology target is the Center for Advanced Engineering and Research (CAER).** CAER, an initiative of Region 2000 designed to increase the region's research and development capacity, particularly in nuclear energy, was incorporated in 2007

and moved into a new \$7.6 million facility in 2011. To support research in nuclear safety, the facility has a scaled prototype of the Babcock & Wilcox mPower™ reactor, an LTE Spectrum Sharing Testbed, and a “next generation” nuclear power plant main control room simulator that can be configured for multiple reactor designs. Many nuclear power plants have control room simulators based on the specific reactor they use but having a simulator that can be customized is a competitive advantage for the region. Additional areas for CAER exploration include wireless sensor technology and smart grid technology.

- Also charged to support workforce development in the region, CAER has since 2007 facilitated the Commonwealth Graduate Engineering Program (CGEP), which was originally developed in 1983. The program provides opportunities for post-baccalaureate engineering studies for area workers through a partnership with five universities: George Mason University, Old Dominion University, University of Virginia, Virginia Commonwealth University, and Virginia Tech. Students are able to mix and match courses, offered online and via IP videoconference.
- ✓ Information regarding the Nuclear Technology supply chain and regional leakages provides insight into the types of companies for which the Lynchburg region could reasonable compete and attract. Currently, 43.4 percent of purchases made by power boiler and heat exchanger manufacturers and engineering services firms, the two subsectors that best represent AREVA and BWXT, are met within the region, with over 56 percent of the demand leaked outside of the region, or roughly \$200.6 million. This is an indicator that, within at least some portion of the Nuclear Technology supply chain, limited opportunities may exist for the attraction of suppliers. Subsectors with greater amounts of leakages are management, scientific, and technical consulting services; other professional, scientific, and technical services; basic chemical manufacturing; iron and steel mills and ferroalloy manufacturing; nonferrous metal production and processing; and architectural and structural metals manufacturing, together leaking over \$49.5 million in purchases outside of the region. **This demand could potentially be met by firms wanting to co-locate near the region’s existing firms.**
- ✓ **The Virginia Economic Development Partnership targets Energy as one of the Commonwealth’s key industries.** The state economic development entity focuses on three areas within Energy: alternative energy, nuclear energy, and coal. It is no surprise that AREVA and BWXT are listed as major employers in the state and are a vital component of the state’s asset base. Continuing to work with state partners to ensure that Lynchburg is a top contender for energy-related leads is a priority that must not be overlooked.
- ✓ The labor profile of a region can have a significant impact on opportunities to recruit manufacturers. The burgeoning manufacturing sectors in “right-to-work” states, primarily in the Southeastern U.S., provide evidence of the importance placed on this factor when analyzing the overall labor availability and costs of a region. **In the eyes of many a manufacturing company, Virginia benefits from its right-to-work status and the perception of a favorable labor cost environment that such a distinction affords.**

WEAKNESSES AND THREATS

- ✓ **Overall, the target has contracted over the 10-year period examined, losing roughly 447 jobs.** It is important to note here that a major employer was reclassified from “power boiler and heat exchanger manufacturing” subsector to the “engineering services” subsector. As a result, the large growth in engineering services and the large decline in power boiler and heat exchanger manufacturing are inflated and effectively cancel each other out. Even so, the target’s natural gas subsectors were affected during the Great Recession and have not yet fully recovered. Additionally, both AREVA and BWX experienced layoffs recently, citing a struggling nuclear energy industry and restructuring decisions. However, according to EMSI, the target is expected to grow nationally by 15 percent between 2015 and 2025, with losses mainly in hydroelectric power generation (-93 percent), fossil fuel electric power generation (-28 percent), wind electric power generation (-9 percent), and nuclear electric power generation (-6 percent).
- ✓ **Consistent with the business sector data, several of the occupations related to Nuclear Technology have experienced decline over the 10-year period.** Of the 34 occupations for which there is historical data, 22 have lost workers during the time period. Although there has been declines nationwide, the region has experienced more severe declines and in a greater number of occupations. To maintain the region’s occupational strengths, it will become increasingly important that the region has sufficient workforce training programs for existing residents and workers and that talent attraction is a priority.
- ✓ While the region has an impressive number of students completing certain programs in nuclear technology, engineering, sciences, and other supportive fields, it is important to note that **there is a lack of completions specifically related to programs in mathematics and statistics; aerospace, aeronautical, and astronautical engineering, naval architecture and marine engineering, nuclear engineering, nuclear engineering technologies, ocean engineering, nanotechnology, and nuclear and industrial radiologic technologies.** During the time period examined, there were no completions in these applied areas of study. When viewing degree programs more broadly, the region is not as competitive in engineering, engineering technologies, or physical sciences, which could be observed by site selectors. Of the 39 specific engineering programs within the broad category of engineering, only 6 are represented in the region. Similarly, there are 18 specific engineering technology programs and 8 specific physical sciences programs available in completions data, and only 4 and 2, respectively, are represented in the region.
- ✓ **Relative to many peer regions, the Lynchburg region is not as competitively positioned in its ability to offer an impressive portfolio of industrial parks and shovel-ready (or “pad-ready”) industrial sites that fit in-line with the needs of many in the manufacturing community.** Topographical challenges in any mountainous region represent an inherent obstacle to overcome in developing the large industrial sites that are necessary to attract many prospective manufacturing companies. According to the Property Search tool available on the Virginia Economic Development Partnership’s YesVirginia.org website, there are 27 industrial properties with space available. Seven of these properties each feature 15,000 square feet of space or less. Ten feature between 20,000 to

37,000 square feet of space, with one expandable to 60,000 square feet. Six of these properties feature between 50,000 and 90,000 square feet of space, with one expandable to 119,600 square feet. There are only four buildings with more than 100,000 but less than 160,000 square feet of space available, with one expandable to 282,000 square feet. **The region is most well-positioned for small to medium manufacturers who are looking for readily available space. However, input from regional economic development practitioners indicates that available properties are often outdated or do not meet the physical requirements (such as ceiling/clear heights) of many modern manufacturers.**

- ✓ **The uncertainty of legislation and federal investment regarding energy is a threat.** Government regulations, specifically at the federal level, will have a significant impact on the nuclear technology target and related energy subsectors. Acknowledging that nuclear energy should be a significant component of the nation's clean energy strategy, President Obama included over \$900 million in the President's FY 2016 Budget for the Department of Energy to support R&D efforts in the civilian nuclear energy sector.¹ Future federal support for the sector is unknown and will likely be closely related to the 2016 election cycle. Federal and state involvement in other heavily regulated energy sectors, such as fracking, will also impact broader alternative energy trends over the near-term.
 - Because of the region's heavy reliance on major federal contracts, Lynchburg is particularly vulnerable to sequestration and potential cuts to defense spending—external factors that LRBA cannot directly influence. Thus, this is a target that does not fully support regional efforts to become a more resilient economy.

¹ "FACT SHEET: Obama Administration Announces Actions to Ensure that Nuclear Energy Remains a Vibrant Component of the United States' Clean Energy Strategy." Press Release: The White House, Office of the Press Secretary. November 06, 2015.

Wireless Infrastructure and Communications

DEFINITION AND OVERVIEW: At its core, Information Technology is a platform with applications to all industries. However, some subsectors position IT as their principal employment focus, while others use IT as a key yet supportive component of their operations. For the purposes of this report, the Wireless Infrastructure and Communications sector contains firms in the Lynchburg region that leverage technology as their principal product or service. In modern times, radio communications, including wireless internet connections and cellular phones, have become an essential part of life. As new technology is developed and integrated into manufacturing processes, network capacity will be increased, power consumption decreased, and the cost of personal devices reduced. Wireless communications includes firms that manufacture components and final products related to wireless communications as well as those that serve as carriers and support services. The target includes software development and publishing, data storage, computer system design and programming, data and web hosting, and data analytics. Although the region is currently not competitive for these traditional IT subsectors, the Lynchburg region may be competitive in specific niche applications related to wireless technology development. The region is particularly strong in the aspects of traditional Information Technology that supports wireless communications in terms of infrastructure and hardware manufacturing, not software design and development.

LOCAL COMPANIES: Large firms in the Lynchburg region include HARRIS Corporation/RF Communications Division (supplier of supplies radio equipment for public safety, federal, commercial and transportation organizations), CommScope (network solutions), and Catalyst Communications (provider of radio control over IP solutions to the mobile radio industry).

NATIONAL TRENDS: There is perhaps no sector of the U.S. economy that is more competitively positioned than the Information Technology sector. The emergence of "Big Data," the Internet-of-Things, and the full-on integration of social media into the lives of people everywhere are proof positive that the world has entered a new age of reliance on Information Technology. The ubiquity of mobile devices in the lives of many a global citizen further underscores this reality. Subsectors related to cloud computing services and e-commerce activities are expected to fuel expansion in the broader Information Technology sector as both corporations and your average American consumer continue to drive demand for these services.

Overall, the target is expected to gain employment nationally at a pace of 13.6 percent between 2015 and 2025. Subsectors projected to grow jobs most rapidly include blank magnetic and optical recording media manufacturing (140 percent), computer systems design services (37 percent), custom computer programming services (29 percent), electronic connector manufacturing (29 percent), printed circuit assembly manufacturing (26 percent), and software publishers (25 percent). On the other hand, subsectors expected to experience rapid decline include software reproducing (-77 percent), telephone apparatus manufacturing (-76 percent), bare printed circuit board manufacturing (-71 percent), and telecommunications resellers (-53 percent). It remains vitally important, by virtue of the nature of technology,

that the region remains at the head of innovation as much as possible as to avoid investing too heavily in processes or technologies that will quickly become obsolete.

