

Economic Development

TARGET INDUSTRY EVALUATION FOR THE ALLEGHANY HIGHLANDS OF VIRGINIA

March 2014



Moran, Stahl & Boyer

Site Selection and Economic Development Consultants



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■ SECTION I – EXECUTIVE SUMMARY

1.1 Introduction



Identifying *Target Industries* is a tool used in economic development to help define priorities and expectations. Through a series of evaluation steps, a list of industries or economic opportunities are defined that potentially could thrive in and/or expand in a given location. In addition, the resources that are required to support each target industry are also defined and then compared with the local situation. This *Gap Analysis* helps to prioritize any community development efforts that are needed to assure the community's competitiveness in attracting additional companies while assuring the potential expansion of current local companies.



County stakeholders, through the support of the Allegheny Foundation, are seeking to expand the local economy by leveraging the available resources and existing industries. The Allegheny Foundation retained Moran, Stahl & Boyer (MS&B), a nationally recognized economic development and site selection consulting firm, to perform a thorough evaluation of the overall market opportunities and define target industries that the area should focus on for future growth.

1.2 Overview on the Allegheny Highlands Region

Allegheny Highlands region is located in western Virginia contiguous with six counties (Monroe and Greenbrier Counties in West Virginia and Bath, Rockbridge, Craig and Botetourt Counties in Virginia). Within this seven-county area, the economy is comprised primarily of the following four segments:

- **Manufacturing:** diverse base consisting of paper-board production on converting, carpet production, fabricated metals/machine shops, transportation equipment (high lift trucks and aircraft deicing systems), wood products, computer/electronics and plastics).
- **Health Care:** local hospitals and clinics (regional hospitals are located in the City of Roanoke to the southeast and Fishersville (Augusta County) to the north).
- **Tourism:** includes destination resorts (Homestead and Greenbrier), state parks, C&O Railroad Museum and of historic features, arts and crafts, antiques, etc. in addition to lodging, restaurants and a portion of retail receipts.
- **Retail:** local and regional (Lewisburg).

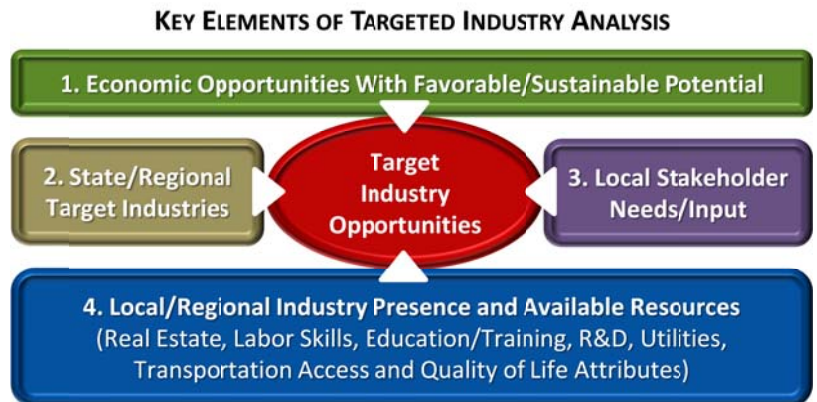


1.3 The Basis for Defining Target Industries

In the process of defining specific target industries for a local economy, MS&B has integrated the input from four primary sources as listed below. This is a unique approach in that it gathers multiple points of perspective – from the macro dynamics of the marketplace, to activities/priorities at the state and regional levels, down to the local situation.

1. A macro-level review of economic opportunities and trends that have a favorable and sustainable growth potential.
2. An understanding of state and regional target industries that have strong potential.
3. Feedback from local stakeholders on needs and general inputs/feedback.
4. Local/regional industry presence and resources that support economic growth, such as:

- Labor (availability of skills at a competitive cost)
- Education and Training (degree and certificate programs)
- Transportation access (interstate, rail and air)
- R&D activities that support specific industries and processes
- Utilities (availability, backup potential and cost)
- Real Estate (site/buildings and their size, location, expandability, cost and level of readiness)
- Quality of life attributes to help attract talent when required (e.g., overall cost of living; availability, quality, style and cost of housing; property tax levels; quality of educational resources; access to health care; cultural, recreational and retail options, etc.)



1.4 Summary of Target Industry Opportunities

Incorporating all the input gathered in Section 1.2 that is provided in detail within Sections 2 through 4 of this report. A brief summary of target industries/economic opportunities are presented below in a modular format that describes the opportunity followed by pertinent details that support the industry/opportunity selection.

General Thoughts on Target Industry Selection

The target industries selected take into consideration the limited land and buildings that are currently available. Most of the smaller and mid-size companies are most interested in leasing space and not making a major cash flow commitment to buying land and building a building. This leaves limited options such as a portion of the Bacova building in Low Moor and the newer/front section of the Rail Over River property as potential options.

The selection of the paperboard conversion and printing on clothing/accessories are not major business opportunities but they help jump-start the process of converting an idea in a marketable product that is sold through multiple channels.

The microbrewery, customer care center and data center ideas will be potentially viable but on a longer horizon. There will need to be some extensive business and facility plan development before embarking on them in an aggressive manner.

SUMMARY LISTING OF TARGET INDUSTRIES/ECONOMIC OPPORTUNITIES FOR THE ALLEGHANY HIGHLANDS

1. MANUFACTURING OF PARTS/COMPONENTS FOR TRANSPORTATION EQUIPMENT, MACHINERY AND OTHER APPLICATIONS

Trends:

- Manufacturing operations are beginning to return from China due to escalating cost of labor, fuel and carrying inventory along with and other factors. A major segment impacted by “reshoring” relates to machinery and its sources of component parts. (see
- Growth in commercial aircraft as well as light sport, unmanned and executive class aircraft is also driving demand for additional components/parts.

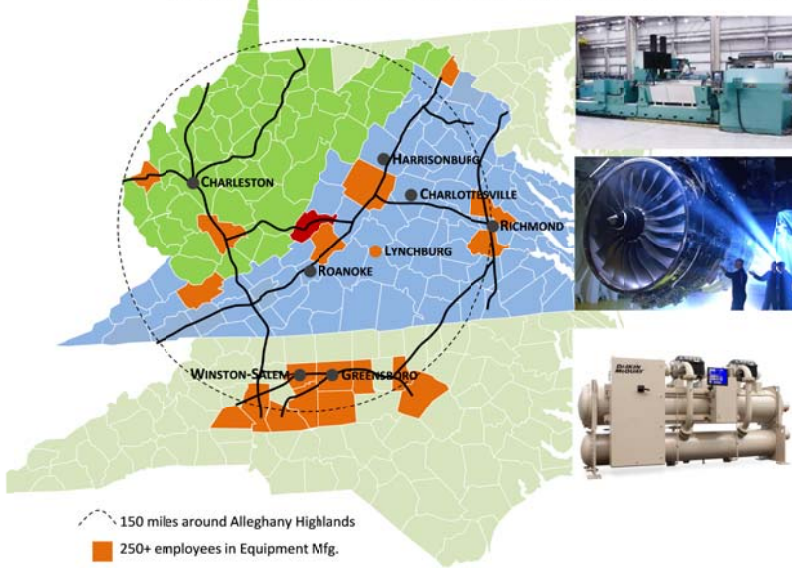
Opportunity	Comments
Production of parts and components	Includes molding of plastic/polymer materials; machining of metal/alloy materials; and forming of composites from substrates such as fiberglass, Kevlar, carbon fiber, etc. coated with epoxy and other resins.

ORIGINAL EQUIPMENT MANUFACTURERS (OEM’S) AND THEIR CONTRACT PARTS/COMPONENTS SUPPLIERS



MACHINERY MANUFACTURING

(Ag, Industrial, Commercial, HVAC, Metalworking, Engine/Turbine, etc.)

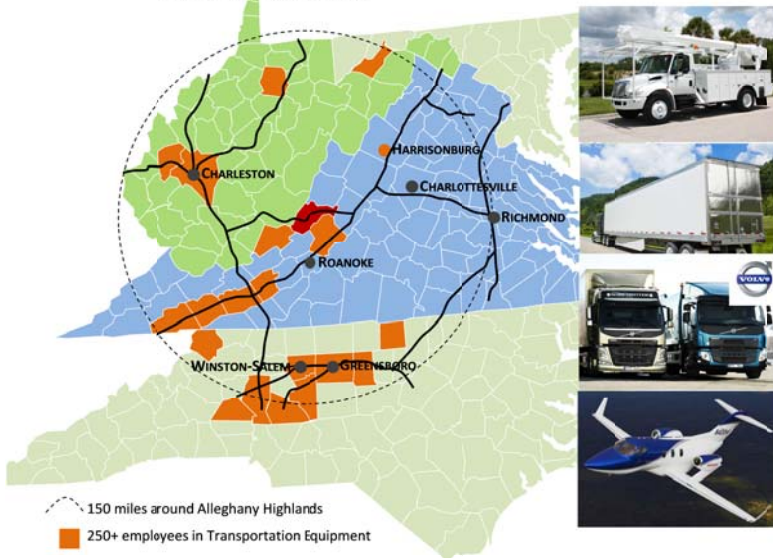


MACHINERY MANUFACTURING DIRECT EMPLOYMENT



TRANSPORTATION EQUIPMENT

(Motor Vehicles/Aerospace/Parts)



MOTOR VEHICLE MANUFACTURING/ASSEMBLY EMPLOYMENT



MOTOR VEHICLE PARTS MANUFACTURING EMPLOYMENT



AEROSPACE EQUIPMENT/PARTS MANUFACTURING DIRECT EMPLOYMENT



2. MANUFACTURING OF BEVERAGES (CRAFT BEER FROM A MICROBREWERY)

Trend:

Although the overall consumption of beer has been slightly dropping over the past 15 years, the consumption of local craft beers has been escalating rapidly. The variety of brew flavors and local names, such as *Blue Lab* in Lexington, VA, has its own cache – particularly for the 21 to 35 year olds. Having a microbrewery in your community is somewhat of a status symbol of “cool” for the younger generation – but the Boomers have also been known to hoist a few.

Opportunity	Comments
Microbrewery	Typically a local craft brewer will also have a small/select lunch and dinner menu (like Jack Masons in Clifton Forge).

WWW.BREWERSASSOCIATION.ORG/PAGES/GOVERNMENT-AFFAIRS/ECONOMIC-IMPACT-DATA

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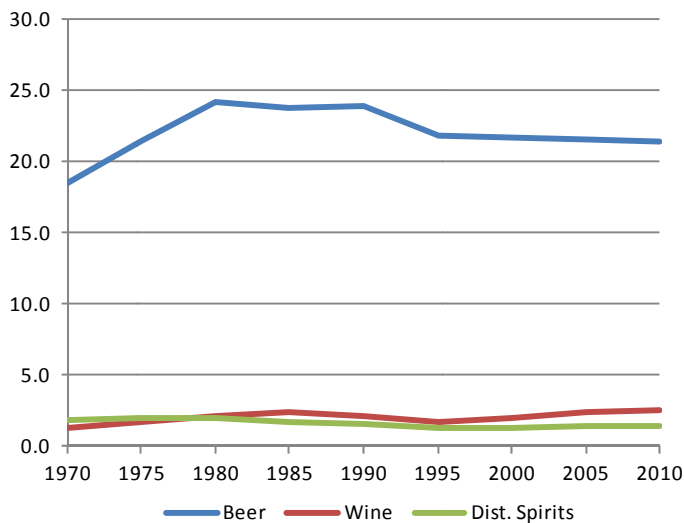
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ANNUAL BEER, WINE AND SPIRITS CONSUMPTION (GALLONS/CAPITA)



Source: USDA/Economic Research Service (2011)

Trends Impacting Segment:

- Overall beer consumption is flat but a strong interest in micro breweries and niche craft beers.
- Increased interest in domestic/local wines along with tours on regional wine trails in California’s Sonoma Valley, New York’s Finger Lakes Region, selected areas in Virginia and other states.
- Mixing of liquor with lemonade and other fruit flavors to extend its market reach.



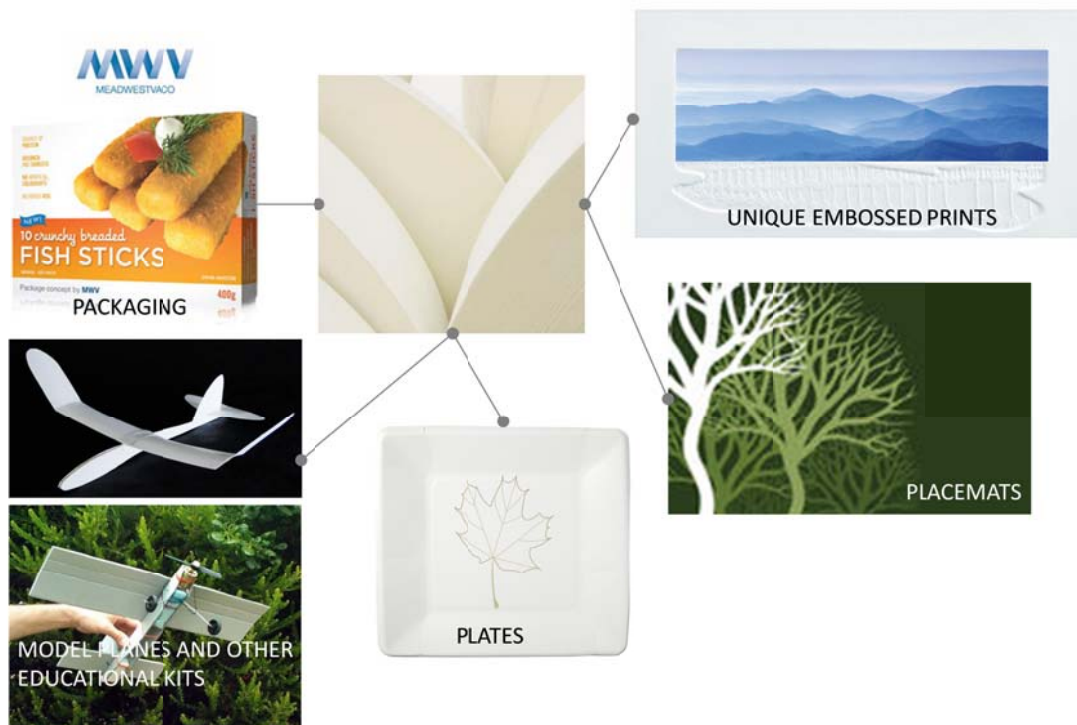
3. CONVERSION OF MWV HIGH QUALITY PAPERBOARD TO VALUE-ADDED PRODUCTS

Trends:

The Alleghany Highlands region has access to a unique resource (premium grade paperboard) that has excellent printing and embossing characteristics. This material is predominantly used for high grade product packaging. There are local opportunities to convert this paperboard to packaging (print/emboss/cut) and ship out in a knocked down state but also to produce a line of unique products that reflect the natural image of the area (mountains, rivers and trees). There is also a potential to print and cut airplane and other models that could be used in conjunction with the **C&O Railroad Museum** and the **Alleghany Highlands Industrial Heritage and Technology Discovery Center**.

Opportunity	Comments
Packaging Embossed Prints Plates/Placemats Models Etc.	Establish a small firm (initially) with the capabilities to print, emboss, cut and package products. There may be a central processing facility (contract manufacturer) that makes product runs that supplies individual design/marketing teams to handle different products. Marketing channels will vary depending on the function of the product and the end user.

CONVERSION OF MWV PAPERBOARD INTO HIGH VALUE PRODUCTS



4. PRINTING ON CLOTHING/ACCESSORIES

Trends:

Destination clothing is always “hot” if it has good graphics and represents a “cool” location. A variety of high quality cotton made in the USA clothing as well as canvas totes, hats and other accessories could be printed and marketed to the tourists as well as over the Internet on the region’s Web Store (currently being established).

Opportunity	Discussion
Printing on clothing and accessories.	Graphics would reflect the mountains/ivers/trees/nature in the region and would also serve as a soft marketing strategy to promote the region.

CLOTHING AND OTHER ARTICLES MADE FROM 100% COTTON PRODUCED IN THE USA.



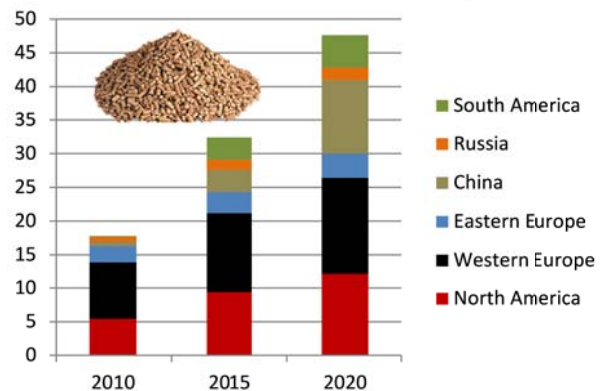
5. WOOD PELLET PRODUCTION

Trend:

The global demand for wood pellets is projected to more than double in the next six (6) years to nearly 50 million tons per year. The use of wood pellets is popular with both homeowners and some businesses. The MWV wood-fired boiler is an example of a major industrial operation shifting to a wood-based fuel. Europe is heavily focused on ramping up the use of wood pellets not only because it is a renewable source but they also rely heavily on Russia for oil and gas and that source may be at risk with the issues in the Ukraine.

