Green Jobs
TASK FORCE

Green Jobs in Minnesota:
Market Analysis

A Report prepared for the
Minnesota Green Jobs Task Force by GSP Consulting Corp.

GSP

TABLE OF CONTENTS

The Green Jobs Task Force Members and Staff	04
Market Analysis Executive Summary	05
Methodology	08
Results	08
Green Jobs Defined	09
The Green Marketplace	10
Federal Green Jobs Action	13
Minnesota's Business Climate	16
Minnesota Green Jobs Analysis	18
Patents and Research as Indicators	19
Federal Research & Development Awards and Programmatic Funding	20
Federal Green Programmatic Funding	20
Federal Green R&D Funding	21
Renewable Energy: Industry Size and Patents	23
Green Products: Industry Size and Patents	28
Environmental Conservation: Industry Size and Patents	31
Green Services: Industry Size and Patents	34
The Green Jobs Sector in Minnesota	36
Green Jobs: Occupational Analysis	38
Educational Resources	41
Workforce Services in Minnesota	44
Green Jobs Programs in Benchmark States	46
Notes	58
R&D Methodology	58
Research Methodology	59
Employment Projections	60
End Notes	61

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MARKET ANALYSIS EXECUTIVE SUMMARY

Minnesota's Green Jobs Task Force ("Task Force") was established pursuant to 2008 legislation and charged with developing a statewide action plan ("Action Plan") to "optimize the growth of the green economy."[1] In preparing its Action Plan, the Task Force has relied on this Market Analysis to identify business opportunities and needs created by key environmental policies previously adopted in Minnesota including: increasing the use of energy from renewable sources through achieving the renewable energy standard established in section 216B.1691; achieving the statewide energy savings achieved by the conservation investment program under section 216B.241; achieving the greenhouse gas emission reduction goals of section 216BH.02; expanding the use of biofuels including activities to achieve the 25 by 2025 initiative of sections 41A.10 subd. 2 and 41A.11; and monitoring, protecting, restoring and preserving the quality of service waters to further the Clean Water Legacy Act of section 114D.10 subd. 1.

Because of these environmental policies, Minnesota is well positioned to attract and grow green jobs in the state. Already, Minnesota through its focus on renewable energy and the environment has positioned itself as a leader. This leadership has translated into some economic benefit for the state but more is possible with an Action Plan that is focused and targeted on existing areas of market strength.

Highlights of the Market Analysis performed by GSP Consulting that provides the background for the Action Plan include:

- Minnesota is estimated to currently have 52,827 jobs that can be considered as Green Jobs.
- A conservative estimate, considering current economic trends, projects the number of Green Jobs to grow to 55,025 by 2020.
- With full compliance with Minnesota's Renewable Portfolio Standard and Minnesota industry meeting green market opportunities, the state can see increases to as many as 72,467 green jobs by 2020.
- With adoption of an Action Plan, the current growth rate can be accelerated to produce even more jobs (above the 72,467)in Minnesota.
- In performing the Market Analysis, we find that Green Jobs growth will be demonstrated in all market sectors but to realize the growth projection of 72,467 Green Jobs by 2020, the State should focus and target its Action Plan on the Renewable Energy, Buildings Products and Energy Conservation industry sectors in conjunction with the Green Services sector that serves the Renewable and Green Products sector industries.
- The economic output of green jobs is currently estimated at $11B with projected growth by 2020 this figure is estimated to reach as much as $15 B in annual ouput.

SUGGESTED ACTION PLAN ITEMS

For inclusion in the Action Plan, we are recommending the following tools that are in existence in benchmark states and we believe would aid in job creation in Minnesota. We are optimistic that an Action Plan can position Minnesota to compete for Green Jobs by providing:

- More visible and directed green jobs activity
- Funding mechanisms to encourage the adoption of green technology
- Support for increased innovation, research and patents
- A platform for coordination and leverage of existing efforts to access more federal funding

Overall

- There is an opportunity to better coordinate green jobs and in general green opportunity information. During the course of this project information regarding what is currently occurring in Minnesota was not readily available and the various meetings became great opportunities for participants to learn about a variety of activities that are operating under the radar. This issue can be fixed with a 'green office' or improved coordination regarding these activities.
- In our work in the economic development field there are several characteristics that are common to successful economic development efforts:
    - Focus on the opportunities where industry, innovation and markets align – rather than a scattershot approach as many economic development efforts do.
    - Insure the scale is appropriate to the opportunity - several current green jobs programs do not have the resources they need to accomplish their goals.
    - Remain consistent in the effort – job growth and company attraction take time and stakeholders should be patient with the eventual outcomes.
- Identify and support opportunities to boost research and development funding in green technology areas.

RENEWABLE ENERGY

The Renewable Energy sector is the strongest area of economic opportunity for Minnesota. This opportunity will create green jobs both through the expansion of existing firms as well as attraction of firms looking to serve the region. The subcategories of wind, solar and biofuels can deliver the largest number of green jobs.

GSP Consulting estimates indicates that:

- There are currently 9,477 employees in the Renewable Energy sector
- Our projection is that by 2020 Minnesota will have between 12,238 to 18,458 green jobs in this sector.

Based on a review of Minnesota and the benchmark states we offer the following recommendations to support the growth of green jobs in the Renewable Energy category:

- Modify existing programs or create a grant and/or loan program to assist in the adoption of renewable energy technology not covered by Minnesota's utility supported Conservation Investment Programs, or Renewable Development Fund (CO, MI, OH, IL, WI, PA, ND, SD)
- Provide tax credits for installation of renewable energy systems (ND) or tax exemptions for development of co-generation facilities (IA, IL)
- Create additional specialized training programs to support industry growth (IA, MI)
- Develop a biogas and biomass to energy grant program to support development of this market (IA)
- Create a pre-seed investment/ grant program to support the development and adoption of new renewable energy technologies (MI, OH, PA)

GREEN PRODUCTS

Green Products offers the second strongest opportunity for the state of Minnesota. While Minnesota may attract some additional firms in this category, much of the opportunity for green jobs growth in this sector will come from existing firms taking advantage of growing green markets. In particular Green Building Products and Green Transportation (transit) products demonstrate the clearest opportunities.

GSP Consulting estimates indicate:

- There are currently 9,541 green jobs exist in this sector
- Our projection is that by 2020 Minnesota will have between 10,340 and 12,640 green jobs in the Green Products sector.