STRENGTHS AND OPPORTUNITIES

- ✓ **Lynchburg's clear strength in the Wireless Infrastructure and Communication field is producing the equipment needed to support technology and wireless communication, tied directly to its historical and significant strengths in manufacturing.** There are nine related subsectors with location quotients higher than 2.0: power, distribution, and specialty transformer manufacturing (14.87), audio and video equipment manufacturing (5.03), other electronic parts and equipment merchant wholesalers (4.35), other industrial machinery manufacturing (4.09), motor and generator manufacturing (3.43), printed circuit assembly manufacturing (3.37), computer terminal and other computer peripheral equipment manufacturing (2.83), relay and industrial control manufacturing (2.41), and bare printed circuit board manufacturing (2.01). These subsectors combined employ over 1,400 workers.
- ✓ **The target has experienced competitive employment growth between 2005 and 2015.** Over the 10-year period, the target grew by 12.8 percent, or 400 jobs, a more rapid pace than the nation at 7.5 percent. The fastest growing subsectors are related to computer components manufacturing and other management consulting services, which includes telecommunications and utilities management consulting services. Despite this growth, BRE efforts remain important to retain existing firms and assist in avoiding layoffs and consolidations when possible by connecting companies to export and business-to-business supplier opportunities. As an example, in 2014, Harris Corporation laid off 30 employees after the company experienced a slowdown in demand for public safety communications equipment.
- ✓ **Despite low to average concentrations of many of the occupations related to Wireless Infrastructure and Communications, the region has high concentration of high-paying engineering and skilled technical occupations,** including mechanical engineers (3.08), electrical engineers (2.93), and information security analysts (1.85). This target provides opportunities for workers at various levels of skills and experience, starting with assembler occupations that require limited prerequisite training and often provide on-the-job training.
- ✓ **The region has several opportunities for workforce development related to IT.** Central Virginia Community College offers associate degree programs in computer and electronics technology and in information systems technology. Lynchburg College has a bachelor's degree program in computer science, and Liberty University offers programs at the associate, bachelor's and master's levels in information systems, information technology, and computer science.
 - There were 903 degree or certificate completions between 2009 and 2014 in the Lynchburg region. In 2014, there were 224 degrees conferred, equivalent to 0.86 completions per 1,000 residents, compared to 1.41 in Virginia Beach MSA, 0.59 in Roanoke MSA, and 0.53 in Richmond MSA. In the Lynchburg MSA, over half were in management information systems

and services, while there were 40 in general computer and information sciences, 21 in electrical and electronics maintenance and repair technology, and fewer than 10 in electrical, electronics, and communications engineering, computer and IT administration and management, and computer engineering.

WEAKNESSES AND THREATS

- ✓ **Although average annual earnings for the target (\$62,060) significantly surpass the regional average of \$37,153, they are notably lower than the national average for the target (\$94,867).** This poses a challenge to attracting and retaining IT talent. Because this field is an increasingly lucrative field that relies on workers with largely formal training, low wages are a deterrent to top talent.
- ✓ **While there are several subsectors with competitive employment concentration in the region, they are many others with location quotients of much less than 1.0,** a sign that the target, although strong in many ways, is not well-rounded across the spectrum of business activities it covers.
- ✓ Although the region does have IT-related educational programs, there were no completions in several related fields of study, including computer programming, computer systems networking and telecommunications, computer software and media applications, and electromechanical instrumentation. This indicates a gap in available programs in the region that would support this target.

Financial and Business Support Services

DEFINITION AND OVERVIEW: The Financial and Business Support target is composed of insurance firms, business support services companies, and professional service providers. While business support services typically covers outsourced or shared service “back-office” functions (payments, billing, collections, customer service, etc.) through a division of an existing company, professional service providers are typically standalone firms that provide higher value services to other companies. Such services include legal, marketing and public relations, architecture and engineering, computer systems design, and a variety of research and development services. These firms are also included in the analysis.

LOCAL COMPANIES: Existing financial and business services firms that are located in the Lynchburg region include but are not limited to Genworth Financial (operations center for long term care insurance), Nationwide Insurance (call center), Innovairre Communications/Mail America Communication Inc. (nonprofit operations support solutions), StarTek Inc. Lynchburg (business process management, supply chain management and customer care services), Gentry Locke (law firm), and Woods Rogers PLC (law firm).

NATIONAL TRENDS: While the United States has experienced a reshoring of manufacturing jobs due in part to increasing labor costs in many developing countries, so too has the business support services sector benefited from the same dynamic primarily in the form of reshoring call center operations. Telemarketing Bureaus and Other Contact Centers (NAICS: 561422) grew by 24 percent since 2010 at the national level, and the growth was even greater in Virginia (28 percent). A number of factors are likely to drive further reshoring of back office operations in coming years. Companies seeking to consolidate back office functions into more vertically integrated “in-house” business units will continue to drive the reshoring trend. Many companies are also motivated by the potential for increased customer satisfaction that can result from locating these positions in the United States, where cultural and language barriers are less prominent. Overall, the target is expected to experience healthy growth of 16 percent between 2015 and 2025, according to EMSI projections. Subsectors expecting to grow most rapidly include marketing consulting services, other nondepository credit intermediation, administrative management and general management consulting services, financial transactions processing, reserve, and clearinghouse activities, and process, physical distribution, and logistics consulting services, all with projected growth of 30 percent or more.

STRENGTHS AND OPPORTUNITIES

- ✓ **Lynchburg currently has nearly 6,000 jobs related to Financial and Business Support Services, and the region has existing strengths in direct mail advertising (LQ = 16.7), other insurance related activities (7.2), and insurance agencies and brokerages (2.2).** These subsectors alone have 2,700 employees, and are an important base of employment for the region. In fact, these subsectors are also well-utilized to meet regional demand for these services—99 percent of the region’s demand for other insurance related activities, 97.6 percent of the demand for direct mail advertising, and 89.8 percent of the demand for insurance agencies and brokerages are met inside the Lynchburg region.

- Lynchburg's largest direct mail advertising employers are Innovairre Communications/Mail America Communication Inc. and Valtim, a marketing, fulfillment and call center solutions firm. Both are located in Bedford County.
- ✓ **Financial and Business Support Services has gained employment by 28.5 percent over the ten-year period examined.** This is a more rapid pace than that of the nation (23.3 percent) as well as overall regional employment growth (1.6 percent). However, business retention and expansion (BRE) outreach efforts will be important to the LRBA's ability to identify opportunities for internal growth, mitigate closures, and to understand employer needs. This is true in all target sectors. In 2015, Nationwide announced the closing of its Lynchburg call center by mid-2016, which will show up in 2017 employment estimates.
- ✓ **The Commonwealth's business tax climate is competitive.** The comparative analysis of state tax costs on business conducted by KPMG and the Tax Foundation in 2015 ranked Virginia 21st for mature firms and 29th for new firms.
- ✓ Financial and Business Support sectors, such as data center operations, typically seek locations with low natural disaster risk. A natural disaster that damages or destroys a business facility can have a debilitating impact on any business, but especially for IT-intensive facilities that have expensive equipment storing sensitive information. **The Lynchburg region has a generally low natural disaster risk, an important factor taken into consideration for most companies operating within the Business Support Services sector.**
- ✓ **There are several training options in the region to support Financial and Business Support Services,** including associate degree programs in business administration and accounting at Central Virginia Community College and Liberty University, bachelor's degree programs in accounting and business administration at Lynchburg College, Liberty University, and Randolph College. In addition, Lynchburg is within driving distance to larger universities in the state, including the University of Virginia and Virginia Polytechnic Institute and State University. However, as stated, talent attraction and retention will prove difficult in Lynchburg with larger metro options and the potential for greater levels of earnings for these students post-graduation.
- ✓ **Although short-term diversification efforts are limited by workforce educational attainment statistics, in the long term, trends are promising.** The region's young professional population (adults aged 25-34) have higher levels of educational attainment than their older counterparts and compared to their peers nationwide. In the U.S., 33.5 percent of this age cohort hold bachelor's or graduate degrees, compared to 38.5 percent of Lynchburg young professionals. The Lynchburg MSA ranks #61 in the nation for educational attainment of this age group, which is a sign of future gains in overall adult educational attainment.
- ✓ **According to EMSI, in terms of degree completions, the number two field of study represented in the Lynchburg region is business administration, management, and operations,** following only theological and ministerial studies. In 2014, of the 19,281 degrees or certificates completed within the region, 10.3 percent are in business administration, management, and operations. These

3,386 completions are equivalent to 13.12 completions per 1,000 residents. This is significantly more than the 2.83 completions per 1,000 residents in Virginia Beach MSA, 2.19 in Richmond MSA, and 1.96 in Roanoke MSA. This is an important competitive advantage that can only be leveraged by increasing the number of graduates who remain in the region post-graduation.

- ✓ As evidenced by the fact that three of the five targets described in this report are related to manufacturing, the Lynchburg region is considerably competitive for a variety of manufacturing activities. **In addition to creating products, manufacturing firms engage in sales, marketing, and many other general management tasks.** For small companies, these activities may be carried out in the same establishment that handles the actual production of goods. By contrast, larger firms – especially those with multiple locations – must separate these activities into a stand-alone corporate headquarters operation, which may be co-located at the same site or at least in the same region as the production facility. While this would not necessarily constitute economic “diversity” in the traditional sense – the white-collar employment would still be tied to the success of the manufacturing sector – the associated jobs would provide numerous new high-wage opportunities for qualified area residents.