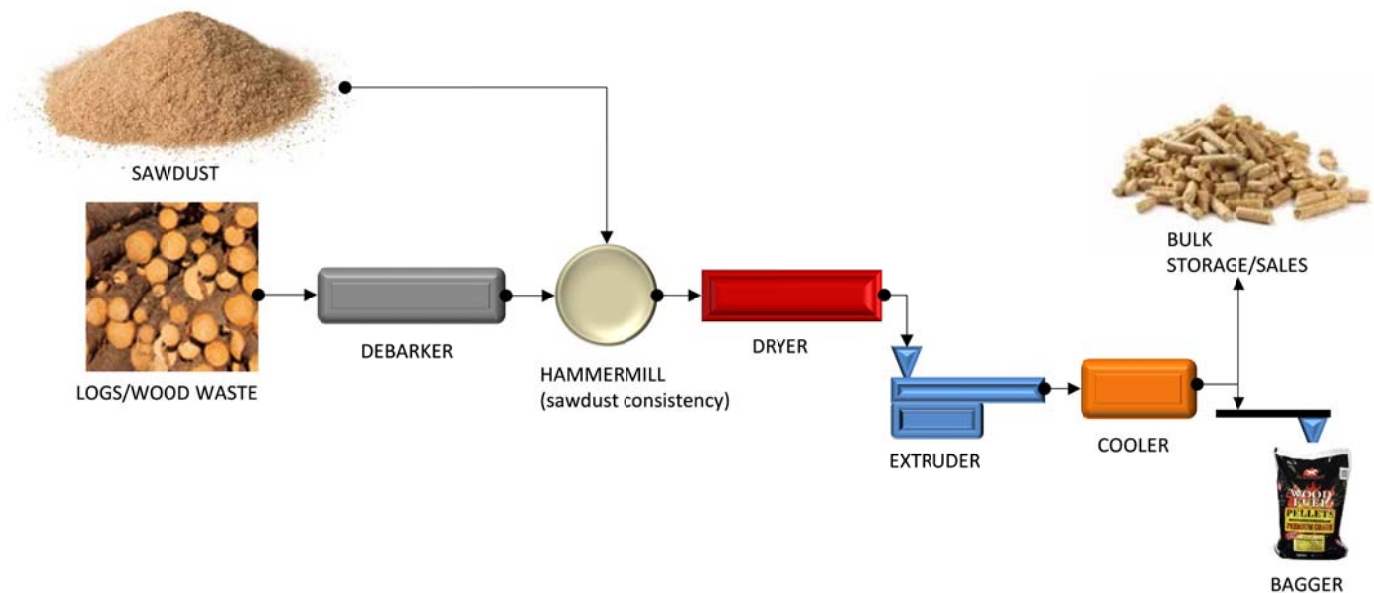
Opportunity	Discussion
Wood Pellet Production	A wide source of wood waste can be utilized for wood pellets – derived from sawdust to slash in the forest to scrap wood that is chipped and hammermilled to sawdust consistency . There is usually a separation of hardwood and soft wood varieties because fuel made from each type has different characteristics. Southern Pine burns hotter and produces less ash than typical hardwoods and is considered a premium product. Producers are either marketing their pellets in bulk or bagging for consumer use. NOTE: Because the wood sources in the region are primarily hardwood, it is recommended that the typical wood/sawdust mix be tested to BTU content and ratio of residual ash to initial charge weight.

GROWTH IN WOOD PELLET CONSUMPTION BY REGION (MILLION TONS)



Source: Bain Consulting (2013)

WOOD PELLETIZING PROCESS



6. CUSTOMER CARE CENTER

Trends:

During the recent recession, there was limited activity in expanding customer care centers but there will be renewed focus on this function as the economy rebounds. Typically, a center is located in a low cost area that has an adequate supply of local talent (particularly a younger population and a student population seeking part-time work), competitive/reliable power and telecom service, and reasonable access to other company facilities.

Opportunity	Discussion
Customer care center	The center would be scaled to the effective size of the regional workforce within a 30 to 45 minute commute zone. Functions of the center will be predominately inbound and relate to some aspects of customer service, sales support (taking an order), answering critical product questions, etc.



7. DATA PROCESSING/HOSTING CENTER

Trend:

The demand for data processing and storage will continue to expand over time while the efficiency, speed and capacity (processing capacity per sq. ft. of space) will continue to increase over time. The need for storage capacity for in-house and third party data centers will also continue to increase along with the concern over security.

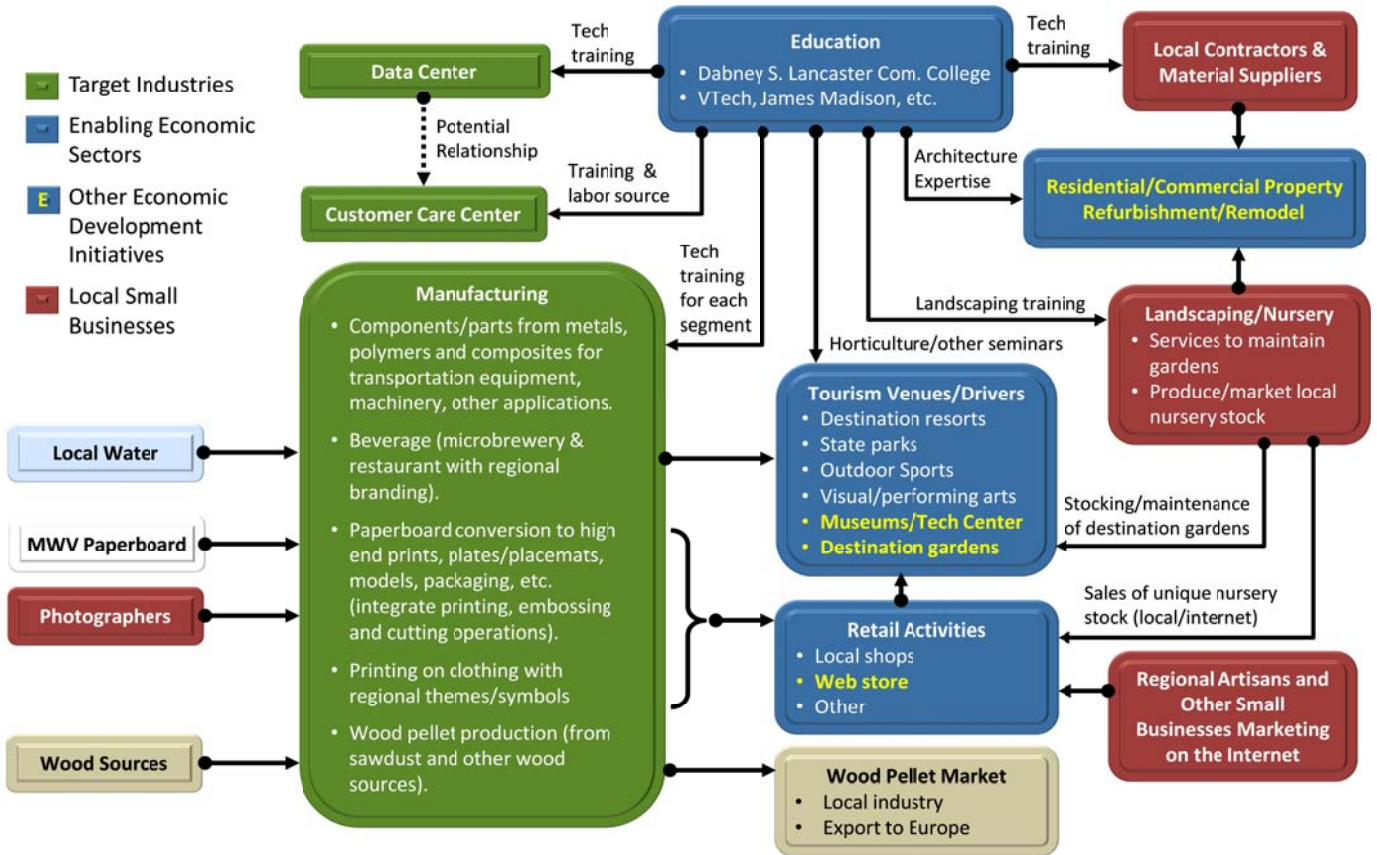
Opportunity	Discussion
Data Center	Data centers have very specific location/utility requirements that will be discussed below and also need access to young and experienced technical talent.



1.5 Interaction Between Economic Opportunities

In the unique chart noted below, the target industries for the region are plotted along with other economic opportunities to demonstrate their points of interaction.

ALLEGHANY HIGHLANDS REGION: INTERACTION BETWEEN ECONOMIC OPPORTUNITIES



Target Industry Identification and the Relationship to the Five (5) Economic Development “Action Initiatives”

As noted in the chart above, the Action Initiatives (2 through 4) are noted in yellow highlight. Action Initiative 1 relates directly to the Target Industries noted in the green boxes above.

FIVE ACTION INITIATIVES

Initiative	Description
1	Real Estate, Utility Development and Marketing to Expand Industry Base Maximize the utilization of available flat land, available buildings and utilities to attract targeted manufacturing and other businesses to the area and facilitate existing companies to expand locally.
2	Alleghany Highlands Web Store and Small Business Support Support the growth of local small businesses through multiple services and establish a Web Store for marketing locally produced high quality products.
3	Resident Curb Appeal, Main Street Program and Enhance Gateway/Signage Enhance the “quality of place” in the region through enhancing curb appeal of homes on selected corridors, improve entranceways, signage and the Main Street Program in order to attract additional businesses and tourists to the area as well as new residents that acquire and invest in the local housing stock.

4	Community Landscaping and Destination Gardens Providing extensive community landscaping, community gardens and destination gardens not only enhances the “quality of place” but also can be a draw for tourism.
5	Allegheny Highlands Industrial Heritage and Technology Discovery Center The discovery center will reflect on the region’s industrial heritage, engage students and interested tourists in learning about the area, and prepare residents to compete for jobs in materials-related technologies of the present and future.

1.6 Resource Requirements for Target Industries

Resource requirements for each target industry are summarized below and provided in more detail in Section 4. Most of these opportunities will be seeking a leased building while the data center is a custom built facility.

RESOURCE REQUIREMENTS BY TARGET INDUSTRY

TARGET INDUSTRY	LOCATION	REAL ESTATE	LABOR SKILLS	UTILITIES
1. Parts/Components Manufacturing	Within a few miles of interstate and modest traffic for trucks. Larger plastics molders need rail access.	Small/mid-size firms lease buildings that are expandable (25,000 to 100,000 sq. ft.).	Equipment operators and technicians with technical ability, lean manufacturing skills, good communication skills, and can work in team environment	Industrial grade <ul style="list-style-type: none"> • Electric power • Gas or other low cost heat source • Water • Sewer • Telecom
2. Microbrewery	Location with visual exposure typically connected to a pub with a small restaurant.	1,500 to 7,500 sq. ft. of working space (depending on size of operation).	Equipment operators and technicians that can work in a food grade environment.	<ul style="list-style-type: none"> • Reliable/low cost electric power (220 and 408 V) • Source of process heat (natural gas or wood) • Water: 1,200 to 2,000 GPH @45-50 PSI
3. Converted Paperboard Products	Within a few miles of interstate and modest traffic area (for truck access).	2,500 to 10,000 sq. ft. leased industrial space depending on size of operation (expandable).	Equipment operators and technicians familiar with converting operations (printing, embossing and cutting).	Light industrial grade for printer, embosser and cutter.
4. Printing on Clothing and Accessories	No specific requirements.	1,000 to 5,000 sq. ft. leased industrial space depending on size of operation (expandable).	Trainable laborers to operate printing process.	Commercial grade.
5. Wood Pellet Production	Industrial area near sources of wood waste and sawdust.	Need space for wood & sawdust storage, processing area and finished product storage (10,000+ sq. ft.)	Equipment operators and maintenance staff. Ability to operate fork truck.	Industrial grade using 220/408 V). Heat source required for drying (use of wood).
6. Customer Care Center	Accessible to regional labor force.	Class B office building with adequate parking.	Trainable labor with high school or two-year college.	Commercial grade with backup power and telecom.
7. Data Center	Away from public view for security reasons.	Specialized building constructed on shovel ready site.	Experienced and younger computer operators, software programmers and software/hardware engineers.	High reliability electric power and telecom at relatively high capacity and low cost. Some systems need water for cooling.

1.7 Target Industry Rollout Strategy and Schedule

The target industry list is based on current and projected market opportunities that will take place over the next 5+ years. In addition, there may be some resource development issues (real estate development, training programs or enhancement of utilities) that need to be addressed prior to engaging a particular opportunity. Therefore, the target industry initiative should consider a roll-out strategy and schedule as outlined below.



OVERVIEW ON TARGET INDUSTRY ROLLOUT STRATEGY AND SCHEDULE

TARGET INDUSTRY	SHORT TERM (1-2 YEARS)	MID TERM (3-5+ YEARS)
Part/Component Manufacturing	<ul style="list-style-type: none"> Identify suitable existing leased buildings that are 25,000 to 50,000 sq. ft. and expandable. Identify sites for future buildings. Develop marketing package and strategy to market area as a parts/components center. 	<ul style="list-style-type: none"> Continue to market if real estate is available. Consider construction of spec. building.
Microbrewery	<ul style="list-style-type: none"> Identify suitable locations for constructing the brewery next to a small pub restaurant. Solicit in local interest/experience in establishing a microbrewery. 	<ul style="list-style-type: none"> Identify financing sources for operation. The hardware and furniture could potentially be a collateral-based loan. Support entrepreneur/brewer in developing and implementing business and production plans.
Converted Paperboard Products	<ul style="list-style-type: none"> Identify suitable existing leased buildings that are 2,500 to 5,000 sq. ft. (initially) and expandable (e.g., former Coca-Cola building in Covington). Identify sites for future buildings. Solicit local interest/experience in establishing a high value product converting operation. Identify financing sources for operation. Used equipment may be available. Support development of a business and marketing plan. 	Further actions will depend on local interest in business opportunity.
Printing on Clothing/Accessories	<ul style="list-style-type: none"> Identify suitable existing leased buildings that are 2,500 to 5,000 sq. ft. (initially) and expandable (e.g., former Coca-Cola building in Covington). Identify sites for future buildings. Solicit local interest/experience in establishing a clothing/accessory business. Identify financing sources for operation. Used equipment may be available. Support development of a business and marketing plan. 	Further actions will depend on local interest in business opportunity.

TARGET INDUSTRY	SHORT TERM (1-2 YEARS)	MID TERM (3-5+ YEARS)
Customer Care Center	<ul style="list-style-type: none"> • Develop master plan for the Clifton Forge Business Park that includes a two-story office building with about 25,000 sq. ft. (this would accommodate 75 to 100 employees) and adequate parking. • Develop plans for constructing office building and get rough estimates for construction. Rent would need to be about \$12 to \$16 per sq. ft. gross basis. • Develop marketing profile and strategy for promoting the area as a back office operation. 	<ul style="list-style-type: none"> • If the market continues to expand, consider raising funds to build a shell building, leaving build-out with input from the occupant.
Data Center	<ul style="list-style-type: none"> • Discuss potential use of Low Moor Mine as a data center with owner Sizemoor & Sons. • Develop master plan for housing a data center in mine noting clearances and utilities in the vicinity (of particular interest is electric power, telecom and water). • Evaluate any structural issues within a select area of the mine that would be utilized for the data center. • Engage in discussions with the Roanoke Partnership and VEDP concerning the marketing of the area to data center companies. 	<ul style="list-style-type: none"> • Support any business leads to utilize the site for a data center.