Based on a review of Minnesota and the benchmark states we offer the following recommendations to support the growth of green jobs in the Green Products category:

- Expedite the permitting process (state and local collaboration) for building green including LEED and GreenStar (Chicago, IL)
- Provide grants specifically for the implementation of solar systems including the rehabilitation of Orphan Solar – i.e. solar installed previously but not functioning properly (CO, PA, and OH). There could also be a property tax assessment reduction for solar systems (IL, IA)
- Create a grant program or tax abatements for high performance green buildings (PA, OH)
- Create a pre-seed investment/ grant program to support the development and adoption of new green building technologies (MI, OH, PA)
- Develop a directory of Green Products and related Green Services to reduce the barrier to find these items. (PA, WI)

GREEN SERVICES

Green Services cover a broad range of industries including energy auditors, green product distributors and solar installers. Minnesota must insure that as an Action Plan is implemented and existing policies are adopted, that a workforce is readily available. For example, several states began to focus on encouraging residential solar only to find out that there was a very limited number of solar installers. Through the Green Jobs Task Force process a lot of discussions centered on enhancing the energy efficiency of buildings and performing retrofits. Minnesota's workforce, education, training, economic, and environmental groups have begun to work together to align their efforts with these green jobs opportunities.

GSP Consulting estimates indicate:

- There are currently 22,441 green jobs exist in this sector
- Our projection is that by 2020 Minnesota will have between 24,841 and 28,337 green jobs in the Green Services sector.

Based on a review of Minnesota and the benchmark states we offer the following recommendations to support the growth of green jobs in the Green Services category:

- Minnesota should seek to convene various potential green services organizations to educate and explore opportunities for green jobs growth. These would include but are not limited to:
  - Architects, contractors, and developers
  - Banking and investment groups
  - Insurance industry representatives
  - Local government and economic development professionals
- While the education pipeline is critical in all of the green jobs categories it is certainly important in the green services sector to match up private sector needs with the education and training delivery system.

ENVIRONMENTAL CONSERVATION

Minnesota is widely recognized for its commitment to environmental conservation. The question is how this behavior translates into economic opportunity for the state. In performing our analysis we noted that Minnesota had positive growth numbers in this sector.

GSP Consulting estimates indicate:

- There are currently 11,367 green jobs exist in this sector
- Our projection is that by 2020 Minnesota will have between 11,514 and 12,032 green jobs in the Environmental Conservation sector.

Based on a review of Minnesota and the benchmark states we offer the following recommendations to support the growth of green jobs in the Environmental Conservation category:

- Create a program that provides grants for pollution control technology (PA)
- Seek to align recently passed Natural Resource and Cultural Heritage program funding initiative with opportunities for green jobs growth

These recommendations and the suggestions received during the public stakeholder process provide solid inputs for the development of the Action Plan.

ABOUT THE GREEN JOBS TASK FORCE

The Green Jobs Task Force was created by the Minnesota legislature in 2008 to advise the governor and the legislature regarding activities to advance the state economy, and to develop a statewide action plan to optimize the growth of the green economy. The task force consists of Minnesota leaders from the legislative, administrative, regulatory, business, academic, environmental, labor and economic development sectors. The task force hired GSP Consulting Corp, to provide a Market Analysis report to guide the development of a Green Jobs Action Plan. The Action Plan will be a companion document that will lay out a series of recommendations for the state to pursue in order to create green jobs.

In addition to the research conducted by GSP Consulting, during the course of this work the Green Jobs Task Force engaged three subcommittees:

- Workforce Education and Training for Green Jobs
- Attracting and Growing New Green Jobs
- Retaining and Expanding Green Jobs

These subcommittees made up of representatives from a variety of disciplines have engaged in a public process to understand green jobs opportunities and assess needs for Minnesota.[2]

FOCUS OF THIS REPORT

The focus of this report centers on the green economy opportunities that are presented in Minnesota based on green jobs related markets, industry strengths, innovation strengths and overall economic framework. The work contained in this report consists of:

- Review of Minnesota's green economy
- Business - market analysis
- Primary industry classification, occupational and innovation research related to green jobs performed
- Analysis of education and training infrastructure to support green jobs
- Analysis of green job opportunities both with and without a defined Action Plan
- Benchmarking Minnesota to ten other states in terms of both strength of the green economy sector as well as policies and actions that have been taken to bolster the green economy
- Recommendations based on analysis and our experience in the area of green jobs economic development

METHODOLOGY

GSP Consulting utilized primary research and a review of research being released almost daily by other sources to quantify and define the green jobs marketplace. The work conducted includes:

- Creation of a research definition of green jobs.
- Assembly of market information that tracks existing levels of green activity in the U.S. marketplace and then analysis to produce market estimates for 2020.
- Identification of North American Industry Classification Codes (NAICS) that represent potential green industries.
- Analysis and the development of 'green share' formulas that have taken the NAICS totals (establishments and occupations) and produced output that is representatives of the actual number of green establishments and green jobs in the state. The green share formulas were developed as a way of taking market data and determining the relative percentages of jobs in a particular industry that can be assumed to be green.
- A review of green related innovation activity in the state and benchmarks including research and patenting activity. These measures are important in gauging if Minnesota has a competitive advantage beyond the existing industries. Communities that have an increased level of research and patents also will have a more dynamic economy that can withstand economic downturns and is more readily able to grow.
- Benchmarking all of this information to peer states to assess Minnesota's overall competitive advantage in the green marketplace.

RESULTS

The Market Analysis provides a resource for the Green Jobs Task Force as it develops and defines the Action Plan for the state legislature and Governor. While numerous reports have come out in the past year that have sought to determine the number and make up of green jobs, this study is significant for several reasons:

- First, the Minnesota Green Jobs Task Force Market Analysis builds upon previous work done for both Minnesota (Minneapolis/ St. Paul) and at the national level. GSP Consulting was able to analyze how other groups had categorized green jobs, and custom fit these and additional definitions to Minnesota's specific case.
- Second, GSP looked at green impacts to determine industries' and occupations' "shades of green." Some industry occupations are clearly green while others can have a green impact, but may or may not.
- Finally and most importantly, the Market Analysis is the first green jobs study to make projections of green jobs based on the percentage of jobs within an industry that can be categorized as green. Other reports have simply used entire industry figures (for instance all welders or electrical engineers) which can lead to numbers that are greatly exaggerated above the actual levels of green jobs. GSP's method, though more conservative, provides jobs projections that are much closer to actual. This allows for better targeting when allocating resources to foster a green economy.