WEAKNESSES AND THREATS

- ✓ **Although there are three subsectors with significant concentration in the region, there are 23 others that are less concentrated locally than they are in the national economy.** This underscores the assertion within the target overview that Financial and Business Support is largely a long-term area of opportunity, dependent on talent and available office space.
- ✓ **While the target’s average annual earnings (\$47,618) are higher than the regional average, they are not high enough to effectively attract the talent needed to support the growth of this target.** Only 59.1 percent of the national average earnings for this set of subsectors, this level of wages are not enough to for talent to take advantage of the fact that the cost of living in Lynchburg is 91.9 (based on a national base of 100).
- ✓ Consistent with other findings about available talent in the region, **38 of the 47 occupations examined have location quotients less than 1.0, or less than national shares of these occupations.** The occupations with location quotients greater than one are largely related to insurance, secretarial work, and computer support. Many of the occupations with LQs less than one are critical to the success of this sector, including applications software developers (0.72), computer and information systems managers (0.54), bill and account collectors (0.39), credit analysts (0.26), new accounts clerk (0.35), financial analysts (0.23), and insurance underwriters (0.57).
- ✓ It has been suggested that the Lynchburg region should pursue diversification with stronger “white-collar” sectors. **However, in the short term, the community’s ability to support activity in these sectors is limited to workforce constraints and office space limitations.** Specifically, 30.1 percent of residents aged 25 and over nationwide holds a bachelor’s degree, compared to 27.2 percent of adults in the Lynchburg region. There is obviously significant variation in the specific types of talent that white-collar firms require – software developers rely on a different mix of skill sets than insurance

underwriters, for instance. But as a general rule, communities that are able to support significant white-collar business sector activity are those that have highly educated populations. While adults in the Lynchburg region are not significantly less educated than the nation, it is important to note that the region ranks #170 of the nation's 381 metro areas, which means that there are 169 metros with more favorable educational attainment statistics.

- ✓ **The Lynchburg region has a limited stock of attractive, available office space to accommodate new business support operations.** This reality likely would require most major new operations in the Financial and Business Support Services sector to invest in build-to-suit options. According to the Virginia Economic Development Partnership's Property Search Tool, there is currently 415,460 square feet of office space available across 28 properties in the Lynchburg MSA, only 35.9 percent of the total space within these properties.
- ✓ **The lack of adequate passenger air connectivity in the Lynchburg region is well-documented,** and this reality represents a disadvantage for business recruitment across those sectors that are especially reliant on air connectivity. In regards to Financial and Business Support, most occupations within this sector do not require significant, if any, amount of business travel.
- ✓ **On average, the Lynchburg region is not competitive for larger firms within the Financial and Business Support arena,** with a few exceptions. When average establishment size is calculated for each subsector, all but three have less than 15 employees per firm. The three with greater levels of employees are telemarketing bureaus and other contact centers (92 average employees per firm), all other insurance related activities (76 average employees), and direct mail advertising (73 employees). This would suggest that small to medium sized firms are the best fit for the region.

Long-Term Opportunities

As depicted in the targets illustration on page 8, there are several long-term opportunities that the Lynchburg region can begin exploring now to set the region up for solid market entry points in the future. This section provides brief introductions of these opportunities, many of which are tied to more than one target areas and are excellent interrelated areas of focus.

NUCLEAR MEDICINE

- ✓ The Nuclear Medicine field is a natural long-term opportunity for Lynchburg because of its strengths in both Nuclear Technology and the potential to marry expertise in this area with its predominantly local-serving Healthcare sector. Nuclear medicine utilizes radioactive materials for speedy diagnosis or the treatment of a patient's organs. Radiotherapy is commonly used to treat some medical conditions, particularly cancer, to weaken or eliminate targeted cells. The expertise of the engineers and scientists working on energy solutions may be parlayed into collaborations for medical uses.
 - While there are no direct workforce training programs in Nuclear Medicine Technology in Lynchburg, there are programs nearby at Carilion Roanoke Memorial Hospital in Roanoke, Old Dominion in Norfolk, and Virginia Commonwealth University in Richmond.

ALTERNATIVE ENERGY

- ✓ Because the Lynchburg has a clear historical strength in nuclear power generation, the region must determine if it will keep its energy target focused specifically on Nuclear Technology or if it will leverage these strengths to pursue expanding its target to include other types of energy, particularly alternative and renewable energy sectors that are becoming more common nationally because of concerns of environmental sustainability. Now is the time to determine what the region would like its future to be so that it can plant the seeds for future growth.
- ✓ The United States boasts a thriving renewable energy industry with across the board strengths in wind, solar, biomass, biofuels, geothermal, and hydropower sectors. Clean energy investments in the United States increased by 8 percent in 2015 and accounted for 17 percent of the world's total new renewable energy investment. Renewable energy production in the United States is expected to more than double in just the next two decades. Recent technological improvements related to wind energy and solar energy have significantly cut costs related to these energy sources. In Virginia, solar energy production is expected to increase in coming years on the heels of the Governor setting a goal for state buildings to derive 8 percent of their energy from solar sources over the next three years. Biomass energy production in the form of wood pellets is another promising sector as steep demand from European markets continues to drive wood pellet exports in the United States. In 2015, over 4.5 million metric tons of wood pellets were exported from the U.S. and this production is expected to continue to grow.

- It is important to note that Virginia is well behind peer states in competing for solar and wind projects. For example, in North Carolina, Duke Energy companies have installed over 400 megawatts of solar energy, equivalent to enough solar energy to power roughly 80,000 homes.² Additionally, Duke Energy has invested over \$4 billion in renewable energy with plans for investment of an additional \$3 billion by 2021. Meanwhile, in 2015, Dominion Virginia Power has pledged to build at least 400 megawatts of solar in Virginia by 2020. As solar costs continue to decline, the Commonwealth must take advantage quickly to compete with other trailblazing states.
- In 2015 alone, investments in solar installations in Virginia increased by 86 percent from 2014, after years of only marginal growth. Virginia has put in place several incentives to encourage further growth in renewable energy, including the VirginiaSAVES Green Community Program, the Energy Efficient Buildings Tax Exemption, and the Solar Energy Equipment Tax Exemption.
- Currently, there already exists demand for renewable energy generation, albeit low. In 2013, \$2.3 million in solar electric, other electric, biomass, and geothermal electric power generation was imported to the region to satisfy 100 percent of its demand. Now is an opportune time to determine if Lynchburg region should diversify its energy sector by targeting renewable energy as a long-term strategy or if the region would rather focus on creating stronger supply chain linkages while remaining focused on nuclear energy as its primary energy target area.

CYBERSECURITY

- ✓ Maintaining the integrity of data is a growing concern among public and private sector leaders alike. High-profile data breaches involving national governments, private companies, and common citizens have only fueled interest in developing data security solutions that can protect valuable information. As technology becomes even more integrated into the lives of citizens and private companies, the need for proper data security measures will only increase. E-commerce and other means of online and cloud-based transactions stand to suffer if consumers are scared off by the threat of their personal information being compromised. The growth of the cybersecurity industry will be fueled by the defense industry and the many supporting industries for which it derives support. Cybersecurity threats against the United States from foreign governments and terrorist organizations represent a burgeoning national security threat. The federal government will invest heavily in R&D efforts to combat this growing threat, opening up plenty of growth opportunities for domestic firms involved in cybersecurity solutions.
 - Because of the region's nuclear technology strength and connections to military and government operations, cybersecurity is a promising long-term opportunity. As technology continues to exponentially advance, cybersecurity will continue to be a major concern and

² "Duke Energy Renewables acquires two North Carolina solar projects from ET Capital." Duke Energy News Center. 4 April 2016.

necessary business sector. This is a potential cross-sector opportunity to leverage both wireless and IT talent and nuclear technology talent.

- The U.S. Bureau of Labor Statistics projects strong growth in occupations related to the cybersecurity sector. Computer Systems Analysts (24.5 percent) and Information Security Analysts (36.5 percent) in particular will far outpace the 10.8 percent growth rate for all occupations.
- ✓ Earlier this year, the Center for Advanced Engineering Research (CAER), a key asset supporting Nuclear Technology, announced the creation of the International Critical Infrastructure Security Institute (ICISI). The new organization is being launched in partnership with the Bedford County Office of Economic Development and will operate from the CAER campus. The organization will serve as a clearinghouse for cybersecurity technologies, assisting power generation companies in monitoring and adhering to cybersecurity regulations while also supporting research and workforce development efforts. The Virginia Tobacco Region Revitalization Commission provided a \$40,000 grant to assist in establishing ICISI, and the Economic Development Authority matched the grant to further support its success.

UNMANNED AERIAL SYSTEMS (UAS)

- ✓ Lynchburg's strengths in steel and metals and in IT and wireless communications lend the region to interesting cross-sections. Investing in combining these areas and leveraging the existing expertise of the region's workforce has the potential to provide the region with long-term cutting edge opportunities.
 - The aerospace industry is an attractive industry that sticks out as an outlier among the larger manufacturing industry in the United States. Employment in the Aerospace Product and Parts Manufacturing subsector (NAICS: 3364) is nearing pre-recession levels, which stands in stark contrast to many other manufacturing operations. Jobs in the aerospace industry are also not easily outsourced like low-skill traditional manufacturing jobs, due to the highly-skilled nature of many aerospace jobs and the intellectual property and security considerations that are unique to the aerospace and defense industries in the United States. Economic growth in many developing countries is expected to drive demand in the aerospace industry as global wealth creation makes travel possible for millions new fliers. Boeing projects that some 38,000 passenger planes – valued at \$5.6 trillion – will be needed over the next 20 years to meet surging global demand.
 - Unmanned aerial systems and drones are a new-age technology that have cross-applications to a number of important sectors including real estate, utilities, construction, and agriculture. Beyond these applications, drones are also quickly becoming a hot commodity among hobbyists. According to the NPD Group, drone sales in the U.S. increased by 244 percent from April 2015 to April 2016. The drone industry is expected to be heavily regulated by the Federal Aviation Administration (FAA), and in many respects, the rapid growth in the drone industry has made it difficult for regulators to keep up. The future of the industry will likely

depend on future regulatory guidelines governing the use of drone technology and the impact these regulations will have on potential widespread commercial adoption.