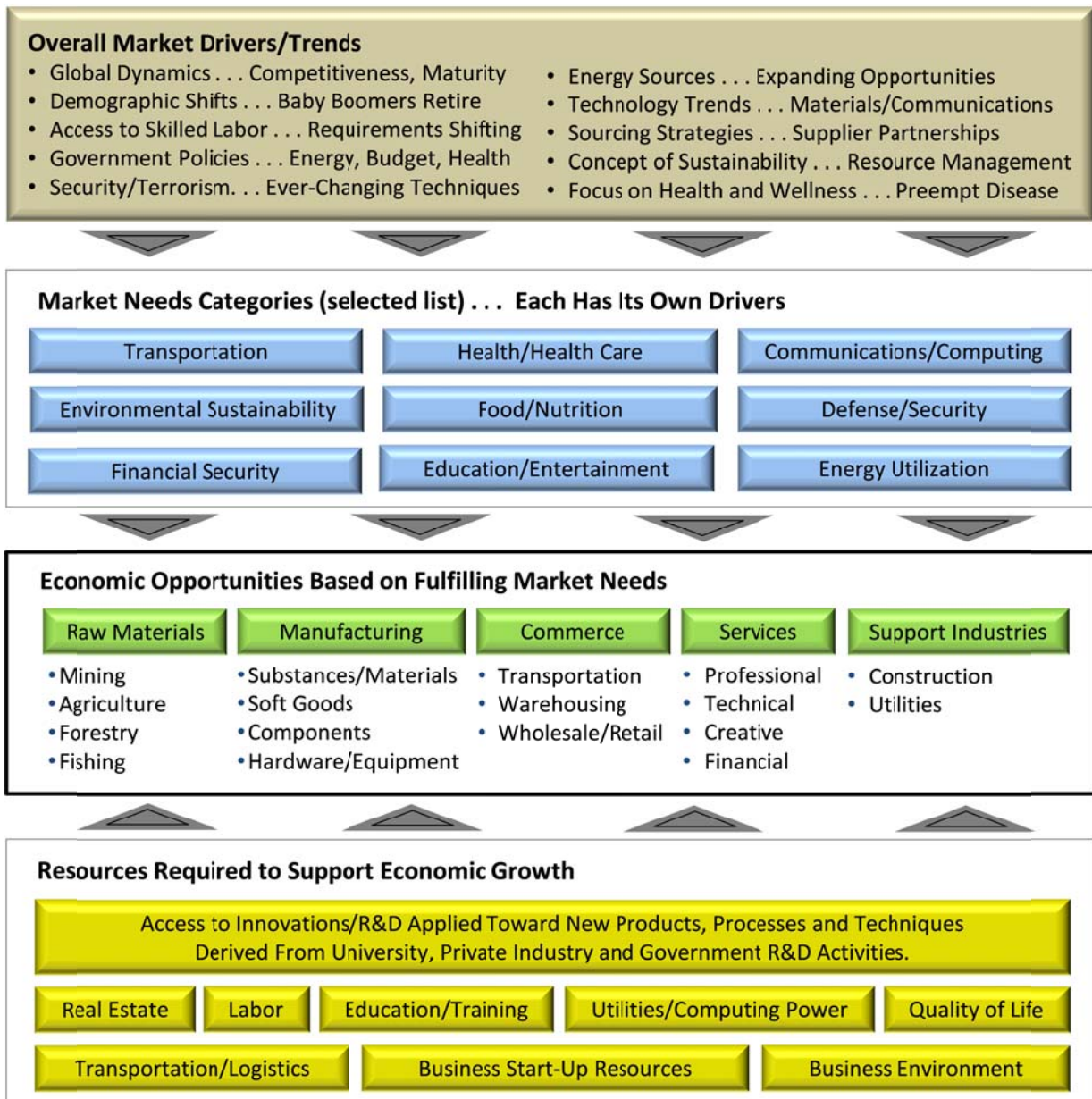
■ SECTION 2 – ECONOMIC OPPORTUNITY MODEL

2.1 Overview on the Model

The Economic Opportunity Model is based on addressing four key questions:

1. What’s going on in the world and the marketplace and what impact does it have?
2. What factors/dynamics are impacting our basic needs – like energy or transportation of education?
3. Are there specific economic opportunities coming about due to market/societal changes?
4. What resources/locational conditions are necessary to have in order to take advantage of the opportunity?

ECONOMIC OPPORTUNITY MODEL DERIVED FROM MARKET NEEDS



Section 2 of this report looks at market drivers and trends as well as impacts on areas of market needs.

2.2 Overall Market Drivers/Trends

Global Dynamics: Sustained competitiveness in a global economy is based on how cost effective a country can produce and deliver quality goods to a specific market destination. Key success factors relate to the cost and quality of labor, overall operating costs, ability to protect intellectual property (for high value goods), political stability, and the optimization of logistics.

China has been steadily gaining in manufacturing production since 1995 and escalating rapidly since 2005. However, there has been a reversing of the trend more recently due to the following factors:

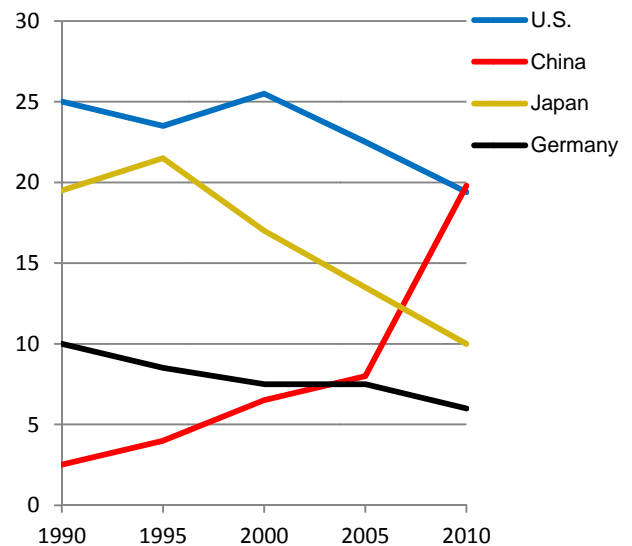
- Cost of fuel for transporting goods long distances is nearly four times what it was in 1995.
- Labor, real estate, energy and other costs in China continue to escalate. A rising middle class in China is demanding higher wages.
- The need for a supply chain inventory and the pre-payment requirements for goods as they are produced have added additional costs and cash flow issues that were not considered in the initial outsourcing analysis.
- Reduced product life cycles that require smaller runs are not conducive to long distance manufacturing strategies.
- As the speed and technology content rises for products, companies tend to want R&D, engineering and production closer together to keep the process agile.
- There has been a marked variation in quality that is unpredictable and ultimately very costly and impacts a company's brand image in the marketplace.
- For companies that have an increased use of technology, China has a reputation for the lack of protection of intellectual property rights, and frequently will produce a "knock-off" version of a product.
- For many products, there are significant opportunities for automation applications that inherently reduce labor content and the need to be in low labor cost destinations.
- There are emerging strategies to produce goods near the markets being served.

All these factors drive the desire to bring a variety of product manufacturing back to the U.S. and will land in locations that have an available and skilled work force, other required resources and incentives to help off-set the cost of re-establishing operations back in North America. The Boston Consulting Group estimates that it could produce 2.5 to 5 million jobs by 2020.

<https://www.bcg.com/media/PressReleaseDetails.aspx?id=tcm:12-141806>

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TOP MANUFACTURING COUNTRIES AS A PERCENT GLOBAL VALUE-ADD PRODUCTION: 1990 - 2010



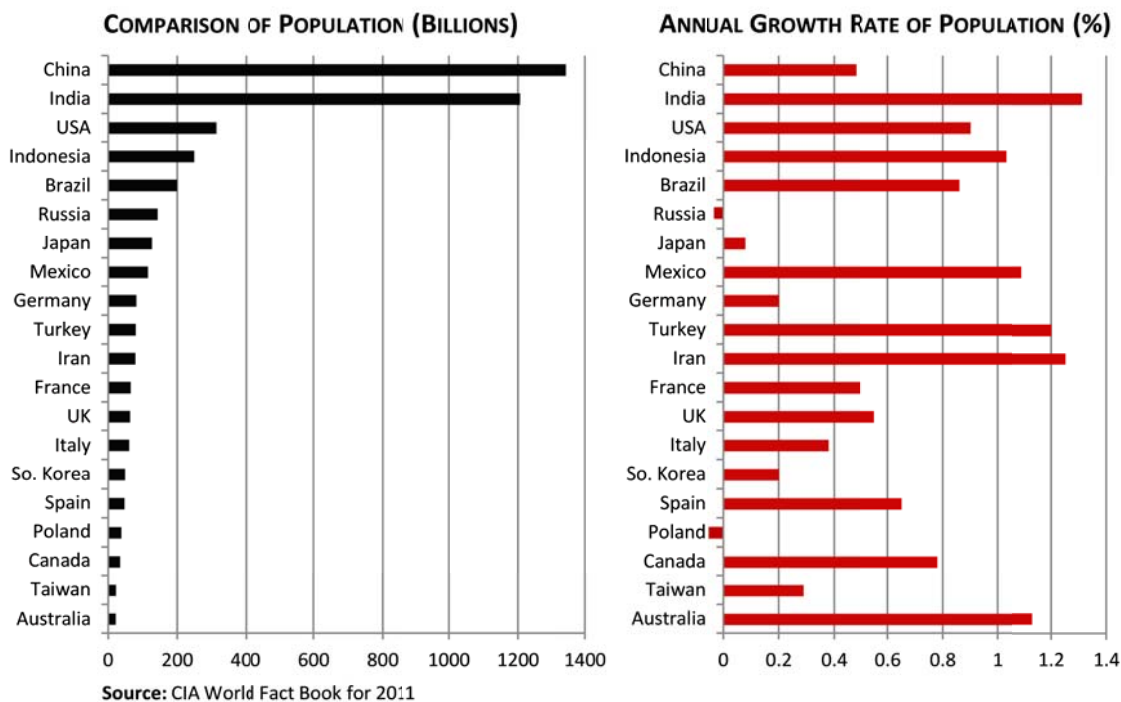
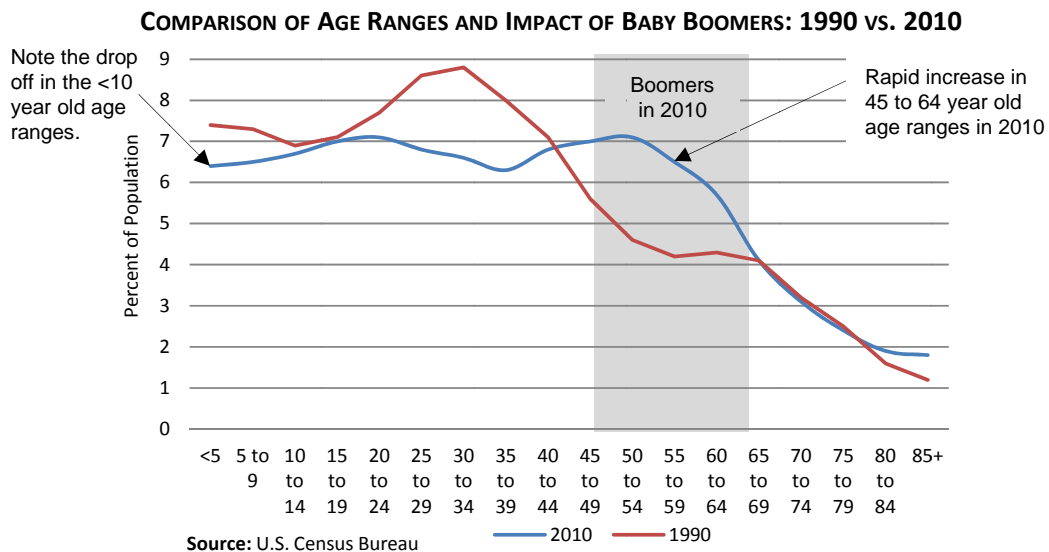
Source: Based on World Bank Data



Again
MADE IN THE USA

Demographic Shifts: WWII and the Depression impacted birth rates and the rapid economic expansion after WWII of the baby boomers that are now reaching retirement. The official boomer birth years are 1946 to 1964, which means in 2014, they are 50 to 68 years old. Also note the dip in population lower birth rate with young adults that are having fewer children (frequently later in life) or none at all compared to the baby boomers. The impact of this demographic phenomenon on the economy and workforce includes the following:

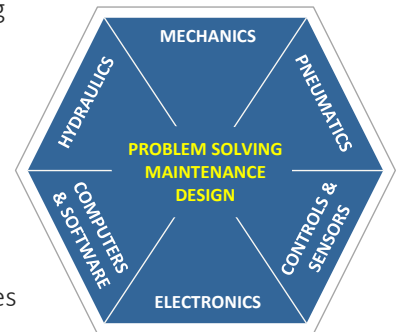
- As boomers leave the workforce, there are fewer workers available to take their place and the skills required for many of the next-generation jobs are much more complex. By 2020, the U.S. Bureau of Labor Statistics, confirmed by the Boston Consulting Group, estimate a gap of 875,000 machinists, welders, machinery mechanics and industrial engineers in the U.S.
- The shock in the size of the aging population will have profound impact on the societal cost of healthcare unless there is a quantum shift in the delivery of healthcare or in sustaining health.
- There is a substantial transfer of wealth from one generation to the next.



Access to Skilled Workforce: In a time of high unemployment and underemployment, there are 600,000 manufacturing jobs that are not being filled due to a skills gap and another 500,000 projected to meet near-term growth. The factors that fuel this issue include the following:

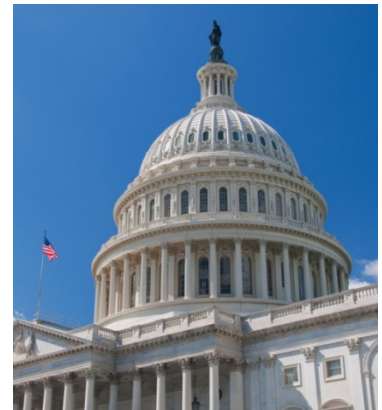


- A generation of future workers that are disengaged from manufacturing due to parents/educators convincing students it's a bad career path (based on their experiences with layoffs in the past and that everyone should get a four-year degree to be successful).
- Employers need talent that can do basic math, have good communication skills, can work in teams, make rapid adjustments to work practices through *Lean Manufacturing* (and other techniques), exhibit punctuality, and pass a drug test. Process design, problem-solving and maintenance of complex automated machinery requires a multidiscipline approach known as mechatronics that includes electronics, mechanics, pneumatics, hydraulics, controls and computers.
- 25% of the total manufacturing work force is age 55 or older and will be retiring in the near future.



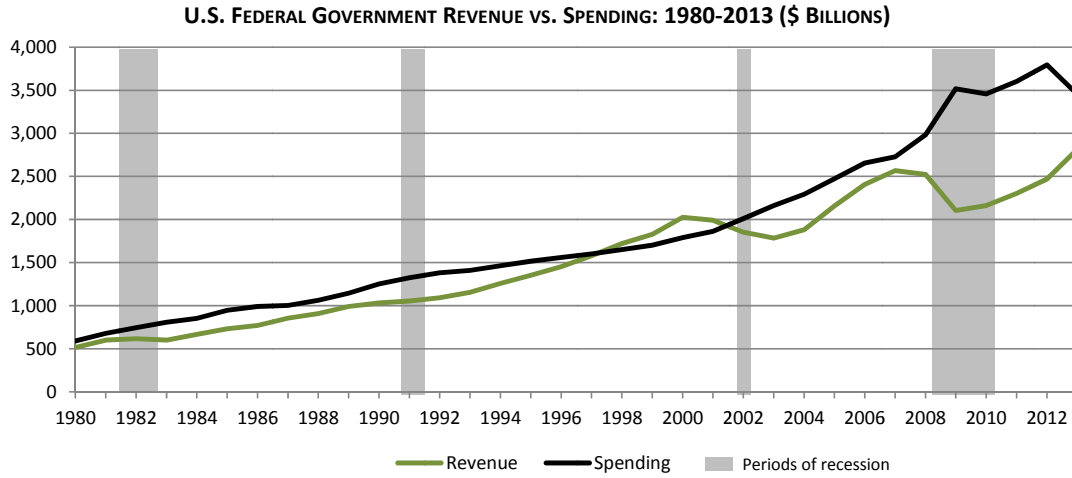
Communities that can stimulate students to consider manufacturing (which requires many different skills) and get the preparation and culture required to thrive in manufacturing (training/education) will be able to attract/support a variety of manufacturing operations.

Government Policies: Policies of the federal and state governments can either stimulate or hinder economic growth and the competitiveness of domestic businesses. Examples of recent and on-going federal policies that have direct impact on the economy and expanded use of innovation include:

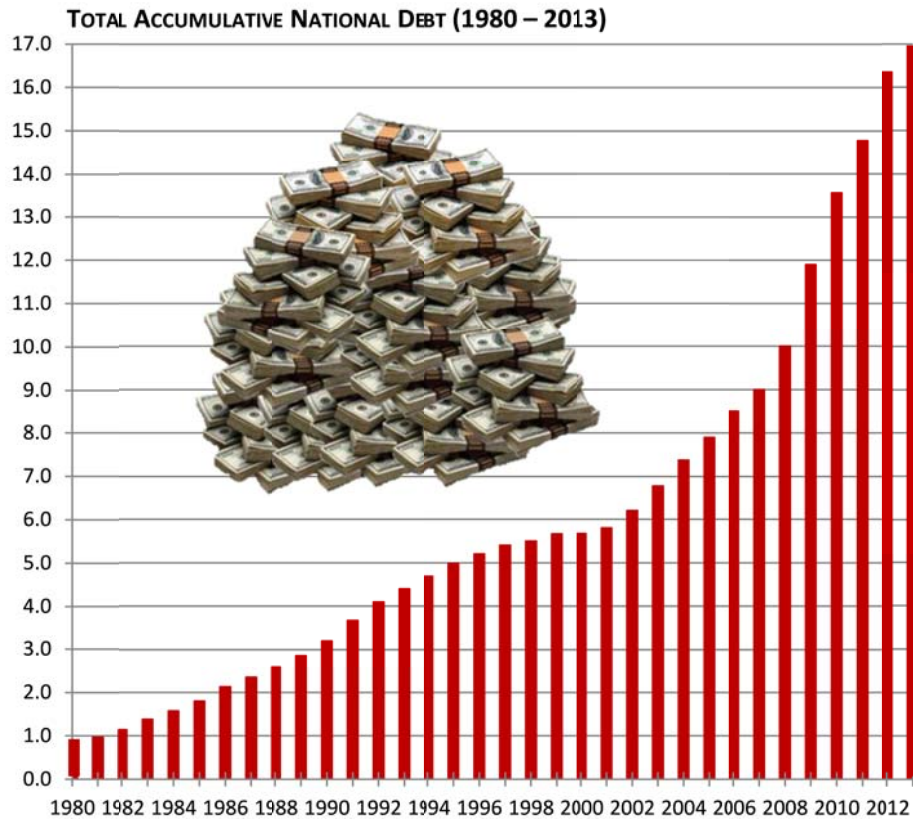


- Defense spending that is targeted toward new technologies.
- Healthcare legislation that has generated a cost unknown for businesses as well as a 2.3% sales tax on medical devices.
- 30% tax credit and other financial incentives for installing wind turbines and solar panels.
- Investing in research related to medicine, energy and other areas of innovation (although there have been some recent cutbacks).
- Investing in civil projects such as road and bridge renovations to improve public safety and create short-term job opportunities.
- Investments in upgrading and improving the national power grid. This will ultimately be a joint effort with the private sector.
- Providing incentives at the state level to attract certain types of businesses and innovation-related activities.