GREEN JOBS DEFINED

In recent years and especially in recent months there has been a growing chorus of leaders from government, industry, and advocacy highlighting the opportunities presented by green jobs. Like many new terms that enter the national rhetoric, the definition of green jobs is subject to the unique perspective of the individual referencing the term. Much like their predecessors of white, blue, and gold collar jobs, a green jobs definition will evolve and take new meaning as time goes by. For purposes of this report, it was necessary to create a definition of green jobs that could be utilized for our market analysis. The market analysis was required to define the size of the green jobs industry as well as occupations that would fit a green job's description. In order to do this we utilized the North American Industry Classification System codes (NAICS) to measure the size of industries that could be "green" industries. To facilitate the research we developed the following definition:

Green Jobs are employment opportunities in four industry sectors that are part of the green economy including:

- Green Products
- Renewable Energy
- Green Services
- Environmental Conservation

Green Products are industries related to the manufacture of products that reduce environmental impact and improve the use of resources such as energy efficiency, water conservation and materials use and re-use.

Green Products are used in one of the following four areas:

- Building – including LEED and other certified buildings
- Transport – including hybrid vehicles and components
- Consumer Products
- Industrial Products

Renewable Energy includes industries related to the production of energy from natural resources such as sunlight, wind, water, geothermal, and biofuels such as corn, soybean, and wood products. The Renewable Energy category also includes industries related to all forms of waste heat recovery and industries that utilize biomass (i.e the utilization of animal waste, crop waste etc) for energy including cogeneration.

Green Services are industries and occupations that are providing a range of services that are helping to build and supply the green economy, utilizing green products and technologies, related to energy infrastructure, farming, and recycling and waste management

Environmental Conservation includes industries related to conservation of air, water and land including air emissions control, monitoring and compliance, water treatment, water conservation, wastewater treatment, land management (including prairie), natural pesticides, natural fertilizers and aquaculture.

THE GREEN MARKETPLACE

CURRENT OVERALL TRENDS

The green jobs discussion became a national one in 2008 as interest that began with high energy costs and global warming concerns was made more urgent by a severe economic downturn and a growing realization that the old way of doing business must change. As the GSP Consulting team reviewed the green jobs landscape we were struck by the diversity of organizations and individuals interested in working to define and create green jobs. From trade unions to private equity investors, from hospitals to farmers, from school students to presidential candidates, the focus on green jobs has continued to intensify. This focus is supported by a set of compelling market data that indicates several areas of opportunity which we will highlight based on the green jobs research definition categories.

RENEWABLE ENERGY

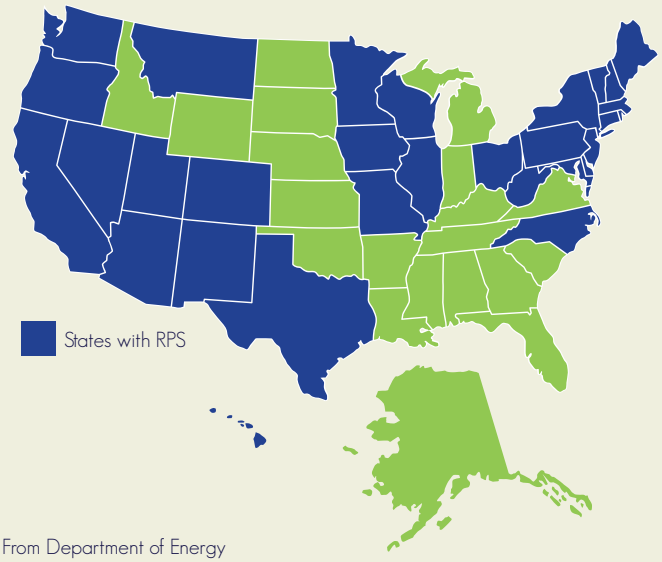
Twenty-four states have Renewable Portfolio Standards in place that will continue to drive the demand for increased renewable energy production.

- According to the International Trade Administration, U.S manufacturing capacity cannot keep pace with demand for products such as wind turbines. The market is projected to experience a 40% compound annual growth rate between 2008 and 2013. U.S. market value for wind turbines, components and systems will reach $60.9 billion by 2013.[3]
- The U.S. Department of Energy reports 11,603 MW of wind power installed at end of 2006. This figure soared 45% to over 16,000MW installed capacity in 2007.
- Ethanol production as of 2007 was a $6.7 billion industry. However, spending on transportation, operations, and capital investments for new plant construction added an additional $21 billion to the U.S. Gross Domestic Product.[4]
- Investment in Biodiesel production facilities totaled $810 million in 2006.[5]
- In 2007, projects in the U.S. invested roughly $1.8 billion in geothermal projects. An additional investment of $15.1 billion is needed to develop all planned geothermal projects in the western U.S. by 2015.[6]

Minnesota's Renewable Energy Policies and Opportunities

Minnesota has been at the forefront of focusing on renewable energy from a policy and regulatory standpoint. The state's Renewable Portfolio Standard is considered one of the strongest in the nation with a goal of 25% renewable by 2025. In

STATES WITH RENEWABLE PORTFOLIO STANDARDS



From Department of Energy

addition, the state created a Next Generation Energy Board that is supporting the development of new biofuels and working on implementation of regional energy production projects and energy efficiency goals. These activities will enhance the market estimates and will provide a jump start on Minnesota's ability to grow and attract green jobs.

GREEN PRODUCTS

- McGraw Hill released a report titled "Green Outlook 2009: Trends Driving Change," in November 2008 that found:
  - 10-12% of new commercial construction starts are green, representing a $24-$29 billion market.
  - By 2013 the green commercial construction market is on track to grow to $56-70 billion
  - 6-10% of all new residential construction starts are green, representing a $12-$20 billion market, which is expected to grow to $40-$70 billion by 2013.
- Over $300 billion (2004) was invested in energy efficiency technologies for industrial, commercial and residential applications. Estimates suggest this sector will grow to $700 billion by 2030.
- The LED (light emitting diode) market experienced 12% growth in 2008 and should exceed $10 billion by 2012.[7]
- The global battery market is expected to grow 3.7% annually from 2008-2012, reaching $84 billion.[8]
- The U.S. market for advanced drinking water filtration technologies is projected to grow to more than $2.1 billion by 2012. 2006 market value for these products was roughly $1.3 billion. Particular attention should be paid to UV filtration technologies. Currently valued at $29 million, this market is expected to surpass $150 million by 2012.[9]
- Worldwide purchases of heavy duty diesel emissions control devices are projected to triple by 2020 to over $21 billion.[10]