- Liberty University props up these long-term opportunities through its programming. The university's aeronautics program is one of the largest faith-based aviation programs in North America. Educational options include a Bachelor of Science in Aeronautics with focus areas in commercial and corporate aviation, global studies aviation, military aviation, aviation maintenance management, and unmanned aerial systems. Students also are able to earn an Associate of Arts degree or certificate in Aviation Maintenance Technician that allow them to earn FAA Airframe and Powerplant mechanic ratings or in Airline Flight Attendant.
 - The Unmanned Aircraft Systems (UAS) program was created in 2012 and soon after in 2013, it was recognized by the Virginia's Region 2000 Technology Council with its Innovator of the Year award. This Bachelor's degree program includes the opportunity to gain certification as a UAS operator while learning to operate large and small UAS aircraft. The program's goal is to prepare students to operate UAS in an array of applications, including crop dusting, disaster relief and first responder assistance, utility line inspections, and law enforcement, military, and intelligence linkages.
 - In December 2015, Liberty purchased the New London Airport located in Bedford County. The 134-acre public-use airport will be utilized as a hands-on training lab for aviation students. Students are able to log flight hours here and at over 40 partner locations across the country, and pending upcoming FAA regulations, UAS students should be able to gain experience operating aircraft in noncommercial airspace.
- The region is also home to Lynchburg Civil Air Patrol (LynchburgCAP), an auxiliary of the United States Air Force. The Civil Air Patrol's three primary missions are aerospace education, cadet programs, and emergency services. Its aerospace education is available to both volunteer CAP members and the general public, and its cadet programs train youth ages 12 to 21 in aerospace fields, including flight training, aircraft mechanics, aerospace medicine, meteorology, and astronomy, and provide the opportunity for cadets to earn officer status in the Air Force. In 2015, LynchburgCAP announced a new model rocketry program for cadets where cadets learn about the history of model rockets and are taught to build three different engine-powered model rockets.
- The Lynchburg region is also home to businesses that started specifically supporting its Nuclear Technology target but have expanded to also serve aerospace markets. One example is NovaTech, which now provides engineering services to nuclear, aerospace, and defense markets. Although it began its history as a firm largely serving nuclear service providers as a supplier, it now also supports aerospace with design, analysis, and testing services. In fact, they have been instrumental in the development of nuclear powered rockets and solar powered rockets used by the U.S. Air Force and NASA.

EDUCATIONAL TECHNOLOGY (“ED TECH”)

- ✓ Technology has revolutionized the way that education is consumed in the United States from both the grade school level to working professionals pursuing continuing education opportunities. From the proliferation of “smart board” technology in classrooms across the country to the widespread usage of online learning platforms in higher education, technology is more integrated into educational services than ever before. This trend is expected to continue for the foreseeable future, as online corporate learning opportunities around skills measurement and competency-based training become more and more commonplace. The unsustainable growth in the cost of higher education will also be a key driver in the education technology sector. Students are likely to continue to embrace online learning opportunities that still allow them to work part-time, and massive open online courses (MOOCs) will be a key avenue through which universities and colleges engage these students.
- ✓ Liberty University’s massive growth and investment in online education could lead to innovation within educational technology or the attraction of ed tech providers that want to be proximate to a major customer. This is the type of catalyst that can lead to a true cluster of business activity, such as that of health IT companies in Nashville’s Healthcare Council, which spun off from or sought to be located near three major hospital companies headquartered there. It is important to note that Nashville’s intricate “family tree” developed over decades, but over time, the cluster was supported and encouraged by Nashville Area Chamber of Commerce.

APPENDIX: DATA TABLES

FOOD AND BEVERAGE: RELATED SECTORS

NAICS	Description	2015 Jobs	2015 LQ	10-Year Employment Change	U.S. 10-Year Employment Change	Current Earnings	10-Year Change	U.S. Ratio	2015 Establish- ments
Total, Lynchburg MSA		115,528		1.6%	5.1%	\$37,153	20.0%	74.9%	6,829
Total, Food and Beverage Manufacturing		1,838	0.70	(8.0%)	1.8%	\$42,774	23.9%	116.6%	49
3115	Dairy Product Mfg	566	5.63	(21.3%)	2.8%	\$57,499	42.8%	103.1%	2
3119	Other Food Mfg	444	3.12	(9.5%)	20.7%	\$50,225	10.7%	93.8%	2
3118	Bakeries and Tortilla Mfg	302	1.30	45.4%	5.7%	\$34,861	21.7%	97.0%	7
1120	Animal Production and Aquaculture	245	0.77	74.3%	(10.3%)	\$25,638	36.7%	81.3%	16
1110	Crop Production	107	0.17	52.4%	(1.7%)	\$19,012	93.3%	66.2%	5
1151	Support Activities for Crop Production	55	0.16	41.6%	17.3%	\$17,683	12.5%	67.0%	1
3116	Animal Slaughtering and Processing	40	0.11	9.7%	(3.9%)	\$25,404	29.3%	70.6%	5
3121	Beverage Mfg	34	0.22	(14.2%)	24.3%	\$58,121	269.2%	113.3%	6
1152	Support Activities for Animal Production	23	0.77	(20.7%)	(3.8%)	\$22,398	(14.9%)	69.6%	3
3113	Sugar and Confectionery Product Mfg	10	0.20	NA	(9.4%)	\$28,310	NA	59.6%	1
1141	Fishing	<10	0.31	NA	(5.3%)	Insf. Data	NA	NA	0
1142	Hunting and Trapping	<10	1.00	NA	15.6%	Insf. Data	NA	NA	0
3111	Animal Food Mfg	<10	0.04	NA	12.7%	Insf. Data	NA	NA	1
3112	Grain and Oilseed Milling	0	0.00	NA	(4.4%)	\$0	NA	NA	0
3114	Fruit and Vegetable Preserving and Specialty Food Mfg	0	0.00	NA	(3.8%)	\$0	NA	NA	0
3117	Seafood Product Preparation and Packaging	0	0.00	NA	(10.2%)	\$0	NA	NA	0

Source: Economic Modeling Specialists Intl.

FOOD AND BEVERAGE: SUPPORTIVE OCCUPATIONS

SOC	Description	2015 Jobs	2015 LQ	10-Year Jobs Change	U.S. 10-Year Jobs Change	Median Hourly Earnings	U.S. Ratio
Total, Selected Food and Beverage Manufacturing-Related Occupations		2,654	0.84	(7.5%)	(1.7%)	\$16.34	112.6%
51-1011	First-Line Supervisors of Production and Operating Workers	692	1.52	(20.4%)	(10.5%)	\$27.11	101.5%
53-7064	Packers and Packagers, Hand	530	0.99	3.1%	1.8%	\$8.78	85.9%
51-3092	Food Batchmakers	255	2.79	(7.9%)	2.7%	\$14.06	106.3%
51-9111	Packaging and Filling Machine Operators and Tenders	243	0.83	(26.6%)	(3.1%)	\$15.72	121.7%
11-9013	Farmers, Ranchers, and Other Agricultural Managers	191	0.51	42.5%	(19.6%)	\$11.86	80.6%
45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	149	0.26	47.5%	10.6%	\$10.69	103.4%
51-3021	Butchers and Meat Cutters	105	1.00	0.0%	8.1%	\$13.31	93.3%
51-3099	Food Processing Workers, All Other	81	2.43	9.5%	3.6%	\$11.85	101.6%
51-3011	Bakers	63	0.45	(1.6%)	13.8%	\$9.42	81.8%
49-9044	Millwrights	46	1.50	(25.8%)	(3.0%)	\$19.69	79.3%
51-3093	Food Cooking Machine Operators and Tenders	44	1.58	(10.2%)	4.4%	\$10.87	80.1%
51-4035	Milling and Planing Machine Setters, Operators, and Tenders, Metal and Plastic	37	2.26	(19.6%)	(10.4%)	\$18.13	99.8%
45-1011	First-Line Supervisors of Farming, Fishing, and Forestry Workers	31	0.84	(13.9%)	0.3%	\$23.18	105.4%
45-2093	Farmworkers, Farm, Ranch, and Aquacultural Animals	31	0.50	19.2%	8.9%	\$11.19	94.4%
51-9192	Cleaning, Washing, and Metal Pickling Equipment Operators and Tenders	22	1.58	(35.3%)	(0.5%)	\$11.18	84.1%
45-2011	Agricultural Inspectors	20	1.74	(9.1%)	4.1%	\$22.04	99.0%
45-2099	Agricultural Workers, All Other	15	1.44	50.0%	10.8%	\$13.56	89.2%
45-2091	Agricultural Equipment Operators	15	0.28	36.4%	13.5%	\$12.89	95.2%
51-3091	Food and Tobacco Roasting, Baking, and Drying Machine Operators and Tenders	15	1.01	(11.8%)	3.3%	\$11.38	83.4%
51-3022	Meat, Poultry, and Fish Cutters and Trimmers	15	0.13	7.1%	(3.1%)	\$12.71	113.2%
45-2041	Graders and Sorters, Agricultural Products	14	0.33	(26.3%)	5.8%	\$13.56	125.2%
51-3023	Slaughterers and Meat Packers	14	0.22	0.0%	(4.9%)	\$14.53	117.5%
17-2021	Agricultural Engineers	<10	3.26	Insf. Data	18.1%	Insf. Data	NA
19-1012	Food Scientists and Technologists	<10	0.28	Insf. Data	12.0%	Insf. Data	NA
19-4011	Agricultural and Food Science Technicians	<10	0.30	Insf. Data	10.4%	Insf. Data	NA
45-2021	Animal Breeders	<10	0.24	Insf. Data	11.0%	Insf. Data	NA
45-3011	Fishers and Related Fishing Workers	<10	0.44	Insf. Data	(4.7%)	Insf. Data	NA
51-9031	Cutters and Trimmers, Hand	<10	0.41	Insf. Data	(25.3%)	Insf. Data	NA

Source: Economic Modeling Specialists Intl.