Government policies related to program spending, taxation of companies (large and small) and level of debt will impact the competitiveness of the country and its businesses as well as the stimulation of foreign investment in U.S. markets. Managing the national debt is of critical important because paying down the principal in the future as well as the interest (which is \$250 billion and escalating) will be a drag on the economy far into future generations.



Source: U.S. Office of Management & Budget



The realities that the U.S. faces related to the debt include the following:

- If the U.S. credit rating drops further, the interest rate on the nation’s debt will rise.
- The government will need to both drastically cut program spending while raising taxes. The combination of actions will remove spending power from the economy and slow GDP. How this is executed will determine whether the economy just slows down or reverts to a recession or spirals in a downward trend.
- Foreign investments will be reduced as the size of the market is reduced and becomes less attractive.

- The Federal Reserve is not printing billions of dollars each day to cover the debt which will contribute to substantial inflation that will creep up over time.
- Recovery will be slow and painful but can be achieved if discipline is applied; although little of it has been demonstrated by Congress thus far.

Security/Terrorism: The incidence of security breaches and acts of terrorism will continue to escalate with more creative approaches and serious outcomes. Addressing world unrest and the outbreak of terrorism is requiring a substantial investment on many fronts to combat its impact on human life, facilities, computer and network systems (cyber security), vehicles, ports and other transportation destinations and systems, and other target areas. This effort will require a vast array of software, hardware, sensors and more intense use of drones utilizing diverse and complex technologies. The trend in this environment is to optimize cost/value and seek methods of detecting potential situations before they escalate into a disaster.



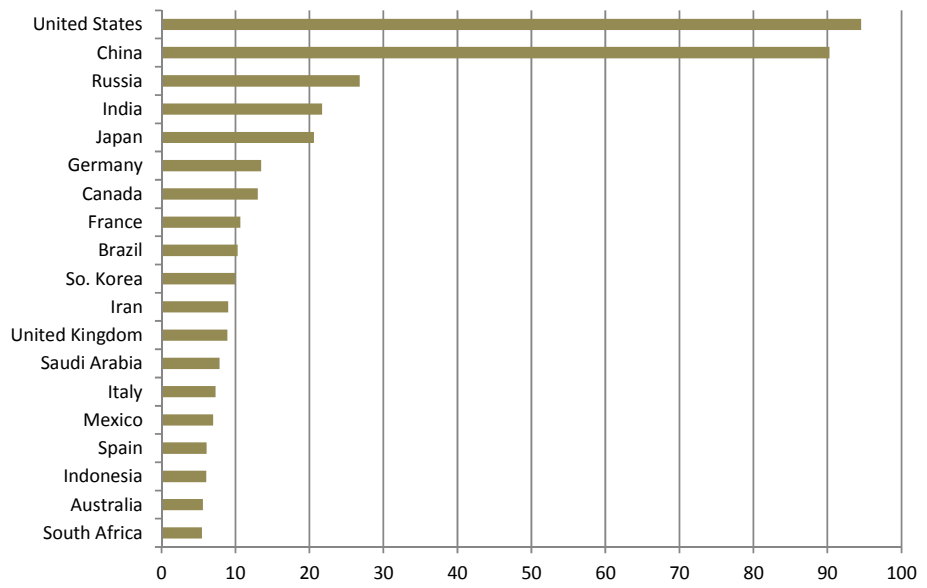
Emerging Energy Sources:

The U.S. is currently the world's largest consumer of energy resources at 95 quadrillion BTU's annually or 19.5% of the total world's consumption. China is close behind and expanding rapidly at 90.3 quadrillion BTU's annually or 18.7% of the total.

Energy consumption in the U.S. is primarily used as a fuel for transportation (vehicles, trucks and aviation), power generation (see charts on next page) as well as gas utilized for space heating and process heating. Within power

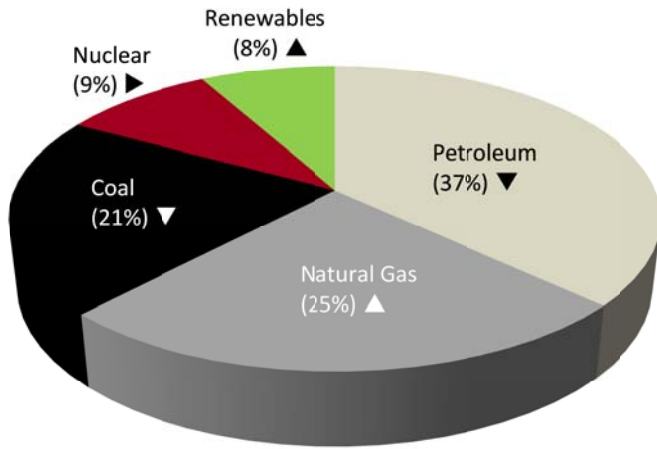
generation, the use of coal is being reduced by shut-ting down older plants and focusing more effort on combined cycle gas fired units that are more efficient and less costly fuel due to the expanded supply of gas on the market.

ANNUAL ENERGY CONSUMPTION (QUADRILLION BTU'S) BY THE TOP COUNTRY CONSUMERS

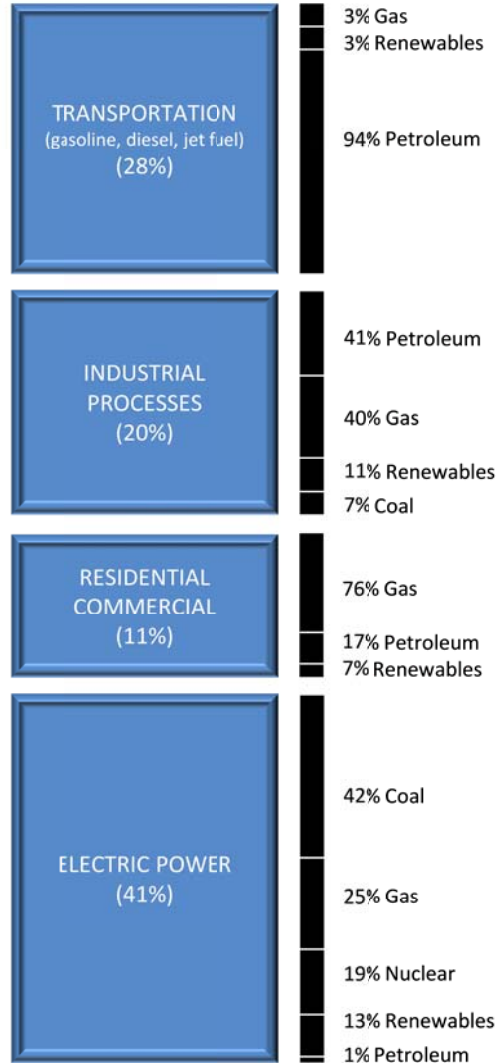


Source: U.S. Energy Information Administration

ESTIMATED U.S. ENERGY SOURCES, USE AND CONSUMPTION TREND
Based on a total annual consumption of 95 quadrillion Btu's



Source: Energy Information Administration



Over the past decade, the federal government and the private sector have expanded the installed base of renewable electric power (including hydro at 62.5% of total) generation to 520 billion kWh in 2011. Going forward, there will be a strong emphasis by the federal government to reduce coal, limit the growth of nuclear generation and promote wind and solar – although many of the incentives are expiring. Natural gas will be in demand due to its expanding supply and falling cost.



Florida Power & Light recently built the largest solar farm in North America near Arcadia, FL.

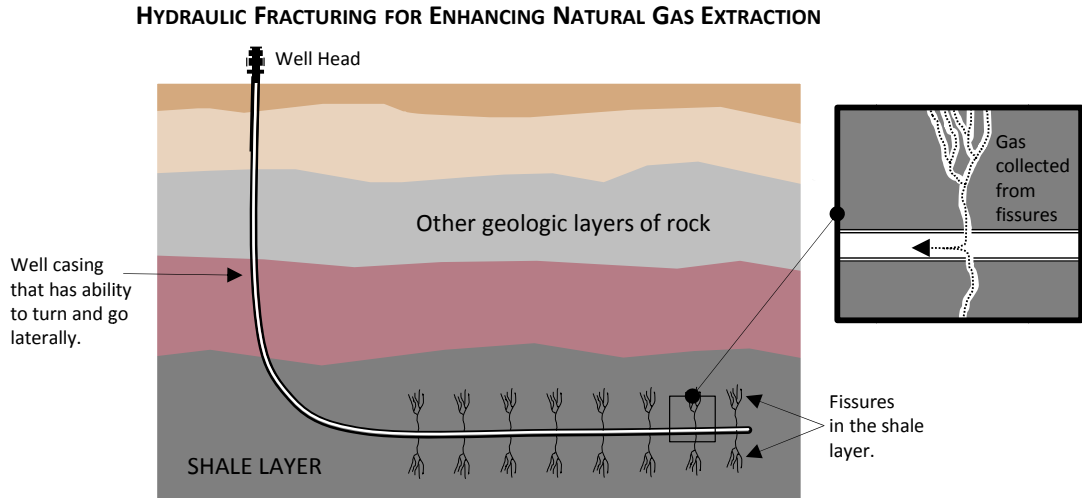


The federal government has also backed the Energy Star Program that identifies energy efficient products and practices. Consumers and businesses gain a return from the program by consuming less energy and therefore paying lower energy bills. Products that have the Energy Star designation then gain a premium or preferred status.

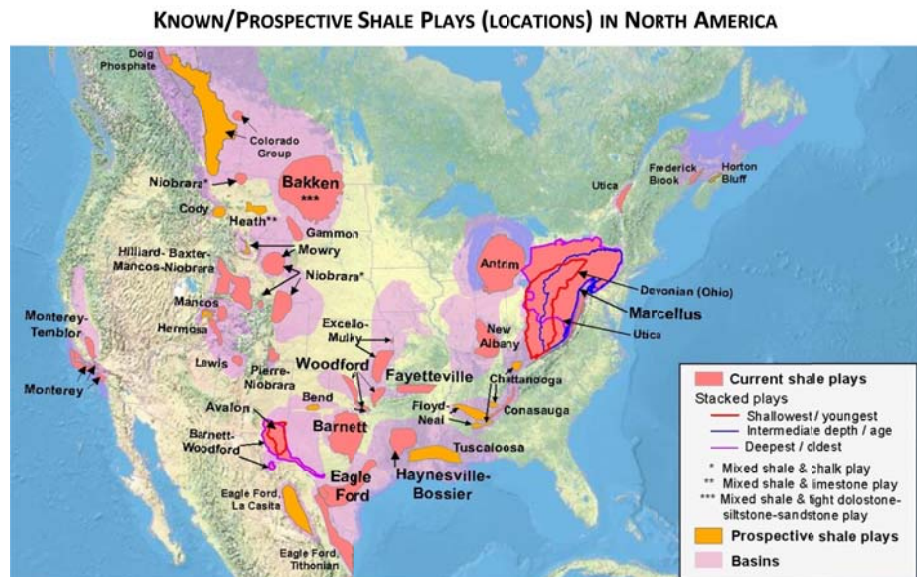
Natural Gas

Gas extraction from shale is facilitated through hydraulic fracturing known as “fracking” or “smart drilling.” Well are drilled up to 10,000’ vertically to the shale layer and then horizontally through the shale. A mixture of water and special chemicals charged into the well under high pressure to further fracture the small cracks (fissures) in the shale to make it more permeable. It is then filled with sand to hold the fissures open. Gas migrates to the fissures and then into the well and brought to the surface for collection and storage.

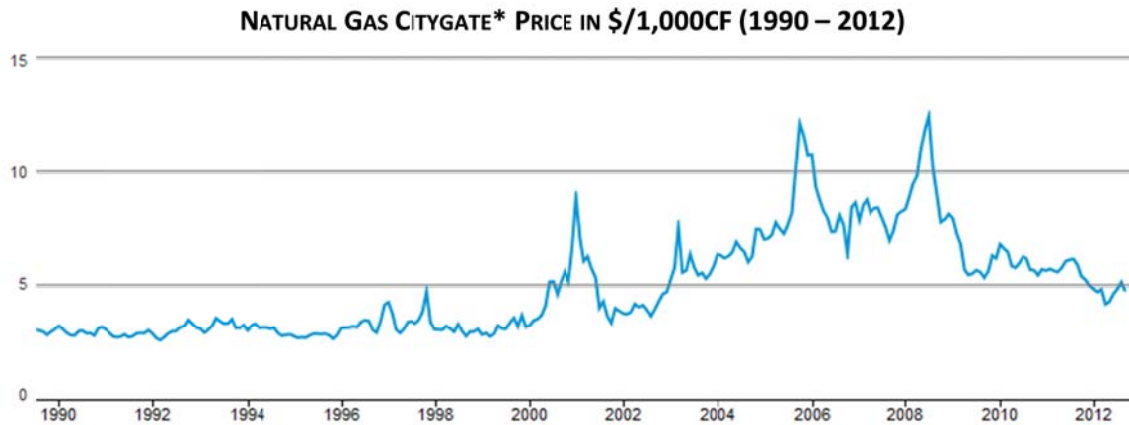
The process has been optimized over the past 20 years has proven to be very effective with substantial



improvements that have been signed off by both EPA and the Energy Administration. However, the environmentalists are concerned over the potential toxicity of the proprietary fracking chemicals and the disposal of the large quantities of waste water that have fracking chemicals as well as a low concentrated radionuclide tracer utilized to track well location along with a naturally occurring radionuclide (radon) in the extracted material.



North American shale *plays* (areas of potential fossil fuel deposits) include the Bakken Shale oil field that is located both in Canada as well as in the U.S. (portions of the states of North Dakota and Montana) that may have as much as 4 billion barrels of oil available for extraction. The Marcellus Shale gas field in parts of New York, Pennsylvania, West Virginia and Ohio may have as much as 50 trillion cubic feet of natural gas that is recoverable from the region. There is also strong promise in Alberta's Duvernay Shale deposits in the Rockies.



*Citygate is the price at the end of the transmission line.

Even at a much lower estimate, the emerging shale gas resources could represent a drastic shift in the cost of energy in North America making the U.S. and Canada desirable manufacturing destinations while providing tens of thousands of direct and indirect jobs within the respective regions. As a commodity, the price of natural gas is sensitive to supply/demand throughout a given year and long term supplies. The supply of natural gas is increasing but so is the demand as power companies convert some of the coal generation facilities to natural gas combined cycle.

Renewables: Wind

The total electricity production from renewables in 2012 was 494.6 billion kWh, 12.2% of the total production from all fuels. Within the renewables, 56% was from hydro followed by wind with 28.3%, wood and other biomass at 11.6%, and solar at 0.87%.

The primary challenge with wind is its availability and dependability as a source due to issues related to wind characteristics and maintenance requirements. Unit availability will vary by location but is estimated to range from 25% to 50% of the time. This then requires a backup system, such as a rapid start-up gas turbine, to be available when the wind is too low to turn the blades. There is substantial R&D still being undertaken to maximize turbine output and reliability.



Looking at the true economics for wind technology, the balance sheet needs to also include the incremental cost of installing substantial transmission lines and other infrastructure costs as well as the current economics have not considered that the federal government provides a 30% tax reduction for installing wind farms.

Small Wind Turbines – According to the American Wind Energy Association, small wind turbines are defined as having a capacity rating of less than or equal to 100 kW. Turbines in this category range in size from smaller than 1 kW for off-grid applications to 100-kW turbines that can provide village power. They also come in a wide variety of designs.



Fifty-four small turbine models are offered commercially in the United States for applications including homes, schools, commercial and industrial facilities, telecommunications, farms and ranches, and communities. By the end of 2012, more than 150,000 small wind turbines were installed in the United States. Today, U.S. manufacturers account for more than 70 percent of the U.S. small turbine market. A recent report on Distributed Wind Turbine activity is available on the Internet at:

http://www1.eere.energy.gov/wind/pdfs/2012_distributed_wind_technologies_market_report.pdf



In order to determine in a site of general location is appropriate for a small wind turbine application, wind data needs to be taken over a period of time by an anemometer that picks up and records wind speed and direction. There may also be a local airport that has data that may also prove some value. The minimum average sustained velocity to support a wind turbine is about 10 MPH.