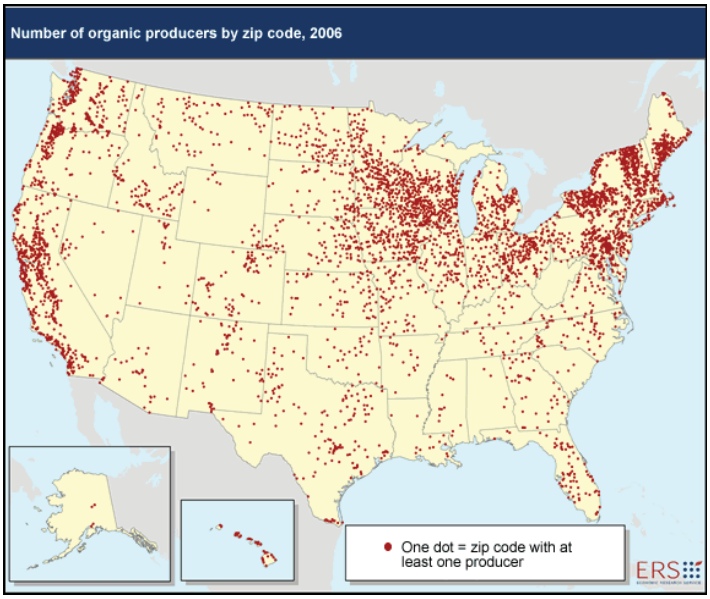
Minnesota's Green Product Policies and Opportunities

Minnesota has begun to support the growth of green product and service markets. The Next Energy Generation Energy Board has a goal of 1,000 Energy Star commercial buildings by 2010 which will drive the use of green products. Minnesota Green Star is focused on creating healthy and sustainable residential buildings throughout the state. In addition initiative's such as the Minnesota Sustainable Buildings Guidelines require that state buildings (and building developed using state bonds) must adhere to the state's sustainable design guidelines. These guidelines ensure that all new state buildings initially exceed the existing energy code by at least 30 percent. The guidelines focus on achieving the lowest possible lifetime cost for new buildings and encourage continual energy conservation improvements as well as use of renewable energy systems. These activities and several smaller initiatives will continue to increase the demand for green products in the state.

ENVIRONMENTAL CONSERVATION

The environmental conservation industry has seen significantly more progress in recent years with the passage of various regulatory provisions at the state and federal levels with regard to pollution and emissions control. The mantra of "Reduce, Reuse Recycle:" has been taken up by many industries outside of the traditional environmental movement with the goal of causing widespread, systemic change.

- Since the Clean Air Act was enacted in 1970, air pollution has been cut more than 48 percent, even as our population and economy have continued to grow.[11]
- The world market for motor vehicle exhaust emission control technologies was approximately $35 billion in 2000 and an estimated $48.6 billion in 2005. In 2010, the world market is expected to approach $71 billion.[12]
- The air pollution control industry (mobile and stationary source controls) is a multi-billion dollar industry that employs about 85,000 workers in the U.S. and has created many high-skill, high-paying jobs.
- U.S organic sales, including food and non-food products, are growing at over 20% per year with $21.2 billion in sales in 2007 and projections for over $25 billion in 2008.[13]
- Water-related expenditures continue to rise – 26 states have $10 billion in approved water projects.[14]



Minnesota's Environmental Conservation Policies and Opportunities

Minnesota is already recognized for its quality of life, among many other factors, due to a history of protecting the environment. In November 2008, that commitment was expanded as a Constitutional Amendment passed increasing the states sales tax rate by 3/8 of one percent to be used for natural resource and cultural heritage programs. While details of the specific initiatives that this funding will support are still being developed, it is clear that Minnesota will see an increase in the green job opportunities related to Environmental Conservation.

Other activities include: Sustainable Forest Certification with over 4.84 million acres of state-administered forestlands verified as sustainably managed and Minnesota has established a strategic vision and action plan to increase the number of acres of family forest land with Forest Stewardship Management Plans from 1.3 million today to 2.3 million acres by 2015.[15]