STEEL AND METALS: RELATED SECTORS

NAICS	Description	2015 Jobs	2015 LQ	10-Year		Current Earnings	10-Year Change	U.S. Ratio	2015 Establishments
				Employment Change	U.S. 10-Year Employment Change				
Total, Lynchburg MSA		115,528		1.6%	5.1%	\$37,153	20.0%	74.9%	6,829
Total, Steel and Metals Manufacturing		3,895	4.34	(36.6%)	(3.2%)	\$73,271	17.7%	131.8%	68
332313	Plate Work Mfg	2,242	62.28	15.9%	1.8%	\$89,033	19.6%	162.5%	5
332710	Machine Shops	443	2.04	12.3%	10.2%	\$50,778	27.2%	100.2%	28
332312	Fabricated Structural Metal Mfg	328	4.89	174.6%	(0.4%)	\$54,592	59.9%	101.8%	6
332410	Power Boiler & Heat Exchanger Mfg	228	12.95	(88.5%)	16.8%	\$45,449	-38.7%	66.6%	1
331511	Iron Foundries	182	6.43	(76.5%)	(36.8%)	\$57,094	44.7%	97.3%	1
332813	Electroplating, Plating, Polishing, Anodizing, & Coloring	101	2.23	(30.5%)	(18.5%)	\$41,593	2.5%	93.8%	2
332322	Sheet Metal Work Mfg	76	1.00	5.9%	(1.3%)	\$31,278	-13.4%	63.5%	6
332991	Ball & Roller Bearing Mfg	76	3.73	(77.7%)	(19.1%)	\$67,332	64.0%	110.3%	1
332996	Fabricated Pipe & Pipe Fitting Mfg	67	2.46	30.4%	25.8%	\$35,897	-23.2%	63.3%	1
331110	Iron & Steel Mills & Ferroalloy Mfg	65	0.99	1.4%	(7.9%)	\$100,824	133.1%	124.3%	2
Metal Coating, Engraving (exc Jewelry & Silverware), & Allied Svcs to Manufacturers		24	0.57	NA	6.2%	\$62,087	NA	138.7%	3
332999	All Other Miscellaneous Fabricated Metal Product Mfg	19	0.33	(74.0%)	(6.0%)	\$29,858	-58.8%	58.7%	6
332912	Fluid Power Valve & Hose Fitting Mfg	10	0.36	(66.3%)	4.2%	\$44,463	85.4%	66.1%	1
3313	Alumina and Aluminum Production and Processing	<10	0.21	NA	(21.5%)	Insf. Data	NA	NA	1
3322	Cutlery and Handtool Manufacturing	<10	0.26	NA	(31.1%)	Insf. Data	NA	NA	2
331221	Rolled Steel Shape Mfg	<10	0.45	NA	(11.2%)	Insf. Data	NA	NA	1
331529	Other Nonferrous Metal Foundries (exc Die-Casting)	<10	0.99	NA	(12.0%)	Insf. Data	NA	NA	1
332420	Metal Tank (Heavy Gauge) Mfg	<10	0.03	NA	47.0%	Insf. Data	NA	NA	0
332721	Precision Turned Product Mfg	<10	0.02	NA	(6.3%)	Insf. Data	NA	NA	1
332811	Metal Heat Treating	<10	0.04	NA	4.4%	Insf. Data	NA	NA	1
3314	Nonferrous Metal (except Aluminum) Production and Processing	0	0.00	NA	(14.6%)	\$0	NA	0.0%	0
3321	Forging and Stamping	0	0.00	NA	(10.3%)	\$0	NA	0.0%	0
3326	Spring and Wire Product Manufacturing	0	0.00	NA	(29.1%)	\$0	NA	0.0%	0
331210	Iron & Steel Pipe & Tube Mfg from Purchased Steel	0	0.00	NA	(2.0%)	\$0	NA	0.0%	0
331222	Steel Wire Drawing	0	0.00	NA	10.4%	\$0	NA	0.0%	0
331512	Steel Investment Foundries	0	0.00	NA	(9.5%)	\$0	NA	0.0%	0
331513	Steel Foundries (exc Investment)	0	0.00	NA	(11.2%)	\$0	NA	0.0%	0
331523	Nonferrous Metal Die-Casting Foundries	0	0.00	NA	(30.1%)	\$0	NA	0.0%	0
331524	Aluminum Foundries (exc Die-Casting)	0	0.00	NA	(25.8%)	\$0	NA	0.0%	0
332311	Prefabricated Metal Building & Component Mfg	0	0.00	NA	(10.4%)	\$0	NA	0.0%	0
332321	Metal Window & Door Mfg	0	0.00	NA	(35.8%)	\$0	NA	0.0%	0
332323	Ornamental & Architectural Metal Work Mfg	0	0.00	NA	(5.1%)	\$0	NA	0.0%	0
332431	Metal Can Mfg	0	0.00	NA	(16.6%)	\$0	NA	0.0%	0
332439	Other Metal Container Mfg	0	0.00	NA	(30.6%)	\$0	NA	0.0%	0
332510	Hardware Mfg	0	0.00	NA	(32.7%)	\$0	NA	0.0%	0
332722	Bolt, Nut, Screw, Rivet, & Washer Mfg	0	0.00	NA	(8.3%)	\$0	NA	0.0%	0
332911	Industrial Valve Mfg	0	0.00	NA	15.3%	\$0	NA	0.0%	0
332913	Plumbing Fixture Fitting & Trim Mfg	0	0.00	NA	(30.2%)	\$0	NA	0.0%	0
332919	Other Metal Valve & Pipe Fitting Mfg	0	0.00	NA	(26.6%)	\$0	NA	0.0%	0

Source: Economic Modeling Specialists Intl.
 Note: Shaded rows are not included in calculations for target totals.

STEEL AND METALS: SUPPORTIVE OCCUPATIONS

SOC	Description	2015 Jobs	2015 LQ	10-Year Jobs Change	U.S. 10-Year Jobs Change	Median Hourly Earnings	U.S. Ratio
Total, Selected Steel and Metals Manufacturing-Related Occupations		13,598	1.19	(11.7%)	(2.1%)	\$20.52	88.9%
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	1,611	0.86	(3.4%)	2.2%	\$10.96	90.9%
51-2092	Team Assemblers	1,349	1.55	(12.7%)	(10.4%)	\$13.07	93.5%
49-9071	Maintenance and Repair Workers, General	1,263	1.18	4.6%	4.5%	\$16.08	91.1%
11-1021	General and Operations Managers	1,058	0.66	(9.0%)	5.4%	\$38.89	81.4%
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	879	0.80	(9.1%)	(1.4%)	\$23.80	90.7%
51-1011	First-Line Supervisors of Production and Operating Workers	692	1.52	(20.4%)	(10.5%)	\$27.11	101.5%
17-2141	Mechanical Engineers	638	3.08	32.4%	0.2%	\$42.96	106.6%
49-9041	Industrial Machinery Mechanics	617	2.49	0.5%	9.4%	\$19.21	81.3%
43-5071	Shipping, Receiving, and Traffic Clerks	558	1.10	(6.1%)	(3.2%)	\$14.80	101.6%
51-4041	Machinists	493	1.65	(4.6%)	1.7%	\$18.58	95.8%
53-7051	Industrial Truck and Tractor Operators	470	1.17	(16.2%)	(5.2%)	\$14.09	91.6%
51-4121	Welders, Cutters, Solderers, and Brazers	469	1.58	(36.1%)	(4.1%)	\$19.30	105.6%
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	370	0.98	(24.0%)	(3.6%)	\$17.51	100.0%
51-9198	Helpers--Production Workers	365	1.16	(23.5%)	(9.4%)	\$9.94	85.7%
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	343	1.02	(6.0%)	1.4%	\$28.21	94.2%
51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	278	2.89	(15.0%)	(18.5%)	\$15.74	111.9%
47-2211	Sheet Metal Workers	272	2.49	(3.9%)	(7.3%)	\$17.16	75.8%
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	238	1.67	(31.8%)	(17.2%)	\$20.89	139.0%
51-2041	Structural Metal Fabricators and Fitters	217	3.70	(12.9%)	(9.6%)	\$17.01	95.8%
17-2112	Industrial Engineers	162	0.90	(18.2%)	(3.4%)	\$31.25	78.5%
51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	154	1.39	(15.4%)	2.7%	\$21.47	120.4%
51-9041	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders	153	3.00	(9.5%)	(16.9%)	\$16.69	107.6%
11-3051	Industrial Production Managers	141	1.10	(28.4%)	(9.9%)	\$46.32	103.5%
51-4021	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	139	2.58	0.7%	(16.7%)	\$18.52	117.4%
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	133	1.82	(26.1%)	(16.3%)	\$16.42	99.4%
51-9121	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	110	1.61	(34.5%)	(12.7%)	\$13.12	86.1%
51-4034	Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic	81	2.61	(19.8%)	(10.2%)	\$19.97	114.5%
51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders	75	1.57	(14.8%)	(19.8%)	\$13.12	84.9%
51-4023	Rolling Machine Setters, Operators, and Tenders, Metal and Plastic	58	2.35	(18.3%)	(14.2%)	\$17.79	91.9%
51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	56	1.27	(40.4%)	3.5%	\$14.14	82.1%
51-4111	Tool and Die Makers	46	0.80	(36.1%)	(12.8%)	\$21.88	90.1%
51-4033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic	31	0.61	(64.8%)	(16.7%)	\$20.60	129.6%
51-9022	Grinding and Polishing Workers, Hand	25	1.15	(55.4%)	(16.0%)	\$13.39	96.5%
51-4071	Foundry Mold and Coremakers	17	2.02	(72.1%)	(26.9%)	\$13.71	90.0%
53-7021	Crane and Tower Operators	13	0.39	(35.0%)	2.8%	\$19.71	77.7%
47-2231	Solar Photovoltaic Installers	<10	1.51	Insf. Data	(2.1%)	Insf. Data	NA
51-4051	Metal-Refining Furnace Operators and Tenders	<10	0.36	Insf. Data	(11.6%)	Insf. Data	NA
51-4052	Pourers and Casters, Metal	<10	1.38	Insf. Data	(24.4%)	\$16.34	103.5%

Source: Economic Modeling Specialists Intl.