Renewables: Solar

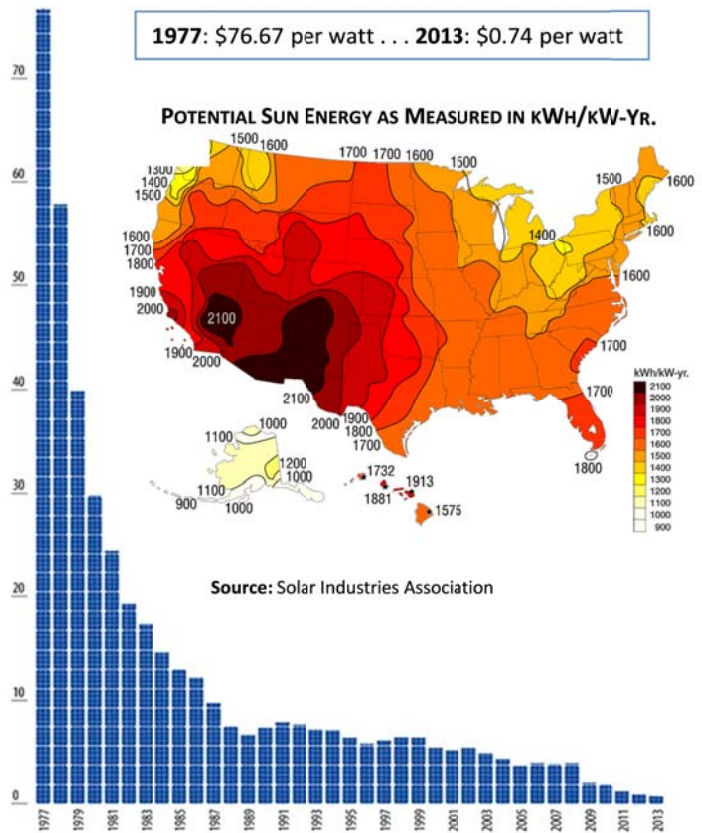
Current market presence is low but has a significant potential in selected markets. The cost of photovoltaic has historically been an issue but more recently the cost per watt has dropped below a dollar. Placing the solar units on roofs instead of on land helps to conserve land and places the user next to the source for greater efficiency. As the output per unit surface area increase, the use of solar for large



Solar panels on Lifeline Data Center in Indianapolis and panels on shopping mall and Wal-Mart distribution center in Arizona

DROP IN THE PRICE OF CRYSTALLINE SILICON PHOTOVOLTAIC CELLS OVER 36-YEAR PERIOD

1977: \$76.67 per watt . . . 2013: \$0.74 per watt



buildings and remote/off-grid applications with continue to increase as an attractive option.

The Federal government offers a 30% tax credit for solar installations but the State of Virginia currently lacks any state-wide program. They had a \$4/watt rebate program from 2006 to 2009 when the funds to support the rebate ran out. They are also some loan programs that help defer the initial investment for the solar system. Virginia requires that the excess power generated must be sold to the utility at whole-sale rates and cannot be sold directly to the marketplace at retail rates. This makes major non-utility energy generation for market consumption less economically attractive. As the cost of equipment continues to drop and if the state reinstates its rebates (or some financial reduction program), the demand for solar systems should continue to rise.

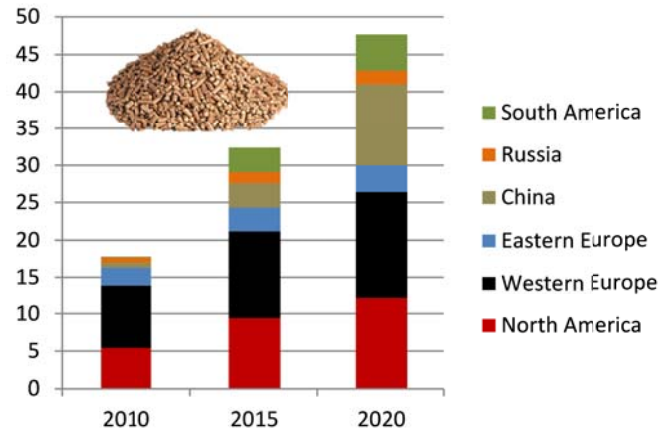
Some residential builders are installing solar systems into new construction and the solar equipment providers are leasing the system for a 30 year period (to align with lease terms) to reduce the impact of high initial investment costs. This demonstrates the creative approaches that will come about to support the growth of the solar heat and photovoltaic market.

Renewables: Biomass

Biomass includes wood-based materials, plants and grasses used for producing a fuel. Western Europe is placing a heavy emphasis on wood pellets (made predominantly from softwood) as a fuel source to displace the use of coal and hedge against interruptions of oil/gas from Russian sources. New England as a region will be interested in this approach because they have traditionally relied on heating oil and there are limited gas lines in the more rural areas.

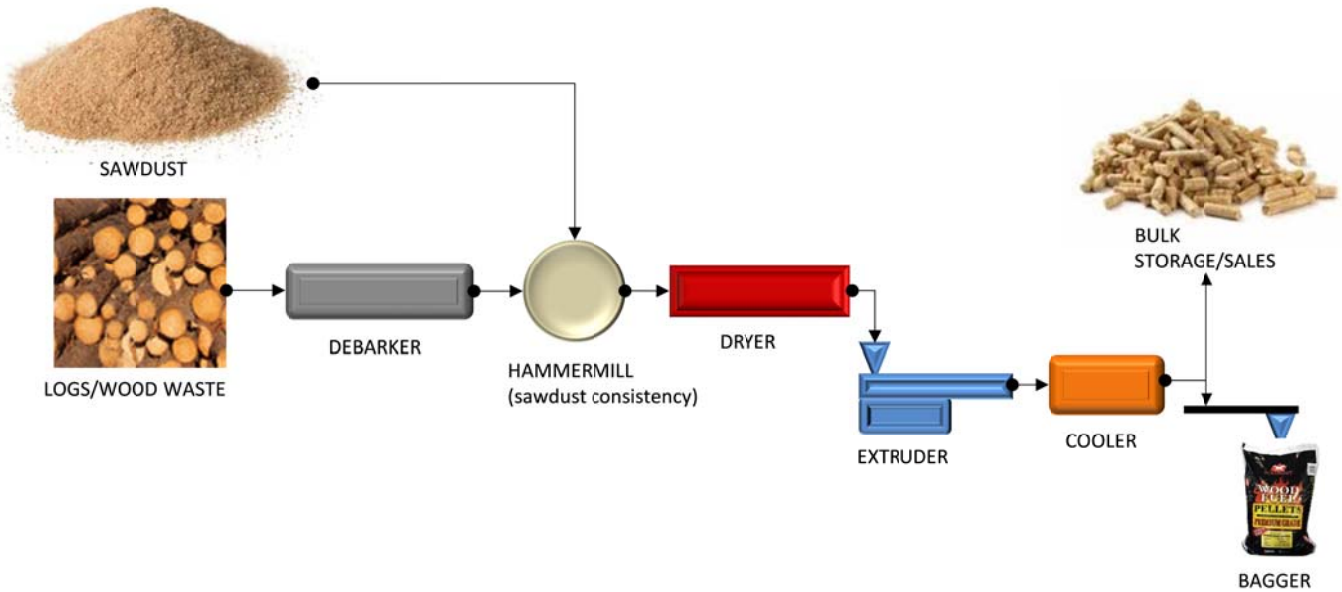
The environmentalists are seeking to reduce carbon dioxide (CO₂) emissions through the use of the wood pellets since they assume the carbon in the wood was previously sequestered from the air making the emission “carbon neutral.” Interestingly, CO₂ emissions from coal are actually lower (205 vs. 213 lbs. per million btu). Softwood pellets tend to burn cleaner and with a higher heat output (due to the terpene concentration) and ultimately generate less ash. The quality/consistency of the pellet and the moisture content are other factors that impact combustion characteristics.

GROWTH IN WOOD PELLET CONSUMPTION BY REGION (MILLION TONS)



Source: Bain Consulting (2013)

WOOD PELLETIZING PROCESS



Chippers & Hammer Mills

Some pellet plants start their process by putting large pieces of wood through a chipping machine for processing. These are only necessary for mills that accept this non-uniform feed stock. There are many different configurations to pellet manufacturing plants depending on their raw material source. While they all don't have chippers, almost all of them have a hammer mill at the beginning of their milling process. These machines take sawdust and wood chips and break them down into a consistent smaller size making drying and pressing through the pellet die quick and consistent.

Dryers

If a pellet mill uses fresh cut raw material, material exposed to the weather or high humidity, or a mix of raw materials that may contain moisture, they have to dry the sawdust to a consistent moisture level. Large dryer drums may use natural gas, propane, sawdust burners, or other fuels to heat the drum, driving off the extra moisture.

The Pellet Mill

After drying, the sawdust is pressed through dies at high pressure. This process causes the sawdust to heat up and release natural lignins in the wood that bind the sawdust together. The mill also determines the density of the pellet, the diameter, the durability, and the length. All of these characteristics are very important for consistent pellet appliance operation.

Cooling and Storage

The pellets come out of the mill between 200 and 250 degrees and soft. A cooling tower is used to bring the temperature down and harden the pellets. After cooling, they are usually stored in a large silo to await bagging or bulk distribution. Smaller operations place pellets directly into bags and then onto pallets and shrink wrapped.

Bagging or Bulk

The most common method for distribution in the US is to put the pellets into 40 pound plastic bags and stack them on pallets or skids. These skids may contain anywhere from one to one and a half tons of fuel, depending on the distribution channel. Bagging pellets adds between \$25 and \$30 per ton in plastic bags, pallet, outer cover bag, shrink wrap, and the labor and equipment to stack and wrap them. These skids are then shipped out and delivered all over the country (and exported) for consumer pick-up at retail locations or home delivery.

Other Sources of Information on Wood Pellet Manufacture and Use

http://www.bain.com/Images/BAIN_BRIEF_Making_biomass_part_of_your_energy_mix.pdf (Bain Consulting Report)

<http://www.siteselection.com/issues/2013/jul/world-reports.cfm> (general information on state of the industry)

<http://pelletheat.org/wp-content/uploads/2010/01/Walker.pdf> (Industry overview by Massachusetts company)

<http://www.pellergy.com/about-us/> (Vermont wood pellet stove manufacturer based on Finnish technology)

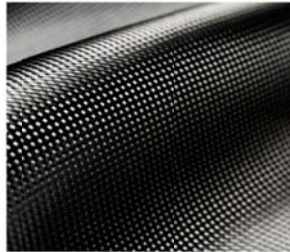
<http://energy.gov/eere/energybasics/articles/wood-and-pellet-heating-basics> (DOE basic information)

Technological Trends: Technology includes any scientific innovation with commercial value that meets a societal need. A constant stream of new innovations is what drives the U.S. economy over time and is the basis for our competitive advantage. A sampling of current and emerging technologies include:

“Continuous innovation is our ultimate, sustainable competitive advantage.”



Improved crops with higher yields, lower water utilization, higher nutrition and more disease resistance.



The development of new composites (polymers with fiber reinforcement such as carbon, fiberglass and other materials) that result in improved characteristics such as strength and lighter weight.



Biodegradable bioplastic packaging from starch-based polymers derived from corn, soy, switchgrass, potatoes, sugarcane, etc.



Continuous improvements in batteries and other energy storage devices and techniques. Large scale energy storage will ultimately make wind and solar energy more viable.



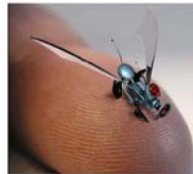
The diversification of weapons platforms utilizing sonar, electromagnetic forces and other sources along with the use of remote operated aircraft, robots and other devices to detect and combat terrorism.



Shetkastone™ is a recycled material (55-90% recycled paper) used for countertops and other surfaces. The product is currently produced in Le Center, MN.



The expanded use of LED lamp technology that provides flexible illumination options with less energy and a much longer operating life.

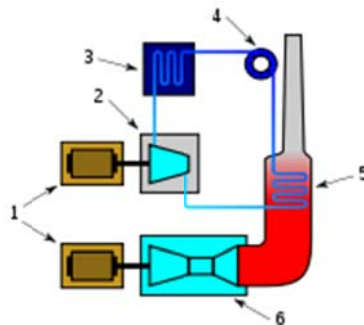


The use of nanotechnology to increase product performance at the ultra small molecular level to increase detection performance, deliver a drug or radiation to a cell and many other applications.



Photo of GE combined cycle power station model.

Typical combined cycle gas-fired power station that integrates a gas turbine and steam turbine to generate electricity.



1. Electric generator
2. Steam turbine
3. Condenser
4. Pump
5. Boiler/heat exchanger
6. Gas turbine



The Audi R8 uses carbon-fiber-reinforced polymer (CFRP) for seat frames and other parts along with magnesium and fiberglass-reinforced polymer (FRP) components to shed hundreds of pounds without sacrificing performance. The vehicle also has ceramic brakes and a titanium exhaust system.



A new craze in jewelry is a baked ceramic coated carbon fiber ring that is strong, light and attractive. It probably will not take on the classic gold ring any time soon.



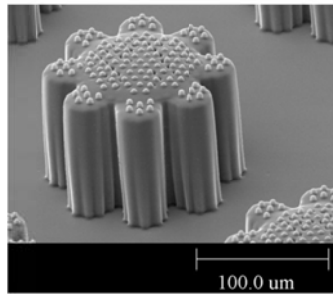
This part is constructed of polymer-to-ceramic composites (PTCC) for wear corrosion and wear resistance.



Aircraft engines and their “first cousins”, the land-based gas turbine, need high strength and dimensional stability at very high temperatures. They use a nickel-based super alloy for the turbine blades along with the use of ceramic matrix composite (CMC) with carbon fiber. Ceramic polymers are also utilized on engine part manufacturing.



Composite materials utilized in the fabrication of wind turbine blades.



The use of material micro machining and molding in the manufacturing of drug delivery devices.

Concept of Sustainability: The definition varies widely but reflects a desire to assemble a set of best practices that address the ills of misuse of resources and past losses of companies. It's not possible to design away all problems but society can be much better at meeting the needs on its citizens into the future. The outcome of this trend will be communities and companies that embrace best practices and become preferred locations to life.



- Spending . . . budgets that live within the means of the community at tax rates that keep it competitive (optimizing government, education and health services).
- Conservation of resources: water, energy, land (development . . . use of brownfield land)
- Minimize environmental impact (water, air, land, human exposure)
- LEED certification of buildings
- Sustained economy (host to companies/industries that continuously adapt to changes in markets)
- Communities support business through supporting a culture and environment of entrepreneurship, promoting innovation, celebrating new business activities, and equipping residents for available jobs through effective education and training.
- Transportation that promotes efficient/cost effective ways of moving people and goods.
- Quality of life that promotes health/wellness, good work ethic, arts/recreation and spiritual growth.

Desire for Health and Wellness: To combat the epidemic incidence and related costs of cancer, heart disease, diabetes, obesity, aging, the outbreak of multiple allergies and intolerance to certain foods, and other conditions, there is a strong emphasis on the diagnostic, therapeutic and prevention aspects of medicine along with nutrition. Addressing our needs will take multiple strategies and technologies in a time when financial resources are shrinking. Some of the issues are related to diet (types and quality of foods) and lack of exercise, others are genetic, and still others are derived from basic aging because the average person is living longer.

Society is seeking options that help them live longer and more active while enjoying life to the fullest. The federal government is taking strides to assure healthcare is available to everyone and is affordable. How this will be accomplished is still in a state of development.



2.3 Market Drivers and Trends Related to Specific Societal Needs

Transportation: R&D and manufacturing of parts/components and final assembly of motor vehicles, aircraft/aerospace vehicles and boats/ships.

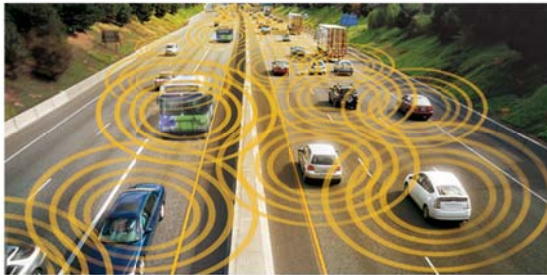
Trends/Drivers (Motor Vehicles)

- Cost of gasoline is driving new options for fuels and vehicle design (electric, natural gas, biofuels, etc.).
- Globalization of automobile manufacturing continues to intensify with assembly in local markets.



Car as Communications Center by providing access to 4G LTE capability it enhances access to the Internet and cell phone use.

Vehicle to Vehicle (V2V) Technology allows vehicles to communicate with each other to avoid collisions. There is also Vehicle to Infrastructure (V2I) that allows a vehicle to communicate with signs and other devices.

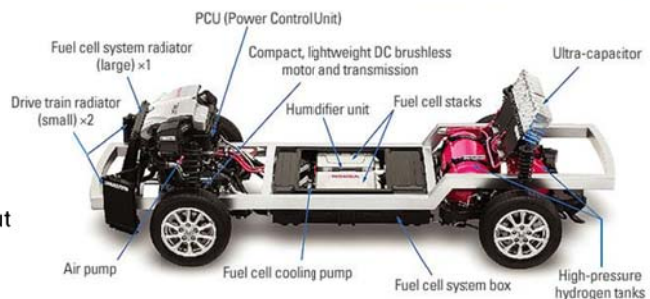


Hydrogen Fuel Cell concept is still alive among Japanese and other car makers. They feel its efficiency will ultimately drive market demand but there is a huge infrastructure challenge to make the switch.



Car Side Panels made of polymer fiber and carbon resin that are strong enough to be used in vehicles and pliable enough to be molded into panels with energy storage capability.

Augmented Reality Dashboard allows for images to be super-imposed on the windshield to enhance driving safety and directions.