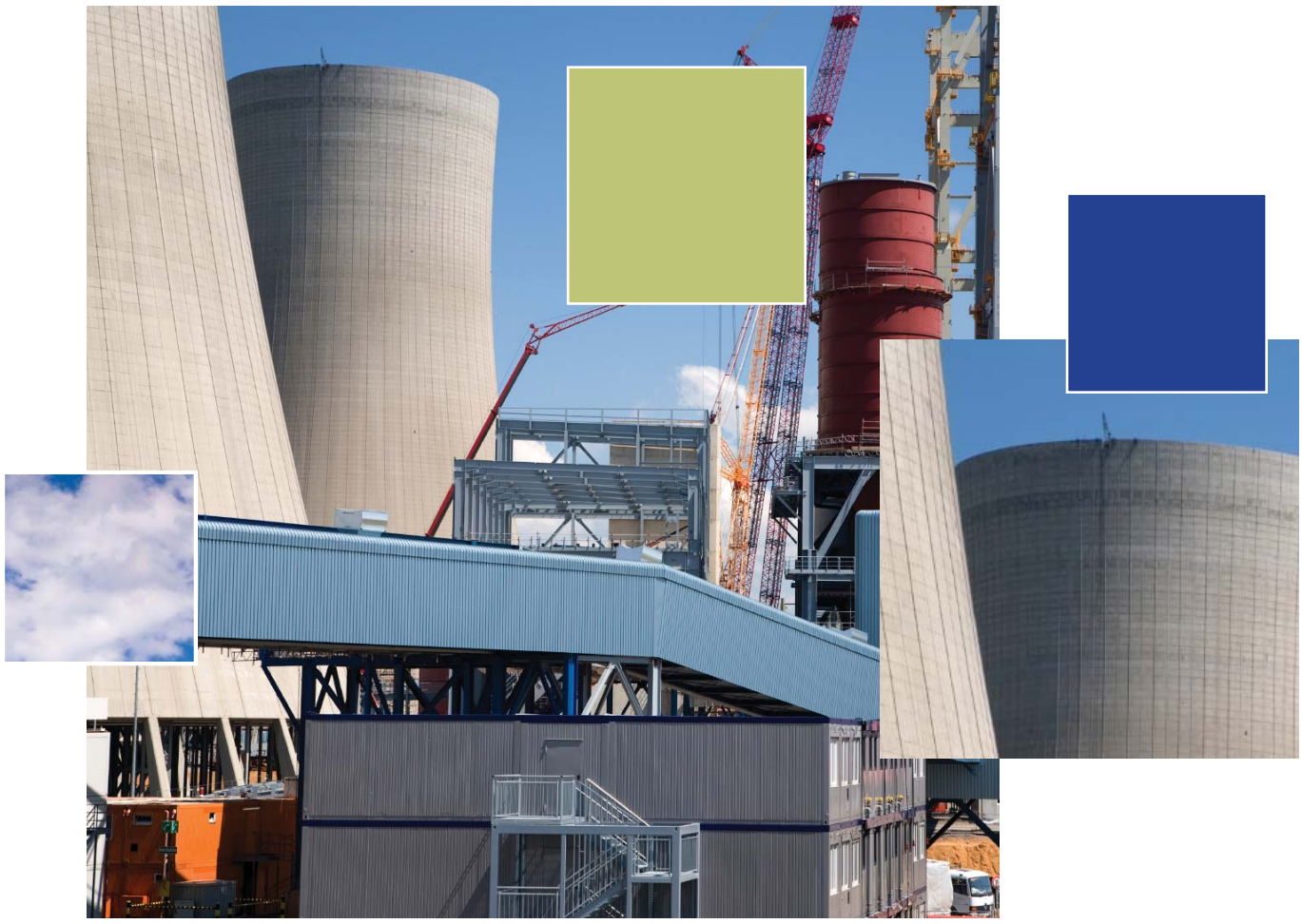
GREEN SERVICES

The green services sector has seen significant growth as these industries support the growth of the other three green jobs sectors.

- Continued investment in the cleantech space will drive new market opportunities. In the 3rd quarter of 2008 alone, $2.6 billion was committed to cleantech investments in the U.S.[16]
- Waste management and remediation services are forecasted to grow 5.3% annually until 2012 when the market is expected to reach $109 billion. Increasing interest in material recovery and recycling will drive this growth.[17]
- Insurance products are continuing to be introduced. An example is the Fireman's Fund Green Insurance program which offers premium discounts and covers replacement costs of upgrading to green building.[18]
- Green Mortgages and Energy Efficient Mortgages (EEM) continue to expand in their popularity as more banks and lenders understand the short and long-term benefits of these products.[19]
- The numbers of architects, engineers, builders, developers adopting green practices has continued to show growth with an average of 15% increase each year in their specifications and materials use.

Minnesota's Green Service Policies and Opportunities

Programs like GreenStar and the Conservation Improvement Programs offered by the utilities are driving the need for green services. From energy auditors to building retrofit construction professionals, the states existing programs and regulations are creating new green jobs. GSP Consulting was not able to identify insurance and/or retail banking groups that are focused on the green marketplace. Educating these groups on the opportunities of the green market may also help create additional green jobs.



FEDERAL GREEN JOBS ACTION

There are numerous federal green job related opportunities that are already being implemented or designed. The key to leveraging federal dollars often has as much to do with organization as it does with programmatic merit. It seems clear that there are growth opportunities for Minnesota in each of the four identified sectors. Minnesota should work to support the bonds between Industry strengths and R&D efforts, as well as industry needs and workforce development programs. Doing so will allow Minnesota programs a better chance of receiving federal dollars across the board as applied to green jobs.

Among the many initiatives the federal government puts forward, it seems that there are three in particular the present the best opportunities. While the Farm Bill has already been passed into law, the funding opportunities it requires will take place over the next few years. Similarly, the stimulus package that is being proposed by President Obama will take time to implement once passed. This lag will allow Minnesota the necessary time it may need to align strategies and submit winning proposals. Finally, the federal energy bill which was signed into law in late 2007 is finally beginning to be implemented. These programs also present opportunities to fund Minnesota initiatives.

Minnesota should become more aggressive at pursuing federal funding opportunities. The stimulus will be the first set of programs to be introduced under the new president but it is predicted that soon after additional initiatives will be developed. These range from a increased commitment to research and development funding to a restructured workforce development system.

Historically Minnesota has not done well at well at receiving support back from the federal government in return for the taxes its residents and corporations pay. The chart below shows that of the benchmark states Minnesota ranks the worst in this area, with only $0.72 on the dollar coming back to the state from the federal government. In other words in 2005 the state contributed over $40.5 billion in taxes and received back only $31 billion in funding. Whereas a state like North Dakota contributed $3.8 billion in taxes and received $6.6 billion in federal funding. The state must work to not allow this kind of disparity to occur when it comes to green jobs funding from programs like those proposed in the economic stimulus and the other initiatives profiled in this section. While it is difficult to identify the cause of this situation we do note that Minnesota seems to have fewer discretionary or flexible funding streams that can be utilized to match these efforts. Often these opportunities require matched contributions from the state or other sources and also require a swift application process. Minnesota must insure that it has both tools in place to be able to improve their performance in the receipt of federal funding.

State	Fed Spending Rec'd per $1 of Tax Paid	Rank
CO	$0.81	41
IL	$0.75	45
IA	$1.10	24
MI	$0.92	37
MN	$0.72	46
ND	$1.68	6
OH	$1.05	31
PA	$1.07	28
SD	$1.53	8

Source: Tax Foundation - 2005 Data

2008 FARM BILL

Congress passed a comprehensive Federal Farm Bill in May 2008. There are numerous provisions which can benefit Minnesota, both in terms of bolstering existing strengths and in building upon new opportunities.

With regard to new green jobs, the greatest impact on Minnesota will likely be in the renewable energy sector, as the bill devotes much new funding to assisting the bio-based energy industry. Minnesota should position R&D, and economic development efforts to leverage funding from the Farm Bill. The most promising funding opportunities within the Farm Bill (as related to the 4 green job categories) are listed below and come from the U.S. House Committee on Agriculture.