NUCLEAR TECHNOLOGY: RELATED SECTORS

NAICS	Description	2015 Jobs	2015 LQ	10-Year Employment Change	U.S. 10-Year Employment Change	Current Earnings	10-Year Change	U.S. Ratio	2015 Establishments
Total, Lynchburg MSA		115,528		1.6%	5.1%	\$37,153	20.0%	74.9%	6,829
Total, Nuclear Technology		2,551	2.27	(14.9%)	8.9%	\$85,806	26.9%	91.3%	65
541330	Engineering Services	1,838	2.54	175.1%	12.0%	\$94,454	34.5%	104.2%	50
335311	Power, Distribution, and Specialty Transformer Manufacturing	275	14.87	145.9%	(5.3%)	\$72,038	36.2%	113.1%	2
332410	Power Boiler and Heat Exchanger Manufacturing	228	12.95	(88.5%)	16.8%	\$45,449	25.7%	66.6%	1
221122	Electric Power Distribution	140	0.90	635.4%	56.0%	\$60,915	36.0%	63.5%	4
221210	Natural Gas Distribution	39	0.46	(13.0%)	6.8%	\$95,784	40.2%	91.5%	1
221111	Hydroelectric Power Generation	18	4.11	NA	(86.3%)	\$45,804	20.3%	43.3%	1
221112	Fossil Fuel Electric Power Generation	<10	0.01	NA	(25.6%)	Insf. Data	35.6%	NA	2
221121	Electric Bulk Power Transmission and Control	<10	0.47	NA	(1.7%)	Insf. Data	37.9%	NA	2
486210	Pipeline Transportation of Natural Gas	<10	0.17	NA	15.4%	Insf. Data	45.9%	NA	1
486910	Pipeline Transportation of Refined Petroleum Products	<10	0.09	NA	62.1%	Insf. Data	54.2%	NA	1
211111	Crude Petroleum and Natural Gas Extraction	0	0.00	NA	42.6%	\$0	43.9%	0.0%	0
211112	Natural Gas Liquid Extraction	0	0.00	NA	66.1%	\$0	14.8%	0.0%	0
213111	Drilling Oil and Gas Wells	0	0.00	NA	13.0%	\$0	54.4%	0.0%	0
213112	Support Activities for Oil and Gas Operations	0	0.00	NA	81.6%	\$0	38.4%	0.0%	0
221113	Nuclear Electric Power Generation	0	0.00	NA	(7.9%)	\$0	37.1%	0.0%	0
221114	Solar Electric Power Generation	0	0.00	NA	48.6%	\$0	19.9%	0.0%	0
221115	Wind Electric Power Generation	0	0.00	NA	1.9%	\$0	6.4%	0.0%	0
221116	Geothermal Electric Power Generation	0	0.00	NA	75.0%	\$0	(22.9%)	0.0%	0
221117	Biomass Electric Power Generation	0	0.00	NA	(15.1%)	\$0	3.2%	0.0%	0
221118	Other Electric Power Generation	0	0.00	NA	(16.1%)	\$0	14.6%	0.0%	0
324110	Petroleum Refineries	0	0.00	NA	2.1%	\$0	35.9%	0.0%	0
333611	Turbine and Turbine Generator Set Units Manufacturing	0	0.00	NA	33.7%	\$0	17.3%	0.0%	0
486110	Pipeline Transportation of Crude Oil	0	0.00	NA	61.1%	\$0	34.3%	0.0%	0

Source: Economic Modeling Specialists Intl.

Notes: Shaded rows are not included in calculations for target totals.

This table includes alternative energy subsectors to illustrate the lack of activity in energy-related sectors outside of Nuclear Technology.

NUCLEAR TECHNOLOGY: SUPPORTIVE OCCUPATIONS

SOC	Description	2015 Jobs	2015 LQ	10-Year Jobs Change	U.S. 10-Year Jobs Change	Median Hourly Earnings	U.S. Ratio
Total, Selected Nuclear Technology Occupations		8,422	1.12	(11.8%)	(5.0%)	\$23.20	88.2%
49-9040	Industrial Machinery Installation, Repair, & Maintenance Workers	740	2.12	(6.2%)	(10.0%)	\$19.41	58.7%
47-2030	Carpenters	715	0.94	(35.2%)	4.0%	\$14.66	67.8%
47-2060	Construction Laborers	652	0.68	(24.6%)	(8.0%)	\$12.01	59.8%
17-2140	Mechanical Engineers	638	3.08	32.4%	(28.0%)	\$42.96	132.6%
47-1010	First-Line Supervisors of Construction Trades & Extraction Workers	571	1.24	(29.8%)	0.0%	\$21.41	53.1%
17-3020	Engineering Technicians, Except Drafters	554	1.68	26.5%	2.0%	\$20.55	43.6%
51-4120	Welding, Soldering, & Brazing Workers	526	1.54	(36.5%)	(3.0%)	\$18.76	47.2%
51-4040	Machinists	493	1.65	(4.6%)	9.0%	\$18.58	46.9%
17-2070	Electrical & Electronics Engineers	440	1.85	54.9%	23.0%	\$33.40	79.7%
47-2110	Electricians	382	0.78	(11.4%)	(1.0%)	\$19.80	130.1%
47-2150	Pipelayers, Plumbers, Pipefitters, & Steamfitters	313	0.84	(6.6%)	21.0%	\$18.27	62.5%
29-2030	Diagnostic Related Technologists & Technicians	286	1.03	2.9%	15.0%	\$22.09	41.6%
47-2070	Construction Equipment Operators	217	0.68	(28.1%)	1.0%	\$17.15	71.4%
11-9020	Construction Managers	215	0.79	(41.1%)	(21.0%)	\$29.22	157.8%
49-9050	Line Installers & Repairers	213	1.19	25.3%	4.0%	\$25.80	57.3%
51-9010	Chemical Processing Machine Setters, Operators, & Tenders	199	2.41	3.1%	6.0%	\$18.15	56.9%
17-2110	Industrial Engineers, Including Health & Safety	189	0.95	(15.2%)	3.0%	\$32.51	89.7%
17-2050	Civil Engineers	171	0.81	31.5%	(6.0%)	\$35.21	120.0%
49-2090	Miscellaneous Electrical & Electronic Equipment Mechanics, Installers, & Repairers	160	0.86	(3.0%)	11.0%	\$24.91	68.8%
19-2030	Chemists & Materials Scientists	114	1.62	1.8%	0.0%	\$30.53	67.2%
17-1010	Architects, Except Naval	87	0.83	(17.1%)	(8.0%)	\$33.00	176.8%
19-2040	Environmental Scientists & Geoscientists	64	0.63	16.4%	(2.0%)	\$28.48	144.7%
47-2220	Structural Iron & Steel Workers	56	1.12	(26.3%)	(2.0%)	\$16.18	59.8%
47-2130	Insulation Workers	52	1.19	(16.1%)	7.0%	\$14.50	30.2%
17-2190	Miscellaneous Engineers	48	0.45	(12.7%)	6.0%	\$50.94	220.2%
49-9010	Control & Valve Installers & Repairers	39	0.87	(11.4%)	26.0%	\$21.43	79.2%
51-8090	Miscellaneous Plant & System Operators	36	0.45	(25.0%)	3.0%	\$24.99	104.2%
19-4030	Chemical Technicians	34	0.70	(5.6%)	(6.0%)	\$20.87	95.6%
51-8010	Power Plant Operators, Distributors, & Dispatchers	30	0.69	0.0%	(6.0%)	\$34.44	138.5%
17-2160	Nuclear Engineers	29	2.10	38.1%	10.0%	\$42.49	82.4%
17-2040	Chemical Engineers	28	1.09	33.3%	13.0%	\$47.29	131.7%
51-8020	Stationary Engineers & Boiler Operators	23	0.81	(14.8%)	(20.0%)	\$24.12	87.6%
19-1020	Biological Scientists	20	0.25	(28.6%)	4.0%	\$28.87	98.9%
17-2130	Materials Engineers	18	0.94	(10.0%)	16.0%	\$44.43	120.9%
17-2010	Aerospace Engineers	17	0.32	Insf. Data	(3.0%)	\$52.77	290.9%
11-9160	Emergency Management Directors	<10	1.05	Insf. Data	13.0%	Insf. Data	NA
17-2030	Biomedical Engineers	<10	0.30	Insf. Data	1.0%	Insf. Data	NA
17-2120	Marine Engineers & Naval Architects	<10	1.50	Insf. Data	(1.0%)	Insf. Data	NA
19-2010	Astronomers & Physicists	<10	0.44	Insf. Data	2.0%	Insf. Data	NA
19-4040	Geological & Petroleum Technicians	<10	0.25	Insf. Data	(1.0%)	Insf. Data	NA
19-4050	Nuclear Technicians	<10	0.65	Insf. Data	(18.0%)	Insf. Data	NA
43-5040	Meter Readers, Utilities	<10	0.33	Insf. Data	2.0%	Insf. Data	NA
47-2010	Boilermakers	<10	0.49	Insf. Data	0.0%	Insf. Data	NA
47-2230	Solar Photovoltaic Installers	<10	1.51	Insf. Data	16.0%	Insf. Data	NA

Source: Economic Modeling Specialists Intl.