Trends/Drivers (Aircraft/Aerospace)

The aerospace and aviation industry is a \$220+ billion market that employs in total about 620,000. It is rapidly evolving in response to new challenges and opportunities that relate to the cost of operation, serving expanded markets, new classes of aircraft, advanced materials and electronics, and the need to maintain a strong technical talent base.



Light Sport Aircraft: The FAA has defined Light Sport Aircraft (LSA) as a new class of aircraft for recreational and sport use. Many of the craft are built using high technology materials and components that are based on innovative designs.



Advanced Avionics: The use of GPS and other advanced avionics will allow for safer air travel as well as lower fuel consumption by minimizing the stacking requirements around airports.



Advanced Materials: Carbon fiber in the fuselage (see photo) along with other composites and advanced alloys are being used to increase strength and reduce overall weight of an aircraft.



Maturing Industry: As the traditional commercial airline industry matures, further consolidations are taking place to reduce operating overhead while gaining access to additional markets.



MRO Operations: As the fleet size expands and the technology broadens, operations are striving to enhance quality and turnaround time.



Supply of Engineering Talent: As the first generation of aerospace engineers retires and the application of technology expands, it has become critical to have access to a supply of aerospace, electronics, industrial, materials, mechanical and systems engineers to support the industry.

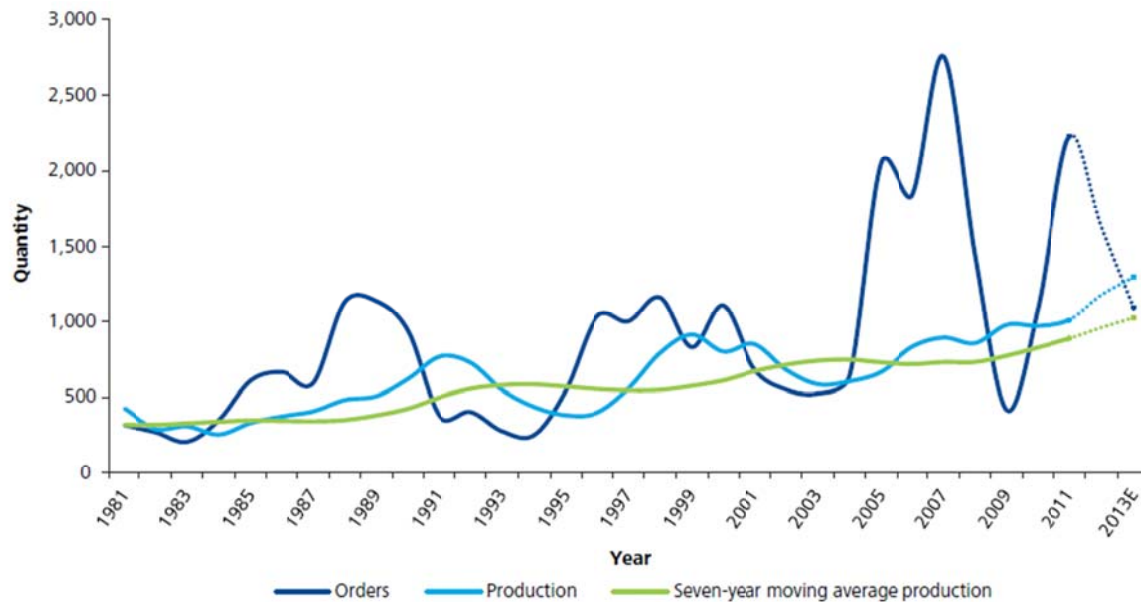
Unmanned Aircraft: There is a rapid expansion of use for unmanned aircraft to military and non-military applications.



Expansion of Corporate/Personal Jet Market: Existing aircraft manufacturers as well as new entrants such as HondaJet and Eclipse Aerospace are expanding this segment.

According to a recent report by Deloitte Touche Tohmatsu LLC, orders for military-related projects have seen a three-year decline primarily due to decreased spending by the U.S. and European countries. In contrast, orders for commercial aircraft hit record levels in 2012 and are projected to do so again in 2013. Aircraft production in 2013 may hit 1,000 aircraft on a world-wide basis. See chart below. The growth in orders comes from the expansion of airlines in emerging countries, the replacement of older aircraft that have reached their service life, and the increased demand for corporate and personal aircraft to avoid the challenges of business and personal travel with commercial airlines.

HISTORIC AND PROJECTED ORDERS VS. PRODUCTION FOR GLOBAL COMMERCIAL AIRCRAFT



Aircraft Manufacturing

Prime Contractors/Assemblers

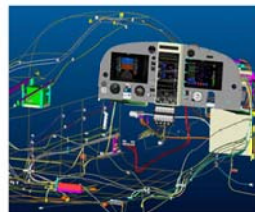
Companies that coordinate the overall design of the vehicle, fabricate the frame, and provide the final assembly and test functions.



Tier 1 Suppliers

Provide major components and systems for the vehicle such as:

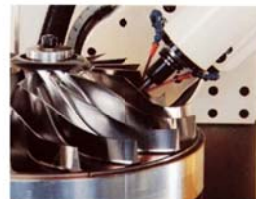
- Avionics system.
- Engine/propulsion system.
- Landing gear.



Tier 2 Suppliers

Provide smaller components to Tier 1 suppliers such as:

- Machining of parts.
- Manufacturing of subassemblies.



Tier 3 Suppliers

Provide materials to the Tier 2 suppliers.

To be a supplier to the aircraft/aerospace industry requires different certifications such as the International Standards Organization (ISO) 9001, Aerospace Standard (AS) 9120 certification for Quality Management System, and the Aviation Suppliers Association ASA-100 Quality System Standard. The Industry is also supported by technical, software, financial and training resources as well as maintenance and repair operations (MROs) around the world

Environmental Sustainability: Issues related to the environment have transitioned over the past 40 years from focusing primarily on environmental protection to more recent concerns with land management (smart growth policies), managing water resources and transitioning to renewable energy resources (e.g., solar, wind, biomass, biofuels, etc.). The overriding issue of climate change has undergone several iterations and still drives some carbon emission initiatives.



Within the construction industry, the LEED (Leadership in Energy and Environmental Design) certification concept was initially introduced in 1998 by the U.S. Green Building Council. The Council is a group of architects, engineers, builders and other related professionals whose purpose is to develop criteria that supports environmentally sustainable construction. LEED certification standards continue to expand and include new construction, renovation, interior build-outs, and operation of commercial buildings. There are also applications for homes, schools, retail structures and neighborhood developments. A LEED certification is based on a point system focused on six key categories that contain both required “prerequisites” and additional “credits”. A summary of the six categories with a general description outlined below.

SUMMARY OF REQUIREMENTS FOR LEED CERTIFICATION FOR NEW BUILDING CONSTRUCTION

LEED CATEGORY	DESCRIPTION OF PREREQUISITE REQUIREMENTS AND OPTIONAL CREDITS
SUSTAINABLE SITES	<ul style="list-style-type: none"> • Construction activity pollution prevention (prerequisite) • Site selection (not using prime farmland/parkland and away from water/wetland sources and 100-year flood plain) • Development density and community connectivity • Utilization of brownfield redevelopment site • Facilitating alternative transportation • Site development (protect/restore habitats and maximize open space) • Stormwater management (quantity and quality of runoff) • Reduce heat island effect for buildings and parking lots and other hardscape areas • Minimize light pollution
WATER EFFICIENCY	<ul style="list-style-type: none"> • Water efficient landscaping, innovative wastewater management technologies and water use reduction measures
ENERGY & ATMOSPHERE	<ul style="list-style-type: none"> • Minimum building energy system requirements, minimum energy performance requirements and refrigerant management (prerequisite) • Further optimize energy performance, utilize on-site renewable energy source(s) or green energy sources • Enhanced energy systems and refrigerant management • Measurement and verification
MATERIALS & RESOURCES	<ul style="list-style-type: none"> • Storage and collection of recyclable materials (prerequisite) • Building reuse (for major renovations) • Minimization of construction waste and multiple option credits for materials reuse and recycled content
INDOOR ENVIRONMENTAL QUALITY	<ul style="list-style-type: none"> • Minimum indoor air quality performance and tobacco smoke control (prerequisite) • Outdoor air delivery monitoring • Increased ventilation • Air quality management during construction and before occupancy • Use of low-emitting materials (adhesives/sealants, paints and coatings, carpet systems, composites) • Indoor chemical and pollutant source control • Light control systems • Design, verification and control of thermal comfort systems • Access to daylight and views from work stations
INNOVATION AND DESIGN PROCESS	<ul style="list-style-type: none"> • Innovation in design and use of LEED accredited professional on the project

Source: U.S. Green Energy Council

Financial Security: Provide society mechanisms for expanding and preserving wealth in very uncertain conditions.

Trends/Drivers

- Public trust in the financial service sector and Wall Street in general has seriously been eroded.
- With the economy near the tipping point of expansion, many investors and companies are holding their assets liquid and searching for viable investment options.
- There is an emerging interest in investing in small businesses that have well defined plans and strong leaders that can be held accountable and influenced by investors – giving the investor some control of the investment.



Health and Health Care: Traditional focus on providing society with the services to detect (diagnostics) and effectively treat (therapeutics) diseases to maximize the quality and longevity of life. Delivering these services requires the integration of the following elements:

- R&D/manufacturing of pharmaceuticals.
- R&D/manufacturing of parts, components and final assembly of medical instruments for diagnostic and therapeutic applications.
- Use of bio and gene-related materials (stem cells, gene therapy, bio organ replacements, etc.).
- Software applications



Trends/Drivers

- Prime medical issue areas:
 - Diabetes (Type I&II)
 - Weight issues/obesity (relates to diabetes)
 - ADHD/autism
 - Cancer (breast, colon, etc.)
 - Age-related (joints (arthritis/replacement), memory, heart, COPD, strokes, and kidney-related)
- There is an emerging trend that shifts the focus to preempt disease through genetic analysis and determine actions that can be taken to avoid disease . . . focus on “health” rather than “health care.”

- Affordable Care Act - The federal government’s attempt at reducing the cost of health care will have several impacts on the health care industry and their ability to survive. If a region is aging rapidly and having an increase in Medicare patients over private insurance patients, the cash flow to support health care services goes down dramatically. In addition, government payouts for Medicare patients will go down in the future as a way to force the reduction in cost. If the productivity to absorb these lower reimbursements is not in place, the operation is in serious jeopardy of shutting down.



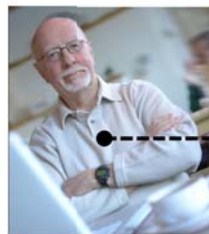
The law has also placed a 2.5% tax on revenues (not profits) for medical device manufacturers. This will definitely impact the growth and development of the industry, particularly among smaller/emerging companies that have very thin margins.

- The aging of the large baby boomer population will place significant stress on medical services delivery but also rapidly expand market opportunities for medical-related products and services.
- Use of nanotechnology in targeted drug delivery and size of devices.
- The health care industry is undergoing some significant changes that are derived from a confluence of an aging population that depends on more care coupled with the rapid changes in technology and the escalating cost of delivering health care utilizing the traditional approach. Technology is playing a key role in reducing cost and expanding capabilities, such as:

Computer-Based Records and Direct Data Entry - An important advance in cutting health care cost is the use of electronic records that not only improve efficiencies but also enhance quality through better communications. The management of these systems will require additional IT staff and large data centers to retain records. The systems will require substantial upfront costs but will bring a significant return over time.



New Remote Diagnostic Technology - Integrating both sensor and cell phone technology, doctors can remotely evaluate a patient's heart and other conditions. This will mean that remotely located patients and doctors can still engage in meaningful assessments of medical condition.



Food/Nutrition: Includes food, beverages and nutraceuticals/functional foods – consumed with an objective of treatment or prevention of disease

Industry Trends

Due to economic, life style, demographic, cultural factors and events/incidences, there are constant trend shifts in the food and beverage industry relating to choice, content, convenience, cost, communications as well as government mandates. Changes in needs and demand are driving enhancements to traditional foods and brands while stimulating new opportunities as outlined below.

➤ Choice (new types and tastes of foods)

- Having access to restaurant quality food at home. Prepared gourmet entrees and desserts for home consumption.
- Foods that meet medical, personal and religious dietary restrictions (low sugar, gluten-free, lactose-free, vegan ingredients, kosher, halal, probiotics (consist of live microorganisms that promote digestion and other benefits) in yogurt and drinks, etc.)
- Niche authentic foods are in demand: Greek yogurt, free range grown meats, ethnic foods, artisan cheeses, special breads, regional and international foods, etc.
- Comfort and nostalgic food . . . home-made style, back-to-basics recipes. Good basic food that the consumer can manage caloric intake based on portion size.
- Access to fresh local produce because of its taste, quality and traceability to a known/trusted source.

- Better quality of school/institutional food (tastier and healthier) . . . putting a chef in the school.
- Beer and wine produced from local/regional ingredients with unique taste and qualities.
- Energy drinks and flavored water have an established but maturing market base.
- Emerging interest in drinks that calm you down rather than hype you up.

➤ **Content** (quality/safety and nutrition)

- Rapid growth in organic foods (eliminate pesticides, hormones and other added chemicals from foods); primarily fruits and vegetables with some meats, juices and selected prepared foods.
- The push-back against genetically modified (GM or GMO) grains and other food substances based on some limited evidence that they cause increased food allergies, intestinal disturbances and other related issues, and their potential impact on the environment and sustained agriculture.
- Improved nutritional value of food to improve personal health (nutraceuticals/functional foods) to improve quality and longevity of life.
- Consumption of foods with specific substances (more fiber, omega-3 fatty acids, calcium, vitamins, antioxidants, minerals/trace metals, etc.).



A Wisconsin dairy cooperative has developed a feed mix for dairy cows with high Omega 6 to Omega 3 fatty acids that produces cheese and meat with higher Omega 3 content. They are marketing it under the Omega Valley Farmers brand.

- Focus on fresh . . . improved nutrition and taste (stimulated the rise of Community Supported Agriculture initiatives throughout the U.S.)
- Concern over content and sources of food (quality and safety) . . . want traceability to source, includes buying local/regional and known processing source . . . at times buy direct from the farmer and an upsurge in home canning. Also want fewer, more understandable ingredients (simple food content).
- Address the issue of food contamination from foodborne illnesses in a variety of products (peanut butter, spinach, mangoes, cantaloupe, ground beef, poultry, pet food, poultry, etc.)
- Shift in demand from soft drinks (particularly with high sugar content) to hot drinks such as organic coffees and teas.
- Bottled water has impacted growth of diet soft drinks but may be leveling off in demand.

➤ **Convenience** (access to food and speed of preparation)

- Interest in European style daily meal purchases from a local store (predominantly in urban areas).
- More men in the kitchen . . . life style and necessity with switch in home-based roles. Also more people working in home-based businesses and eat most meals at home.
- Less trips to the restaurant (to save money) but like to buy prepared gourmet entrees, desserts and baked goods as part of a meal
- Continue developing packaging that enables quality food for the microwave or convection oven (e.g., Birds Eye's Steam Fresh line of vegetables).
- Buying pre-cooked meats, ready-to-eat salads and other sides from major grocery chains. Some stores have a "restaurant" area to eat from the store's buffet.

➤ **Cost** (access to food and speed of preparation)

- Consumers are buying larger portions at the mega discount centers such as Sam’s Club, Costco, BJ’s Warehouse, etc.)
- Popularity of purchasing store brands for certain foods . . . based on personal tastes. Stores are combining contract/toll manufacturing with their own production facilities.

➤ **Communications** (enhancing information between consumer and provider)

- Food-related apps on smart phones . . . store coupons, restaurant deals and other specific opportunities.

- There will most likely be a new labeling system that uses the QR (Quick code to retrieve information on a food product, such as:

- Ingredients and nutrition value
- Processing location and sources of ingredients
- Other health and content-related information
- Supplementary information (coupons, recipes, etc.)



Response)

➤ **Congress** (federal government mandates)

The federal government has been issuing its intentions on some fairly broad reaching mandates as a response to food safety and nutrition issues that have made the national news over the past five years. Specific mandates and intentions for future legislation include the following.

- **Food Safety Modernization Act of 2010** (not passed but gives indication of intent) - strengthens food safety programs from domestic and global sources into the U.S. and gives, for the first time, the FDA authority to recall foods. It also adds an additional 2,000 food inspectors into the system and applies \$1.4 billion in new cost that will be borne directly by the food and beverage industry.
- **Dietary Guidelines for Americans** - every five years the government issues guidelines on nutrition that over time impact the composition of food produced in the U.S. Issues that have been addressed in the past are the need for fiber, whole grain consumption, probiotics, the reduction in consumption for trans fats, saturated fats and cholesterol levels and the impact on heart health. The current issues are sugar consumption, food additives and nutrition level of food.