2008 FARM BILL INITIATIVES THAT CAN BENEFIT MINNESOTA

Environmental Quality Incentives Program (EQIP)
- Funded at $3.4 billion
- Offers financial and technical help for conservation structures and practices
- Now includes conservation practices related to organics

Support for organic and locally grown food
- Provides $33 million to expand opportunities for direct producer-to-consumer marketing
- The Farmers' Market Promotion Program provides competitive grants to improve and expand direct producer-to-consumer market opportunities
- Provides $22 million for USDA's cost-share program that organics can access

Repowering Assistance
- A new program that helps biorefineries replace traditional fossil fuels used to power the biorefinery process
- Funding of $35 million through CCC for FY 2009

Advanced Biofuels
- Provides incentives for expanding production of advanced biofuels made from agricultural and forestry crops and associated waste materials, including animal manure and livestock/food processing waste
- Targets smaller-scale plants (150 million gal/yr or less)
- $300 million from 2009 – 2012 through the CCC

Rural Energy for America Program (REAP)
- Provides grants and loans for energy audits, feasibility studies, project development and purchase of renewable energy systems/energy efficiency improvements
- • Funded at $255 million through the CCC for 2009 – 2012

Biomass Crop Assistance
- New program that seeks to support establishment and production of eligible crops for conversion to bioenergy, and to assist agricultural and forest landowners with collection, harvest, storage, and transportation of these crops to conversion facility
- Payments for up to 75% of cost of establishing an eligible crop
- Matching payments of up to $45/ton for 2 years for collection, harvest, storage, and transportation to a biomass conversion facility
- Contract terms are up to 5 years for annual and perennial crops and up to 15 years for woody biomass

Rural Water Infrastructure
- Provides $120 million for critical water and wastewater projects in rural areas
- Renews Water and Waste Disposal Grants and Rural Water and Wastewater Circuit Rider Programs to help reduce water and waste disposal operating costs for rural areas and towns
- Provides grants to qualified non-profit organizations for the construction of household water well systems in low-income areas

2009 FEDERAL STIMULUS PACKAGE

As this Market Analysis is bring put together there a number of potential green jobs related initiatives are being proposed as part of a federal stimulus proposal. The following list was developed with what information was available as of February 1st, 2009 and is expected to change prior to any formal passage. The programs and opportunities listed are at a minimum telling of the priorities that have been developed under the new President's administration.

Renewable Energy Environmental Conservation Green Services Green Products

2009 FEDERAL STIMULUS INITIATIVES THAT CAN BENEFIT MINNESOTA ‹AS OF 2/1/09›

Renewable Energy Loan Guarantees
- $8 billion for loans for renewable energy power generation and transmission projects

Energy Efficiency Housing Retrofits
- $2.5 billion for a new program to upgrade HUD sponsored low-income housing to increase energy efficiency, including new insulation, windows, and furnaces

Home Weatherization
- $6.2 billion to help low-income families reduce their energy costs by weatherizing their homes, increase efficiency

Clean Water State Revolving Fund
- $6 billion for loans to help communities upgrade wastewater treatment systems

Training and Employment Services
- $4 billion for job training including formula grants for adult, dislocated worker, and youth services. Priority consideration will be given to "green" jobs and healthcare
- Green jobs training will include preparing workers for activities supported by other economic recovery funds, such as retrofitting of buildings, green construction, and the production of renewable electric power

2007 FEDERAL ENERGY BILL

The final set of programs that may be useful to Minnesota come through the Energy Independence and Security Act of 2007 (EISA). This piece of legislation will fund billions of dollars worth of R&D, upgrades, demonstrations projects, and incentives. Several of the most relevant programs to green jobs are listed below.[20]

2009 FEDERAL ENERGY BILL INITIATIVES THAT CAN BENEFIT MINNESOTA

Recoverable Waste Energy Inventory Program
- US Department of Energy (DOE) will provide free technical support
- DOE will fund up to half the cost of any recoverable waste energy feasibility study

Waste Energy Recovery Incentive Grant Program
- Projects recovering waste energy will get $10 per megawatt-hour gained during the first three productive years
- Half of the incentive dollars will be funneled to utilities to enable purchase or transmission of this recovered power
- Other waste-heat recovery will earn $10 per additional 3,412 million Btus achieved, if the heat is applied to purposes other than those originally sought

Renewable Energy Construction Grants
- Grants have been authorized to subsidize up to 50% of the cost of renewable energy electricity projects, including biomass and landfill gas production.

Express Loans for Renewable Energy
- Small Business Administration funds will be administered to help businesses utilize biomass (including animal and other waste, but not unsegregated solid waste)

Energy Efficiency and Conservation Block Grant Program
- Funded annually at $2 billion recurs each fiscal year, 2008-2012
- To be used for energy efficiency improvements including distribution-related technologies and heating and cooling systems
- Purchase of technologies to reduce, capture, and maximize use of methane and other greenhouse gasses (GHG) generated by landfills or similar sources
- Development of onsite renewable solar, wind, fuel cells, and biomass
- Grants for investment in energy are to be apportioned at 68% to local governments, 28% to states, 2% to Indian tribes, and 2% by competitive solicitation

Renewable Energy Environmental Conservation Green Services Green Products

MINNESOTA'S BUSINESS CLIMATE

Minnesota has not placed as much emphasis on identifying and supporting the economic opportunity that will result from its environmental policies and other green market drivers. During the course of our analysis the Governor, Tim Pawlenty, released a green jobs plan described to the right.

When compared to its peers and ranked nationally Minnesota ranks well overall. During our research and participation in the subcommittees several individuals sighted a high corporate tax burden as being a critical economic flaw. We note that a 21st Century Tax Commission has been working on analyzing the existing tax structure in the state. The Commission will recommend tax law changes for a 21st century economy that will improve Minnesota's ability to successfully compete with other states and nations for jobs and business investments, and that promote the long-term economic prosperity of the State and its citizens.

Sources such as the Tax Foundation[21] rank Minnesota 42nd in its 2008 rankings while Forbes which bundles taxes with labor and energy costs ranks Minnesota at 31st. Two of the better rankings are ones that are increasingly becoming more relevant for companies looking to expand to a community: Labor and Quality of Life. The costs of training and recruiting a workforce are now considered much higher on the corporate site selection decision tree than in past years. Minnesota is very strong in both of these rankings which should position it well to attract both new companies and workers.