WIRELESS INFRASTRUCTURE AND COMMUNICATIONS: RELATED SECTORS

NAICS	Description	2015 Jobs	2015 LQ	10-Year Employment Change	U.S. 10-Year Employment Change	Current Earnings	10-Year Change	U.S. Ratio	2015 Establishments
Total, Lynchburg MSA		115,528		1.6%	5.1%	\$37,153	20.0%	74.9%	6,829
Total, Wireless Infrastructure and Communications		3,498	0.76	12.8%	7.5%	\$62,060	31.0%	65.4%	230
238210	Electrical Contractors & Other Wiring Installation Contractors	825	1.17	(4.4%)	(4.9%)	\$43,601	45.2%	80.1%	64
423690	Other Electronic Parts & Equipment Merchant Wholesalers	467	4.35	64.2%	(13.9%)	\$95,504	20.2%	102.3%	3
335311	Power, Distribution, & Specialty Transformer Mfg	275	14.87	145.9%	(5.3%)	\$72,038	42.5%	113.1%	2
541512	Computer Systems Design Services	242	0.34	150.7%	66.0%	\$72,377	73.1%	72.5%	34
517110	Wired Telecommunications Carriers	231	0.51	(25.5%)	(13.0%)	\$75,813	31.9%	92.8%	19
518210	Data Processing, Hosting, & Related Services	173	0.79	8.7%	9.7%	\$40,136	52.1%	42.9%	12
333249	Other Industrial Machinery Mfg	164	4.09	26.8%	(4.9%)	\$59,319	13.8%	93.2%	4
541511	Custom Computer Programming Services	153	0.23	39.4%	49.7%	\$61,608	(15.3%)	60.0%	32
334418	Printed Circuit Assembly (Electronic Assembly) Mfg	135	3.37	280.1%	3.6%	\$34,540	15.8%	63.9%	1
335312	Motor & Generator Mfg	98	3.43	(59.1%)	(23.4%)	\$76,612	36.4%	129.2%	1
	Computer Terminal & Other Computer Peripheral Equipment								
334118	Mfg	83	2.83	557.8%	(35.4%)	\$45,968	2.6%	41.7%	2
335314	Relay & Industrial Control Mfg	82	2.41	21.6%	3.7%	\$63,999	(18.0%)	82.2%	1
	Computer & Computer Peripheral Equipment & Software								
423430	Merchant Wholesalers	79	0.47	(6.4%)	(7.4%)	\$59,390	20.0%	47.8%	5
517911	Telecommunications Resellers	72	1.70	NA	(57.8%)	\$53,082	NA	70.7%	6
334310	Audio & Video Equipment Mfg	70	5.03	NA	(42.7%)	\$71,211	NA	81.3%	1
334413	Semiconductor & Related Device Mfg	66	0.50	NA	(18.0%)	\$42,598	NA	30.9%	1
541618	Other Management Consulting Services	52	0.67	277.3%	2.8%	\$57,462	28.4%	68.9%	12
334412	Bare Printed Circuit Board Mfg	47	2.01	(65.0%)	(47.3%)	\$58,664	62.0%	93.5%	1
	Radio & Television Broadcasting & Wireless Communications								
334220	Equipment Mfg	42	1.12	(53.1%)	(30.5%)	\$83,923	81.1%	76.3%	2
541519	Other Computer Related Services	30	0.33	18.6%	(1.9%)	\$52,240	65.0%	53.3%	7
	Research & Development in the Physical, Engineering, & Life								
541712	Sciences (except Biotechnology)	29	0.09	(59.5%)	14.0%	\$41,584	(47.9%)	34.0%	5
	Instruments & Related Products Mfg for Measuring,								
334513	Displaying, & Controlling Industrial Process Variables	24	0.50	NA	6.5%	\$56,282	NA	71.1%	1
	Software & Other Prerecorded Compact Disc, Tape, & Record								
334614	Reproducing	13	1.41	(30.5%)	(66.5%)	\$41,465	149.8%	48.9%	1
511210	Software Publishers	11	0.05	(50.7%)	35.7%	\$151,044	171.4%	105.5%	4
334519	Other Measuring & Controlling Device Mfg	11	0.39	(44.5%)	2.2%	\$94,336	113.8%	127.4%	2
334419	Other Electronic Component Mfg	<10	0.02	NA	(10.2%)	Insf. Data	NA	NA	1
335921	Fiber Optic Cable Mfg	<10	0.15	NA	1.1%	Insf. Data	NA	NA	1
335931	Current-Carrying Wiring Device Mfg	<10	0.10	NA	(18.5%)	Insf. Data	NA	NA	1
335932	Noncurrent-Carrying Wiring Device Mfg	<10	0.23	NA	(14.4%)	Insf. Data	NA	NA	1
	All Other Miscellaneous Electrical Equipment & Component								
335999	Mfg	<10	0.37	NA	5.5%	Insf. Data	NA	NA	1
541513	Computer Facilities Management Services	<10	0.11	NA	13.4%	Insf. Data	NA	NA	1
541711	Research & Development in Biotechnology	<10	0.01	NA	17.1%	Insf. Data	NA	NA	1
541720	Research & Development in the Social Sciences & Humanities	<10	0.04	NA	(4.7%)	Insf. Data	NA	NA	1
334111	Electronic Computer Mfg	0	0.00	NA	(9.5%)	\$0	NA	0.0%	0
334112	Computer Storage Device Mfg	0	0.00	NA	(27.8%)	\$0	NA	0.0%	0
334210	Telephone Apparatus Mfg	0	0.00	NA	(54.0%)	\$0	NA	0.0%	0
334290	Other Communications Equipment Mfg	0	0.00	NA	(30.7%)	\$0	NA	0.0%	0
334416	Capacitor, Resistor, Coil, Transformer, & Other Inductor Mfg	0	0.00	NA	(26.9%)	\$0	NA	0.0%	0
334417	Electronic Connector Mfg	0	0.00	NA	7.6%	\$0	NA	0.0%	0
	Instrument Mfg for Measuring & Testing Electricity & Electrical								
334515	Signals	0	0.00	NA	(24.0%)	\$0	NA	0.0%	0
334516	Analytical Laboratory Instrument Mfg	0	0.00	NA	8.5%	\$0	NA	0.0%	0
334613	Blank Magnetic & Optical Recording Media Mfg	0	0.00	NA	(39.9%)	\$0	NA	0.0%	0
335313	Switchgear & Switchboard Apparatus Mfg	0	0.00	NA	6.7%	\$0	NA	0.0%	0
335911	Storage Battery Mfg	0	0.00	NA	(5.6%)	\$0	NA	0.0%	0
335912	Primary Battery Mfg	0	0.00	NA	(4.8%)	\$0	NA	0.0%	0
335929	Other Communication & Energy Wire Mfg	0	0.00	NA	13.3%	\$0	NA	0.0%	0

Source: Economic Modeling Specialists Intl.
 Note: Shaded rows are not included in calculations for target totals.



WIRELESS INFRASTRUCTURE AND COMMUNICATIONS: SUPPORTIVE OCCUPATIONS

SOC	Description	2015 Jobs	2015 LQ	10-Year Jobs Change	U.S. 10-Year Jobs Change	Median Hourly Earnings	U.S. Ratio
Total, Selected Wireless Infrastructure and Communications-Related Occupations		12,122	0.91	3.2%	6.0%	\$26.77	84.6%
43-4051	Customer Service Representatives	1,496	0.77	(1%)	7.0%	\$11.93	77.9%
51-2092	Team Assemblers	1,349	1.55	(13%)	(10.4%)	\$13.07	93.5%
11-1021	General and Operations Managers	1,058	0.66	(9%)	5.4%	\$38.89	81.4%
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	879	0.80	(9%)	(1.4%)	\$23.80	90.7%
41-3099	Sales Representatives, Services, All Other	698	0.99	2%	2.3%	\$19.88	79.5%
17-2141	Mechanical Engineers	638	3.08	32%	0.2%	\$42.96	106.6%
15-1151	Computer User Support Specialists	633	1.31	33%	17.9%	\$21.45	92.1%
51-4041	Machinists	493	1.65	(5%)	1.7%	\$18.58	95.8%
15-1142	Network and Computer Systems Administrators	421	1.49	10%	7.8%	\$31.51	85.2%
15-1132	Software Developers, Applications	395	0.72	19%	28.1%	\$42.52	91.7%
17-2071	Electrical Engineers	393	2.93	62%	1.5%	\$33.47	75.2%
13-1111	Management Analysts	382	0.66	4%	15.8%	\$34.88	93.1%
15-1121	Computer Systems Analysts	365	0.85	11%	24.0%	\$38.32	96.4%
13-1161	Market Research Analysts and Marketing Specialists	298	0.77	22%	27.8%	\$22.50	75.2%
15-1133	Software Developers, Systems Software	281	0.93	41%	19.0%	\$46.33	93.5%
13-1199	Business Operations Specialists, All Other	263	0.36	(21%)	9.0%	\$33.30	101.4%
11-2022	Sales Managers	235	0.83	(8%)	2.6%	\$33.86	63.7%
51-2022	Electrical and Electronic Equipment Assemblers	214	1.39	8%	(12.3%)	\$16.35	111.8%
43-9021	Data Entry Keyers	187	1.13	(1%)	(13.0%)	\$10.95	75.6%
17-3023	Electrical and Electronics Engineering Technicians	164	1.57	33%	(4.4%)	\$19.69	68.5%
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	154	0.57	7%	2.6%	\$34.77	96.7%
11-3021	Computer and Information Systems Managers	141	0.54	(3%)	16.7%	\$59.00	96.2%
49-9052	Telecommunications Line Installers and Repairers	129	1.43	16%	(6.0%)	\$31.48	117.8%
15-1131	Computer Programmers	126	0.51	(1%)	13.8%	\$31.99	85.1%
15-1122	Information Security Analysts	117	1.85	34%	31.0%	\$40.05	93.0%
15-1152	Computer Network Support Specialists	98	0.68	18%	5.3%	\$22.83	75.5%
15-1141	Database Administrators	91	1.04	3%	11.0%	\$36.21	92.9%
15-1143	Computer Network Architects	79	0.72	1%	6.2%	\$43.51	91.8%
15-1134	Web Developers	72	0.59	38%	39.5%	\$22.51	78.0%
51-2023	Electromechanical Equipment Assemblers	51	1.46	(6%)	(12.6%)	\$16.97	106.3%
17-2072	Electronics Engineers, Except Computer	47	0.45	15%	(2.7%)	\$32.73	70.1%
15-1199	Computer Occupations, All Other	46	0.26	(18%)	9.8%	\$37.72	94.1%
49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	37	0.22	(23%)	(10.0%)	\$21.68	81.7%
17-2061	Computer Hardware Engineers	26	0.44	24%	1.2%	\$52.16	99.6%
43-9011	Computer Operators	24	0.51	(8%)	(9.4%)	\$19.76	101.4%
43-9071	Office Machine Operators, Except Computer	22	0.42	(12%)	(10.8%)	\$11.87	85.4%
51-9141	Semiconductor Processors	12	0.67	(33%)	(25.8%)	\$17.63	103.3%
15-1111	Computer and Information Research Scientists	<10	0.44	Insf. Data	23.4%	Insf. Data	NA

Source: Economic Modeling Specialists Intl.