Trends in Food Production

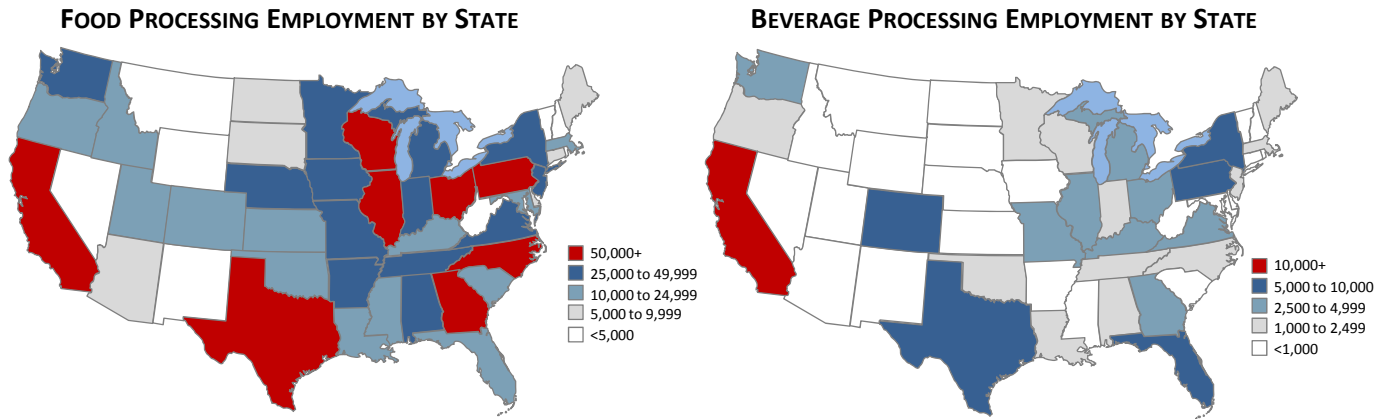
The trends noted below are a compendium of inputs from multiple food industry

- **Sustainable Manufacturing:** Leveraging the concepts of reduced energy use, energy independence and substantially reduced waste generated, the industry is seeking to cut operating costs while scoring points with consumers. Some plants are seeking to achieve the criteria established under the LEED Certification Program.
- **Access to Markets:** on-going trend for successful east or west coast companies to place a complementary operation on the opposite coast.
- **Process Improvement:** In addition to sustainability, companies are constantly seeking methods of reducing operating cost at a rate of 10% per year on average. This not only increases profit margins but also realizes that product life cycles mature and competition is always there to gain market share.
- **Enhance Food Quality/Security:** Companies are continuously incorporating new technologies in production and in packaging to enhance the quality (taste and shelf life) to differentiate their product and security to protect



the consumer and the image of the company. A good example is a technique developed by NC State that subjects a fruit/vegetable puree to a quick/high energy microwave and then it is packed in a Milar™ food pouch. The product has exceptional taste and can last for up to one year on the shelf without refrigeration.

Other Background Information on the Food /Beverage Industry



TOP TEN FOOD PRODUCTION STATES

Segment	CA	TX	IL	PA	WI	GA	NC	OH	NY	IA
Animal/Pet Food	I	H	G	H	G	G	G	G	G	H
Grain/Milling	H	G	I	G		G	G	G	G	I
Sugar/Confections	I	H	I	I	G	G		G	G	
Fruits/Vegetables	K	I	I	I	I		H	J	I	G
Dairy	J	I	H	I	J	G	G	I	I	H
Meat/Seafood	J	K	J	J	J	K	K	I	H	K
Baked Goods	H	J	J	J	H	J	I	J	J	G
Other Foods	K	I	J	J	I	I	H	I	I	H
Beverages	K	I	H	H	H	H	H	H	I	

K	25,000+
J	10,000 - 24,999
I	5,000 - 9,999
H	2,500 - 4,999
G	1,000 - 2,499

Food and Beverage Industry Cluster

Artisan Food Cluster

Cluster includes: agriculture, R&D activities, business startups, food processing, business services, packaging services, internet marketing, transportation/distribution and ag/food-related tourism.



Food and Beverage Industry Opportunities

A summary of the food and beverage industry and the growth potential of individual segments is presented below.

OVERVIEW OF FOOD SEGMENTS AND THEIR GROWTH PROJECTION

Segment	Growth Potential	Comments on Growth
Animal Feed/Pet Food • Pet Food	Low to Moderate	Projections for the near term are growth of 3.5% per year vs. 5-6% that has been the “normal” growth rate.
Grain Milling/Cereal	Low to Moderate	Pressed oils and grains for cereal substitutes (breakfast bars and snack foods) have highest growth potential.
Sugar/Confectionary	Moderate	America has a “sweet tooth” that won’t disappear quickly.
Fruits/Vegetables • Fruits • Vegetables	Moderate Moderate	With the new processes and packaging to enhance taste and flavors along with the understanding of their nutritional value, the demand for fruits and vegetables should improve radically over time.
Dairy Products • Milk (as beverage) • Cheese • Yogurt	Decreasing Moderate High	<ul style="list-style-type: none"> • Demand for milk as a beverage could expand as “functional drink.” • Cheese continues to climb, particularly from pizza/Mexican food. • Yogurt is climbing fast and has not hit a saturation point yet.
Fresh Meat/Poultry/Seafood • Beef • Pork • Chicken • Fish/Salmon	Decreasing Steady Moderate to High Moderate to High	<ul style="list-style-type: none"> • Fresh beef (“red meat”) has been on a slight downward trend. • Pork needs “rediscovery” to build demand (current uptick in TV ads). • Chicken has steady growth with no saturation point in sight. • Demand for salmon strong but tempered by price.
Baked Goods	Moderate	Specialty breads (gluten free), unique crackers and cupcakes have a moderate growth potential. Sandwich shops (e.g., Panera Bread) are helping to introduce new breads.
Snack Foods	Moderate to High	This market is expanded rapidly beyond the traditional chips, popcorn and pretzels to energy bars and other nutrition/performance based offerings.
Prepared Foods	Moderate to High	This is the most dynamic segment in the industry with new concepts constantly coming on the market. There is both high growth and high volatility. New meals with meat (beef, pork, chicken and fish) or non-meat entrees that have great taste and favorable nutrition are gaining momentum.
Beverages • Tea • Coffee • Soft Drinks • Bottled Water • Fruit Juices • Sports Drinks • Other Functional Drinks • Beer • Wine • Distilled Spirits	Moderate Low to Moderate Decreasing Moderate Low Moderate High Moderate Moderate Low	<ul style="list-style-type: none"> • Green and specialty teas are in demand. • Home brewed and take-out coffees have their niches. • Pepsi Next™ announced with 60% less sugar to counter trend. • Recent high growth but saturation point in sight. • High cost . . . Welch’s is promoting the health of grape juice. • Beginning to mature, need another breakthrough for high growth. • High potential, heavy caffeine energy drinks getting push back. • Overall consumption down but niche craft/micro brews expanding. • Local/regional wines are expanding. • Not a growth segment; trying to expand into mixed drinks with lemonade and other flavors.

Organic Foods

The production of food (grains, fruits, vegetables and meat) essentially without synthetic chemicals and other potentially adverse substances has become a significant global market niche. In the United States, the organic market has grown from \$1 billion in 1990 to \$26.7 billion in 2010 that was 7.7% growth over 2009, even in a



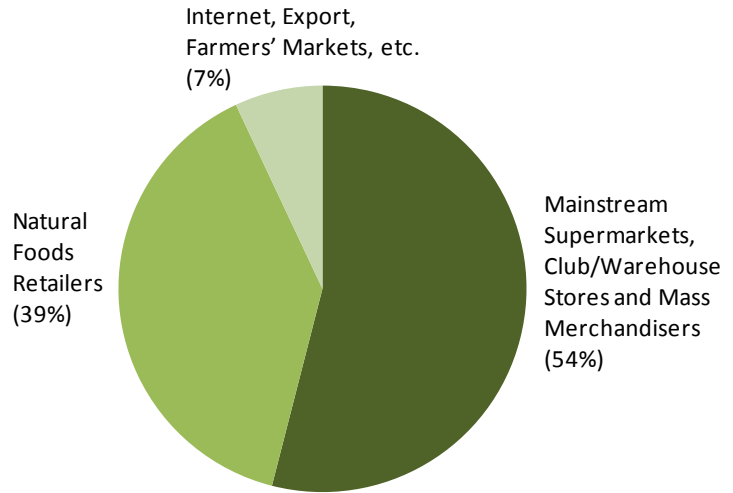
recessionary period. This represents 4% of the overall food and beverage sales and 11% of the fruits and vegetable sales.

Regulation of Organic Food Production and Handling

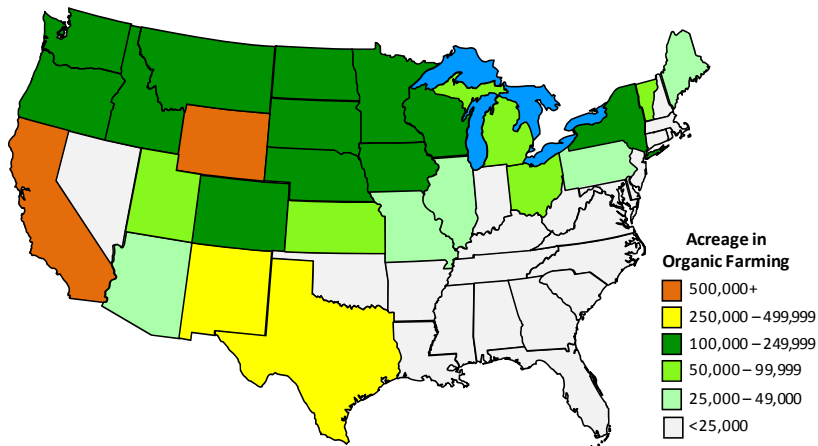
The federal government established regulations (7 CFR-Agriculture, Part 205: National Organic Program) in 2000 for the organic food industry as a program that can be administered by states or other organizations. A number of states and organizations initiated programs, including Virginia, with the high level of participation in the Northern and Western states. Virginia established a program in 2002 and shut it down in 2003.

Land within states that is committed to organic farming noted below. Virginia has over acres committed to organic on 120 farms. It is evident that Southeast has not aggressively the concept while Southern England, New Jersey, Delaware Maryland just do not have the quantities of available land that states have.

SALES CHANNELS FOR ORGANIC FOOD PRODUCTS



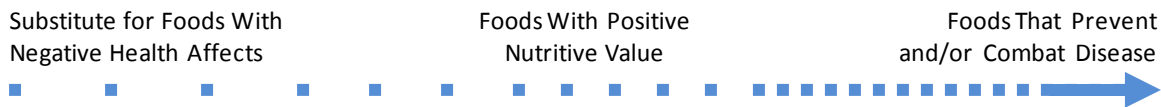
ACREAGE IN ORGANIC FARMING BY STATE



currently by acres is 15,000 agriculture the embraced New and large the larger

Nutraceuticals/Functional Foods

Nutraceuticals and functional foods have the reported ability to deliver health and medical benefits and contribute to the treatment or prevention disease. It follows a progression of understanding between nutrition and medicine over history where society learns what are “good” and “bad” foods for certain types of people in specific conditions. For example, the high calorie fat-based diet may have been fine for those with extreme physical jobs but doesn’t work for those in an office sitting most of the day. The study of nutraceuticals is derived from understanding the effect of human health from foods with certain chemical and physical attributes. The impact on health from foods ranges from effective substitutions for adverse foods (high fat, salt, preservatives, etc.) to foods with a positive nutritive value, to foods that actually help to prevent and combat disease.



Some of the health-related claims that are derived from specific foods and their impact on health are noted below:

EXAMPLES OF FOODS WITH SIGNIFICANT HEALTH-RELATED NUTRIENTS (STUDIES ON ACTUAL IMPACT CONTINUES)

Food	Active Ingredient	Health-Related Benefits
Flax Seed Oil	Omega-3 amino acids + lignin fibers	Reduces estrogen-related cancers
Tomatoes	Lycopene (a primary carotenoid)	Reduces cancer-related activity
Garlic	Produces sulfur-containing compounds	Acts as chemopreventive for cancer, an antibiotic and reduces hyper tension
Soy	Not only high in protein but digestive amino acids	Helps in treating cardiovascular disease (CVD), cancer, osteoporosis, and the alleviation of menopausal symptoms
Fish (Salmon)	Omega-3 amino acids	Cancer and CVD
Oats	Soluble fiber b-glucan	Reduces LDL cholesterol
Canola Oil	Lower triglycerides	Lowers cholesterol

The list is much longer and continues to expand as science and medicine collaborate on defining the effects from different foods on health. The long-term potential of this market is virtually unlimited and there are major efforts underway in Kannapolis, NC to bring together nine North Carolina research universities to further study the effects of nutraceuticals on human health. The nutraceutical/functional foods initiative will join in lock-step with the organic foods industry to provide complete lines of healthy and safe food with high nutritional value.

The current U.S. nutraceuticals market is approaching \$90 billion and as long as outcomes and claims can be proven a reality the market will continue to expand. The market is on average in very early development and initial growth stages that will expand rapidly and trigger acquisitions and merger activity for the larger players to build they portfolio of related companies. There is a good opportunity for branding and building an industry around certain homegrown products supported by local university R&D.

Examples of California Food Companies Establishing East Coast Operations

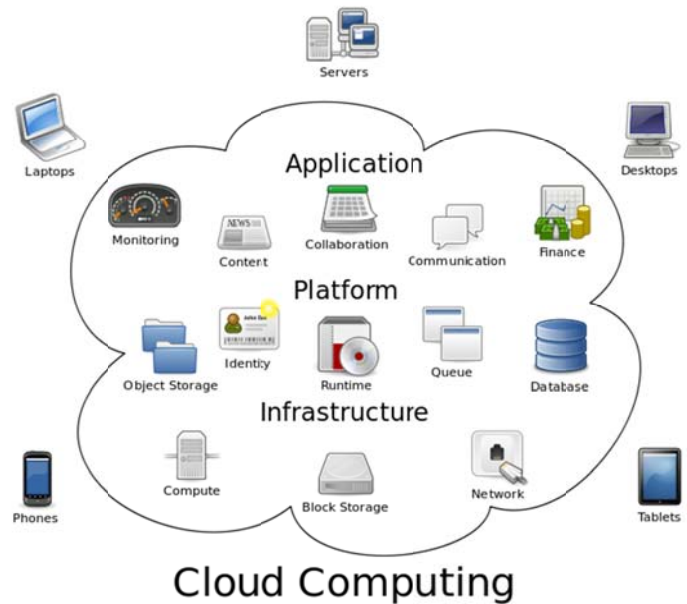
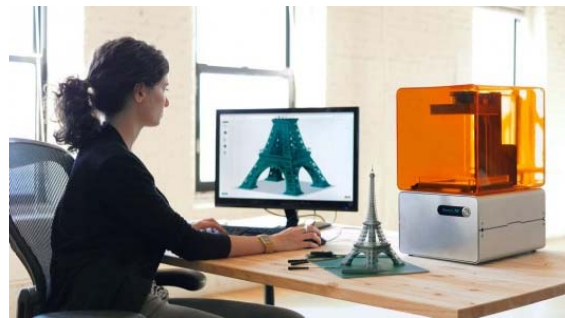
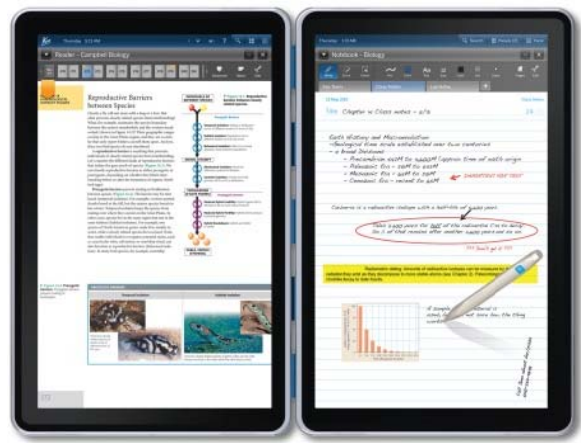
- Shamrock Farms plans to build a \$50 million plant in Augusta County, VA that will process extended shelf-life milk, including Shamrock’s branded, on-the-go Mmmilk product and its Rockin’ Refuel protein fortified recovery beverage.
- California-based Valley Fine Foods, which makes gourmet pasta dishes (some gluten free and organic ingredients) is opening an East Coast manufacturing plant in Forest City, NC, committing to create 305 jobs within three years.

Education/Entertainment: These categories are together because the education field is very quickly going to embrace some of the technology platforms that have been predominantly for entertainment and social media. The expansion of telecom bandwidth and access to low cost computers will accelerate this novel approach.

Trends

- Remote education enhanced by digital textbooks, on-line courses and lectures and the use of social media to interact with student/teacher.
- The “Gamification” of education is where instruction is integrated into a fun/entertaining format.
- The “flipped classroom” where students listen to a lecture out of class (on the internet) and come to class to discuss the material already presented.
- “Learning Analysis” is a technique of tracking an individual’s learning pace/process/effectiveness and customizing/enhancing the process in areas of need. This will lead to a more personalized approach to education that may rely more on computer-based learning than a classroom.
- The use of virtual reality techniques will ultimately provide extraordinary “experiences” at much less cost of a field trip.
- The use of 3D printing just might be the “hook” to re-engage a generation back to making things and overcome the negative image of old school manufacturing. It is rapidly taking on an extensive following in education institutions around the world.

Communications/Computing: Many of the opportunities noted in the Education/Entertainment topic above are made possible by a quantum improvement in broadband and computation speed backed up by substantial data centers.