While Minnesota has a high overall ranking[22], business costs are a significant concern, especially compared to the Dakotas and Iowa. Even though these competitor states rank worse

GOVERNOR PAWLENTY'S GREEN JOBS INVESTMENT INITIATIVE (NOVEMBER 2008)

- Creates new tax-free incentives through a new segment of the state's JOBZ program entitled "Green JOBZ." To qualify, a business must support the state's 25x25 renewable energy standard. Qualifying projects receive the same incentives available under the JOBZ program for 12 years on any agreements initiated before 2015. Incentives offered include exemptions from the corporate franchise tax, income tax, state sales tax, capital gains tax, and commercial property taxes paid on physical improvements. An exemption also exists for the wind energy production tax.
- Establishes a new Job Growth Investment Tax Credit worth $20 million over four years. 50% of the credit goes towards green job products that promote the state's renewable energy goals.
- Implements a new Small Business Investment Tax Credit worth $60 million for insurance companies making investments in capital companies. The capital companies must invest in qualified Minnesota businesses. A capital company is a state sanctioned venture capital firm funded by an insurance company. Half of the tax credits are focused on green job growth.
- Creates incentives to expand the infrastructure and production of biomethane, solar, and other renewables. The incentives are based heavily on providing electric and natural gas utilities with credits towards the annual energy savings requirement.
- Creates a clean and green technology category within the Minnesota Cup competition to connect Minnesota entrepreneurs, business executives, investors, and academia.
- Continues tracking the state government's energy usage and monitoring greenhouse gas emissions reduction.

overall as well as in several other categories, their targeted efforts toward the renewable fuel sector (specifically wind and ethanol production) present a significant challenge to Minnesota as it seeks to grow its own market.

With any new technology, the combination of production costs, regulatory concerns, and market adoption represent substantial risk factors. While Minnesota has the most aggressive Renewable Portfolio Standard (RPS), Iowa and the Dakotas have made great headway on keeping business costs to a minimum, creating state incentive programs to support specific industries, and looking at ways to link workforce development to industries such as wind.

	WA	MN	ND	IA	SD	IL	OH	WI	MI
Forbes Overall Ranking	3	11	13	22	23	35	39	43	47
2007 Rank	5	10	9	24	25	40	38	44	46
Business Costs	28	31	8	12	1	36	29	37	39
Labor	2	7	30	39	38	27	47	37	44
Regulatory Environment	6	20	13	22	46	28	10	37	4
Economic Climate Rank	7	35	22	23	15	37	47	26	46
Growth Prospects Rank	2	21	36	48	41	25	47	46	49
Quality of Life Rank	25	4	26	13	22	18	11	16	32
Site Selection Top 25 2008	NA	22	NA	18	NA	9	7	NA	16
CFED 2007 Resource Efficiency	B	B	F	C	C	B	C	B	C

MINNESOTA GREEN JOBS ANALYSIS

GSP Consulting has performed primary research to identify existing industry strengths that can be harnessed to support the development of green jobs in the state. For each of the four categories we describe the industry trend over the past five years, the patenting and research activity for each. While the focus of this report is on future opportunities, it is important to understand what areas Minnesota is positioned to focus on as it develops recommendations and the action plan for pursuing green jobs.

For each green jobs category we have utilized a location quotient chart to explain our data findings. A location quotient is a way of comparing a particular regional industry or sector to an average concentration for jobs or firms. The location quotients can then be compared across sectors and regions to indicate which industries within which regions have a higher than average concentration (LQ > 1.0).

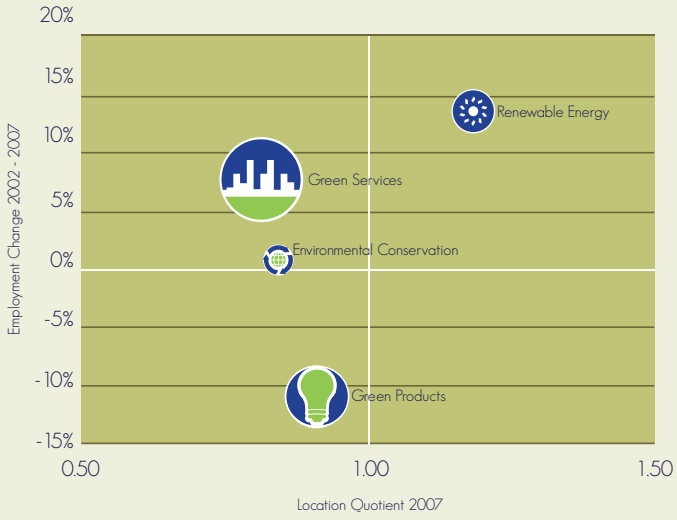
The graph shows Minnesota's location quotient for each of the four categories that we have been using. The graph in general can be interpreted as:

- The size of the circle represents the number of jobs in the group of industries defined for the category.
- The percent change (y-axis) is the overall employment growth or loss over the past five years.
- Sectors that have a location quotient (x-axis) greater than 1.0 are considered strong concentrations and are thus stronger industries in a particular area.

What this specific graph is telling us is that:

- Minnesota's Renewable Energy related sector has the strongest concentration of firms out of the four green sectors and has demonstrated significant growth over the past five years.
- Green Products related industries employee a large number of people but have seen significant job loss during the recent five year period. Suffering declines along with the broader manufacturing sector.
- Environmental Conservation represents the smallest industry relative to the three others by a substantial margin. While it is growing slowly, it still lacks a the significant concentration of firms needed to capture a larger than normal share of the market.
- The Green Services related sector is the largest and is growing but it does not have significant concentration. Because of the size of this sector there may be sub sectors that have more significant opportunity.

MINNESOTA GREEN OPPORTUNITIES



PATENTS AND RESEARCH AS INDICATORS

In analyzing green job opportunities it is important to review not just the existing base of firms but also the pipeline of ideas that will assist existing companies and inspire new start ups. While not all of the research and patents will remain in the state, these indicators provide a method of gauging the strength of the human capital and innovation resources.

Nuclear-related patents were given their own patent class because there is still debate as to where nuclear energy fits in a clean power strategy. To obtain patents on a per capita basis, population numbers from the 2005 – 2007 American Community Survey were utilized. Patents per 250,000 people was the measure used because of the small number of patents in certain categories. Using a smaller measure would have created a situation where a state's data would not be seen due to the extremely small number of patents in a particular area.

FEDERAL RESEARCH & DEVELOPMENT AWARDS AND PROGRAMMATIC FUNDING

The following section tracks the research and development awards provided by the federal government to research performers in the state of Minnesota. This information is important on two levels, first, federal research dollars can support the growth of the innovation pipeline and support existing companies with then state. Second, a state's ability to attract research and program funding for their activities helps improve the balance between federal taxes paid from the state and federal funding spent in the state. For every dollar that Minnesotans pay in federal taxes only $.72 returns to the state which places Minnesota in 46th place overall. A green jobs strategy should seek to enhance that ratio by identifying federal opportunities to support Minnesota efforts.