FINANCIAL AND BUSINESS SUPPORT SERVICES: RELATED SECTORS

NAICS	Description	2015 Jobs	2015 LQ	10-Year Employment Change	U.S. 10-Year Employment Change	Current Earnings	10-Year Change	U.S. Ratio	2015 Establishments
Total, Lynchburg MSA		115,528		1.6%	5.1%	\$37,153	20.0%	74.9%	6,829
Total, Financial and Business Support Services		5,711	1.05	28.5%	23.3%	\$47,618	(21.3%)	59.1%	341
524210	Insurance Agencies and Brokerages	1,652	2.23	157.6%	17.6%	\$46,344	9.3%	67.1%	112
551114	Corporate, Subsidiary, and Regional Managing Offices	1,510	0.96	(12.4%)	28.7%	\$55,653	38.1%	49.0%	42
541860	Direct Mail Advertising	656	16.68	(5.2%)	(33.6%)	\$36,518	14.9%	67.2%	9
524298	All Other Insurance Related Activities	456	7.23	4349.8%	36.4%	\$75,217	53.3%	100.9%	6
541219	Other Accounting Services	258	0.95	35.3%	9.0%	\$44,872	40.9%	95.3%	27
561422	Telemarketing Bureaus and Other Contact Centers	183	0.51	(37.5%)	50.3%	\$18,022	(5.4%)	55.6%	2
518210	Data Processing, Hosting, and Related Services	173	0.79	8.7%	9.7%	\$40,136	52.1%	42.9%	12
561110	Office Administrative Services	131	0.36	(16.2%)	36.1%	\$44,122	27.7%	54.5%	16
541613	Marketing Consulting Services	125	0.60	126.9%	70.0%	\$37,298	(9.9%)	55.4%	18
Administrative Management and General Management Consulting									
541611	Services	110	0.24	1.1%	49.8%	\$43,483	(2.7%)	47.5%	24
522291	Consumer Lending	106	1.35	(34.2%)	(8.2%)	\$37,959	36.2%	66.8%	16
561410	Document Preparation Services	67	1.23	146.5%	22.5%	\$20,064	(40.2%)	73.9%	5
522298	All Other Nondepository Credit Intermediation	63	1.20	NA	14.9%	\$44,929	NA	74.1%	5
541618	Other Management Consulting Services	52	0.67	277.3%	2.8%	\$57,462	28.4%	68.9%	12
561499	All Other Business Support Services	32	0.46	(2.7%)	9.2%	\$19,633	13.9%	37.7%	5
561440	Collection Agencies	26	0.24	20.2%	(4.3%)	\$21,526	(41.2%)	50.3%	2
541214	Payroll Services	25	0.18	NA	31.9%	\$36,395	NA	51.8%	4
524292	Third Party Administration of Insurance and Pension Funds	25	0.18	(30.3%)	36.9%	\$34,782	0.8%	53.7%	4
524291	Claims Adjusting	20	0.36	57.0%	(2.2%)	\$48,940	54.0%	77.5%	9
522220	Sales Financing	<10	0.12	NA	(13.4%)	Insf. Data	NA	NA	2
541612	Human Resources Consulting Services	<10	0.03	NA	(7.4%)	Insf. Data	NA	NA	1
541614	Process, Physical Distribution, and Logistics Consulting Services	<10	0.06	NA	38.7%	Insf. Data	NA	NA	3
561421	Telephone Answering Services	<10	0.22	NA	(25.0%)	Insf. Data	NA	NA	2
561431	Private Mail Centers	<10	0.24	NA	(4.0%)	Insf. Data	NA	NA	2
561439	Other Business Service Centers (including Copy Shops)	<10	0.14	NA	(18.1%)	Insf. Data	NA	NA	1
561450	Credit Bureaus	<10	0.21	NA	(20.3%)	Insf. Data	NA	NA	1
561491	Repossession Services	<10	0.74	NA	(22.7%)	Insf. Data	NA	NA	2
522210	Credit Card Issuing	0	0.00	NA	(25.1%)	\$0	NA	0.0%	0
Financial Transactions Processing, Reserve, and Clearinghouse									
522320	Activities	0	0.00	NA	36.0%	\$0	NA	0.0%	0

Source: Economic Modeling Specialists Intl.
 Note: Shaded rows are not included in calculations for target totals.

FINANCIAL AND BUSINESS SUPPORT SERVICES: SUPPORTIVE OCCUPATIONS

SOC	Description	2015 Jobs	2015 LQ	10-Year Jobs Change	U.S. 10-Year Jobs Change	Median Hourly Earnings	U.S. Ratio
Total, Selected Financial & Business Support-Related Occupations		21,573	0.89	7.6%	6.3%	\$20.95	75.6%
43-9061	Office Clerks, General	3,334	1.36	14.8%	1.4%	\$12.41	88.5%
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	2,436	1.22	25.7%	6.0%	\$12.93	79.8%
43-4051	Customer Service Representatives	1,496	0.77	(0.7%)	7.0%	\$11.93	77.9%
43-3031	Bookkeeping, Accounting, and Auditing Clerks	1,454	1.09	6.3%	4.3%	\$15.75	88.9%
11-1021	General and Operations Managers	1,058	0.66	(9.0%)	5.4%	\$38.89	81.4%
43-1011	First-Line Supervisors of Office and Administrative Support Workers	1,032	0.94	1.7%	6.0%	\$20.83	84.8%
41-3021	Insurance Sales Agents	882	1.63	42.7%	19.4%	\$16.68	70.9%
43-4171	Receptionists and Information Clerks	832	1.05	16.2%	9.3%	\$11.33	86.6%
41-3099	Sales Representatives, Services, All Other	698	0.99	1.9%	2.3%	\$19.88	79.6%
13-2011	Accountants and Auditors	650	0.63	(3.0%)	9.3%	\$29.54	93.0%
15-1151	Computer User Support Specialists	633	1.31	32.7%	17.9%	\$21.45	92.1%
43-3071	Tellers	482	1.26	(8.5%)	(8.9%)	\$13.59	108.6%
43-9041	Insurance Claims and Policy Processing Clerks	436	2.23	54.1%	3.6%	\$14.06	78.3%
15-1142	Network and Computer Systems Administrators	421	1.49	10.2%	7.8%	\$31.51	85.2%
15-1132	Software Developers, Applications	395	0.72	19.0%	28.1%	\$42.52	91.7%
13-1111	Management Analysts	382	0.66	4.1%	15.8%	\$34.88	93.1%
15-1121	Computer Systems Analysts	365	0.85	10.9%	24.0%	\$38.32	96.4%
43-6011	Executive Secretaries and Executive Administrative Assistants	337	0.60	(15.8%)	(1.7%)	\$20.61	82.5%
43-3021	Billing and Posting Clerks	332	0.85	11.4%	13.4%	\$14.92	89.0%
13-1071	Human Resources Specialists	328	0.90	1.5%	6.1%	\$23.47	83.4%
13-1161	Market Research Analysts and Marketing Specialists	298	0.77	22.1%	27.8%	\$22.50	75.2%
11-9199	Managers, All Other	293	0.53	13.6%	21.8%	\$22.81	65.9%
15-1133	Software Developers, Systems Software	281	0.93	41.2%	19.0%	\$46.33	93.5%
23-1011	Lawyers	273	0.46	(4.9%)	(0.8%)	\$33.38	63.3%
13-1199	Business Operations Specialists, All Other	263	0.36	(20.5%)	9.0%	\$33.30	101.4%
11-3031	Financial Managers	238	0.57	(11.5%)	3.5%	\$44.14	79.2%
11-2022	Sales Managers	235	0.83	(7.8%)	2.6%	\$33.86	63.7%
13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	187	0.83	(14.2%)	0.6%	\$25.89	86.9%
43-9021	Data Entry Keyers	187	1.13	(1.1%)	(13.0%)	\$10.95	75.6%
11-1011	Chief Executives	154	0.67	(11.0%)	3.2%	\$67.30	91.0%
11-3021	Computer and Information Systems Managers	141	0.54	(3.4%)	16.7%	\$59.00	96.2%
23-2011	Paralegals and Legal Assistants	135	0.63	(3.6%)	5.3%	\$17.61	72.2%
13-2072	Loan Officers	110	0.48	(7.6%)	(12.6%)	\$30.14	97.3%
41-9041	Telemarketers	107	0.58	(23.6%)	10.0%	\$10.66	94.0%
43-3011	Bill and Account Collectors	106	0.39	2.9%	2.1%	\$13.90	85.2%
13-2052	Personal Financial Advisors	98	0.53	11.4%	10.4%	\$37.58	94.0%
43-4131	Loan Interviewers and Clerks	81	0.51	(4.7%)	(11.2%)	\$15.36	85.1%
41-3031	Securities, Commodities, and Financial Services Sales Agents	77	0.30	(19.8%)	(8.8%)	\$27.31	73.4%
11-2021	Marketing Managers	67	0.44	(5.6%)	13.6%	\$56.85	95.6%
43-6012	Legal Secretaries	65	0.41	(15.6%)	(9.6%)	\$18.38	83.8%
13-2051	Financial Analysts	47	0.23	(30.9%)	9.5%	\$35.08	90.1%
13-2099	Financial Specialists, All Other	44	0.41	(10.2%)	6.0%	\$25.81	81.3%
13-2053	Insurance Underwriters	39	0.57	(39.1%)	(9.6%)	\$28.17	89.1%
43-9022	Word Processors and Typists	26	0.36	(13.3%)	(15.6%)	\$14.43	82.7%
13-2041	Credit Analysts	14	0.26	(12.5%)	(0.3%)	\$29.33	87.9%
43-4141	New Accounts Clerks	13	0.35	(18.8%)	(9.9%)	\$12.67	76.6%
43-4011	Brokerage Clerks	11	0.25	(15.4%)	(10.9%)	\$16.56	71.0%

Source: Economic Modeling Specialists Intl.