Trends Related to Data Centers

The accumulation, storage and retrieval of information continues to expand at an exponential rate driving an increase demand for data centers. Industries that will have a definite need for substantial growth in data centers will be finance and insurance, health care and retail. The demand for additional capacity is further enhanced by the trend of **cloud computing** – a technique of accessing information “anywhere” via the internet.

There are different types of data center ownership and operations arrangements that support the needs of certain size customers with various requirements.

- **Dedicated** data center at a company head-quarters, back office or R&D center.
- **Dedicated/remote** data center that has one user but is located away from other operations. This may be operated by a third party company.
- **Colocated/third-party operated** data center. As the cost of operations and constant replacement of equipment escalates, companies are seeking creative alternatives to company ownership and operation of data centers. This is to the chagrin of the IT staff that wants to maintain total control of the systems because reliability is a critical issue.

Data centers are also classified by levels of reliability and availability (defined as “tiers”) that determine facility design features and utility requirements. A summary of the four tier levels are outlined below.

Tier Level	Data Center Requirements
1	<ul style="list-style-type: none"> • Single non-redundant distribution path serving the IT equipment • Non-redundant capacity components • Basic site infrastructure with expected availability of 99.671%
2	<ul style="list-style-type: none"> • Meets or exceeds all Tier 1 requirements • Redundant site infrastructure capacity components with expected availability of 99.741%
3	<ul style="list-style-type: none"> • Meets or exceeds all Tier 1 and Tier 2 requirements • Multiple independent distribution paths serving the IT equipment • All IT equipment must be dual-powered and fully compatible with the topology of a site's architecture • Concurrently maintainable site infrastructure with expected availability of 99.982%
4	<ul style="list-style-type: none"> • Meets or exceeds all Tier 1, Tier 2 and Tier 3 requirements • All cooling equipment is independently dual-powered, including chillers and heating, ventilating and air-conditioning (HVAC) systems • Fault-tolerant site infrastructure with electrical power storage and distribution facilities with expected availability of 99.995%

Operation of a data center must manage the tension of two key drivers: efficiency (cost) and reliability from a perspective of 99.99+ % uptime and the swings in capacity (depending on the use and access). The operating challenges are different from a fairly predictable and controllable inhouse center vs. a Google center that gets hit with a web site that goes viral.

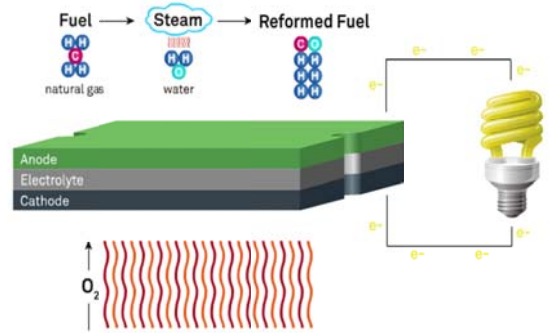
Selecting a site for a data center requires an evaluation of specific criteria that maximize performance while minimize any risks. Key parameters include:

- Low incidence of natural disasters from tornados, floods, earthquakes, hurricanes, etc.
- Adequate capacity and high reliability and low cost of telecom and electric power sources. There is a new strategy to address electric power issues by installing a stand-alone power source that utilizes natural gas or

other highly reliable energy source to generate electricity. Bloomenergy has a system that converts natural gas to an enriched (reformed) fuel by passing the gas and air (oxygen) through electrically charged plates (cathodes and anodes) that free up electrons that conduct electricity. The assumption is that the gas lines are more reliable than the electric power system. The system would then eliminate the traditional diesel-based backup system with all the expensive controls.



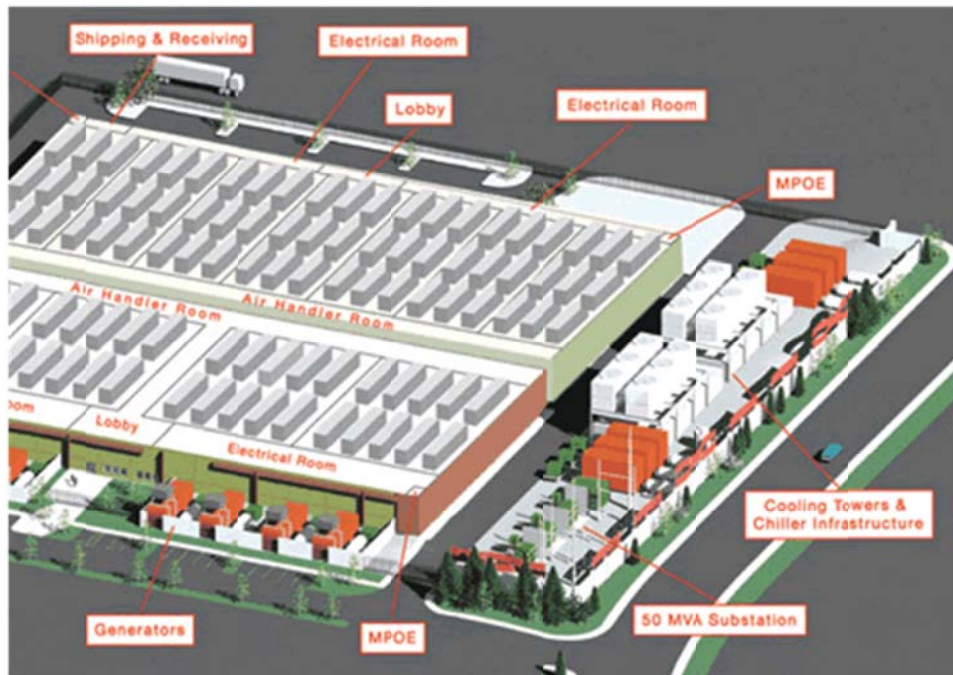
Solid Oxide Fuel Cell Technology by Bloomenergy



- Located on a site that does not have a lot of exposure to traffic and the public. They do not want to be on an interstate with a logo on the building.
- Have access to local and recruited IT, operations and maintenance talent to support the facility.

The physical size of the facility will vary and the amount of buffer and expansion land that a prospective company will require will vary by application. The land requirements may range from 5 to 50 acres and be in a location that has clean ambient air.

LARGE SCALE TRADITIONAL DATA CENTER COMPLEX



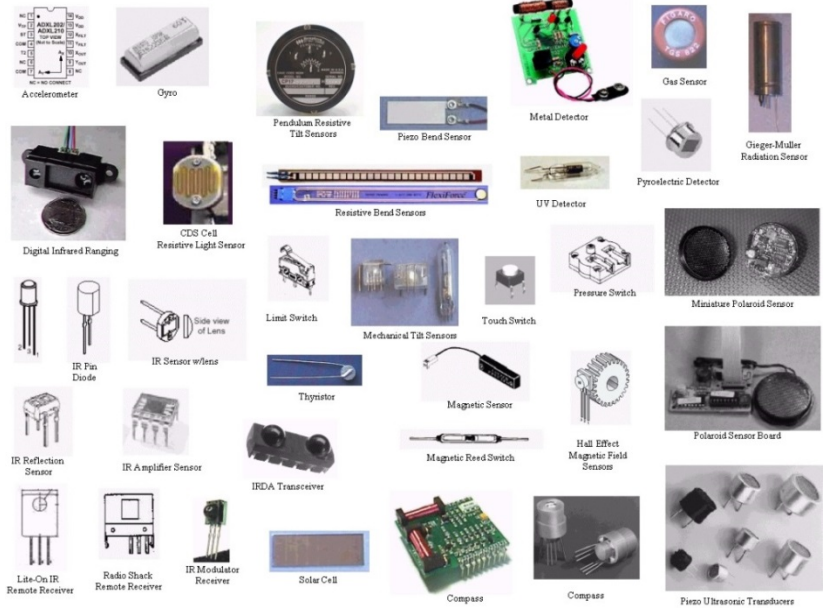
Note: MPOE = the minimum point of entry for telecom wires entering multiple buildings.

Defense/Security: Protection of life and property by governments, organizations, companies and individuals in a hostile global environment.

Trends



- Multiple approaches to terrorism: electromagnetic pulse (EMP) incidents, small bombs with nuclear material and cyber security issues driving more sophisticated software, equipment and sensor-based systems to detect and defend against a variety of sources and situations.
- The use of drones will continue to expand for defense, security and a myriad of other applications. This drives the use of specialty materials (lightweight/high strength composites), electronics for detection, remote vision, delivery systems and other functionality.
- Insecurity of foreign markets and material sources impact the strategies of companies and governments.
- Security systems will be ramped up at all levels and drive new markets for sensors, recognition systems (visual patterns), processors and actuators along with support software.



Energy Utilization: The conversion of different energy sources (sun, wind, moving water, natural gas, nuclear, petroleum, etc.) to useful applications for heat, electricity and mechanical activities.

- We have entered an age of highly diverse energy sources that brings multiple options at different costs.
- Middle East energy sources are quickly becoming unreliable along with Venezuela while new energy sources are being found in multiple locations throughout North America.
- The cost of solar photovoltaic is beginning to reach price levels that make it economical for certain applications; particularly for off-grid residential.
- Wind power has been strongly promoted but it needs backup power to be effective which means it requires a rapidly deployed redundancy like gas turbine technology.
- Natural gas found in the Marcellus and Bakken plays and more recently found in Alberta's Duvernay Shale deposits represent substantial sources for short and medium term reserves.
- The U.S. government needs a balanced approach to energy resources for both transportation and power generation that incorporate fossil fuels and nuclear with renewables on a short, medium and long term basis. They also need to upgrade the grid system to accommodate the pending growth of electric vehicles.



■ SECTION 3 – INPUT FROM STATE, REGIONAL AND LOCAL STAKEHOLDERS

3.1 Target Industries at the State vs. Regional Level

The State of Virginia’s “target industries” are more a list of existing industry strengths that they want to expand and cover a very broad industry scope. The general list is compared to the VEDP and regions in the vicinity of the Alleghany Highlands. This provides insights as to what is being focused on in the area.

VIRGINIA TARGET INDUSTRY	ROANOKE REGIONAL PARTNERSHIP	SHENANDOAH VALLEY
Aerospace <ul style="list-style-type: none"> • Equipment • Components 		
Life Sciences <ul style="list-style-type: none"> • Chemicals/Pharma. • Medical devices/equip. • R&D/testing labs 	Life Sciences <ul style="list-style-type: none"> • Limited/emerging R&D • Medical supplies/devices 	Life Sciences <ul style="list-style-type: none"> • Pharmaceuticals mfg. • Drug research • Medical device mfg.
Manufacturing <ul style="list-style-type: none"> • Food Processing • Plastics and Advanced Materials • Automotive (parts and final assembly) 	Advanced Manufacturing <ul style="list-style-type: none"> • Operations w/high automation • Food and beverage • Consumer goods • Outdoor/sports equipment • Printing and packaging 	Advanced Manufacturing <ul style="list-style-type: none"> • Food processing • Plastics • HVAC and refrigeration • Metal fabrication • Pharmaceuticals mfg. • Medical device mfg.
Information Technology <ul style="list-style-type: none"> • Software • Communications • Data Centers 		Information Technology <ul style="list-style-type: none"> • Data Centers • Information Security • Tech Support • Gov’t Contracting
Distribution/Logistics		
Energy <ul style="list-style-type: none"> • Traditional fuels • Renewable fuels • Smart Grid R&D 		Energy <ul style="list-style-type: none"> • Wood • Biomass • Solar
Corporate Headquarters		
	Customer service call centers	Agriculture and Agritourism

3.2 Input From Local Stakeholders

Based on interviews and discussions with local stakeholders, the following input on Target Industries is provided:

- Want to continue growth of industrial businesses within the constraints of available flat/non-flood plain land.
- Also consider small businesses and the impact of tourism on business opportunities.

■ SECTION 4 – RESOURCE REQUIREMENTS FOR EACH TARGET INDUSTRY

4.1 Evaluation of Resource Needs

Insights into resource requirements for specific industries/opportunities are provided below to serve as a planning tool for developing the required resources to attract business and be competitive.

LOCATION NEEDS (WITHIN A COMMUNITY)

TARGET INDUSTRY	LOCATION REQUIREMENTS	MORE DETAILED COMMENTS ON RESOURCE NEEDS
Parts/Components Manufacturing	Within a few miles of interstate and modest traffic for trucks. Larger plastics molders need rail access.	These types of operations are typically in an industrial park or multi-user industrial facility. They don't have to be on an interstate but a reasonable distance that is safe for trucking.
Microbrewery	Location with visual exposure typically connected to a pub with a small restaurant.	The location has to be a focal point . . . it attracts people to come and enjoy the ambience. The population may have to grow a bit and attract younger folks to be a hit but Boomers will also come to the right environment.
Converted Paperboard Products	Within a few miles of interstate and modest traffic area (for truck access).	These types of operations are either tucked away or become a tourist destination with a "factory store" as a way to promote the business.
Printing on Clothing/Accessories	No specific requirements.	Same situation as the converted products above.
Wood Pellet Production	Industrial area near sources of wood waste and sawdust.	Large lumber mills may have a pelletizing operation on-site but away from the sawing operations.
Customer Care Center	Accessible to regional labor force.	The Clifton Forge Business Park is a viable location that can be reached from the back or near Kroger off Rt. 60 (as long as the slope is reasonable).
Data Center	Away from public view for security reasons.	The location is certainly out of the general view but may be perceived as too remote for some.

REAL ESTATE RESOURCE NEEDS

TARGET INDUSTRY	REAL ESTATE REQUIREMENTS	MORE DETAILED COMMENTS ON RESOURCE NEEDS
Parts/Components Manufacturing	Small/mid-size firms lease buildings that are expandable (25,000 to 100,000 sq. ft.).	The building should have ceiling heights of at least 25', both docks and drive-in doors (for equipment), small office, column widths of 30' and wider, and potential for crane.
Microbrewery	1,500 to 7,500 sq. ft. of working space (depending on size of operation).	Space needs to be able to meet food-grade requirements.
Converted Paperboard Products	2,500 to 10,000 sq. ft. leased industrial space depending on size of operation (expandable).	The building should have ceiling heights of at least 20', both docks and drive-in doors (for equipment), small office, column widths of 30' and wider.
Printing on Clothing/Accessories	1,000 to 5,000 sq. ft. leased industrial space depending on size of operation (expandable).	Building width of at least 20', height not major issue except for storage on a mezzanine, small office.
Wood Pellet Production	Need space for wood & sawdust storage, processing area and finished product storage (10,000+ sq. ft.)	Some of the storage can be in an unheated shelter/shed.
Customer Care Center	Class B office building with adequate parking.	Gross space allocation per employee is ~200 to 250 sq. ft. size of work stations and training/break room requirements.
Data Center	Specialized building constructed on shovel ready site.	Building will be custom designed and built.

LABOR SKILL NEEDS

TARGET INDUSTRY	LABOR SKILLS REQUIREMENTS	MORE DETAILED COMMENTS ON RESOURCE NEEDS
Parts/Components Manufacturing	Equipment operators and technicians with technical ability, lean manufacturing skills, good communication skills, and can work in team environment	Dabney S. Lancaster has programs that can support these industries. Technical skills will vary by types of materials utilized. Core computer skills for machine operations and mechatronics for maintenance staff will be critical.
Microbrewery	Equipment operators and technicians that can work in a food grade environment.	Skills can be acquired but will need to recruit some talent to get the operation up and running.
Converted Paperboard Products	Equipment operators and technicians familiar with converting operations (printing, embossing and cutting).	There may be some former/retired MWV talent that could be a consultant or part-time worker in this operation.
Printing on Clothing/Accessories	Trainable laborers to operate printing process.	There are printing skills already in the region that could potentially be tapped.
Wood Pellet Production	Equipment operators and maintenance staff. Ability to operate fork truck.	
Customer Care Center	Trainable labor with high school or two-year college.	Leverage the existing skills at the contact center already in the Clifton Forge Business Park.
Data Center	Experienced and younger computer operators, software programmers and software/hardware engineers.	Will need to recruit talent from the Roanoke area that will most likely commute (at least initially). Convincing a firm that the talent exists or could be recruited to the area is going to be a challenge.

UTILITY RESOURCE NEEDS

TARGET INDUSTRY	UTILITIES REQUIREMENTS	MORE DETAILED COMMENTS ON RESOURCE NEEDS
Parts/Components Manufacturing	Industrial grade <ul style="list-style-type: none"> • Electric power • Gas or other low cost heat source • Water/sewer • Telecom 	Utilities should not be an issue unless the operation is slated for the Low Moor area and needs natural gas.
Microbrewery	<ul style="list-style-type: none"> • Low cost light industrial electric power • Source of process heat (natural gas or wood) • Water: 1500+ GPH @45-50 PSI 	Need to be sure that there is an adequate water supply and the quality is acceptable for making beer (without being excessively treated).
Converted Paperboard Products	Light industrial grade for printer, embosser and cutter.	Requires heat source that could be from natural gas or wood.
Printing on Clothing/Accessories	Commercial grade.	No unique utility requirements.
Wood Pellet Production	Industrial grade. Heat source required for drying (use of wood).	No unique requirements.
Customer Care Center	Commercial grade with backup power and telecom.	Having backup electric power and telecom will be critical for some types of operations.
Data Center	High reliability electric power and telecom at relatively high capacity and low cost. Some systems need water for cooling.	Have dual feeds for power and telecom and or/back-up power source is critical.