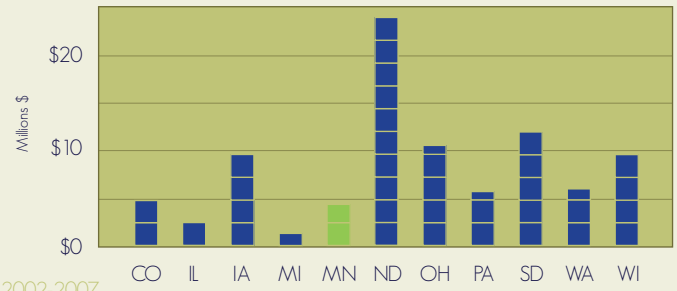
FEDERAL GREEN PROGRAMMATIC FUNDING

Minnesota saw a steady increase in total programmatic funding from 2002 to 2004 where it hit its high point of over $42 million. In 2004 Minnesota ranked behind only Ohio and Illinois in total funding and behind only Ohio in the size of the average award. 2005 and 2006 saw drop-offs in the number of green programmatic awards and funding totals in all but Washington and Wisconsin. In 2007 there was a general increase in both totals (with the exception of Washington and Wisconsin), with Ohio seeing a very sharp increase.

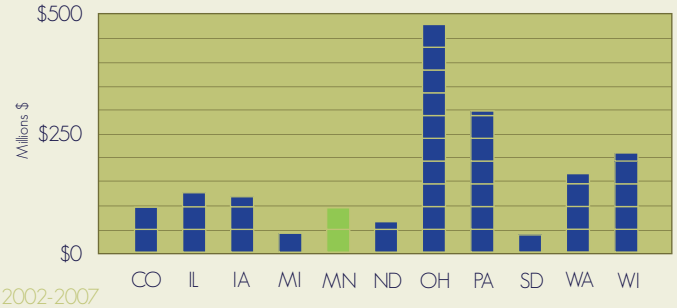
Looking at the trends from year to, Minnesota tends to mirror the benchmark states and actually saw more drastic increases and declines than all but Illinois and Ohio. However, when one looks at the total amounts from all six years, Minnesota ranks 9th out of nine states in the number of green programmatic awards and 6th in total funding for those same years.

It is important to note that Ohio's numbers are slightly inflated due to several large awards to the state's Department of Environmental Protection. Four of these awards accounted for $360 million. Minnesota's funding went in large part to the Minnesota Pollution Control Agency, as well as the MN Department of Natural Resources, and the University of Minnesota. It is interesting to note that Minnesota has

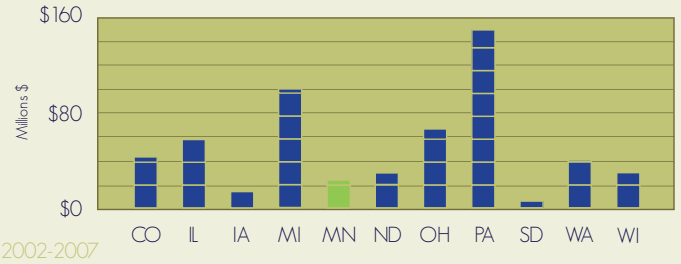
TOTAL FEDERAL GREEN PROGRAMMATIC FUNDING PER 250,000 PEOPLE



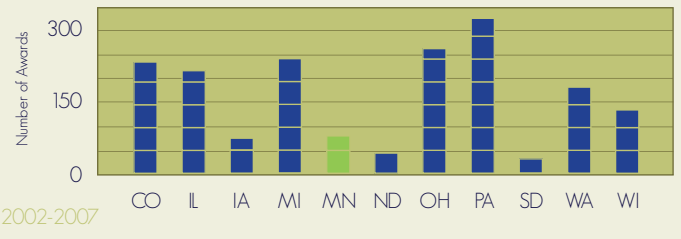
TOTAL FEDERAL GREEN PROGRAMMATIC FUNDING



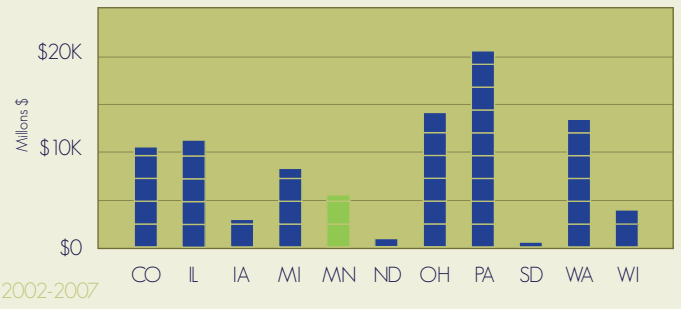
TOTAL FEDERAL GREEN R&D FUNDING



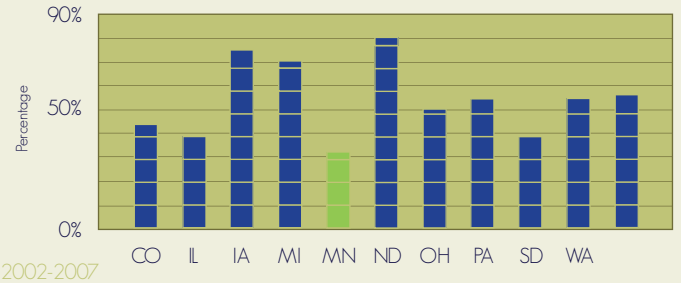
TOTAL FEDERAL GREEN R&D AWARDS



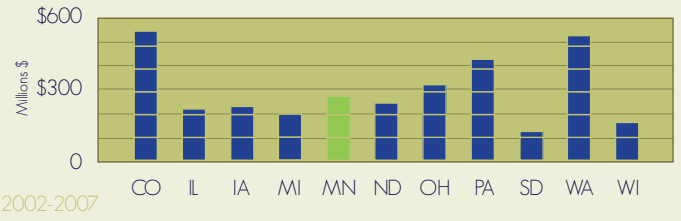
R&D TOTALS (ALL AWARDS)



UNIVERSITY PERCENTAGE OF TOTAL FEDERAL GREEN R&D AWARDS



R&D TOTALS PER 250,000 PEOPLE



significantly fewer awards designated to Native American groups than Wisconsin, Michigan, or South Dakota. This may constitute an opportunity that Minnesota can build upon in securing federal dollars for green projects, and accessing nontraditional sources of federal agency dollars.

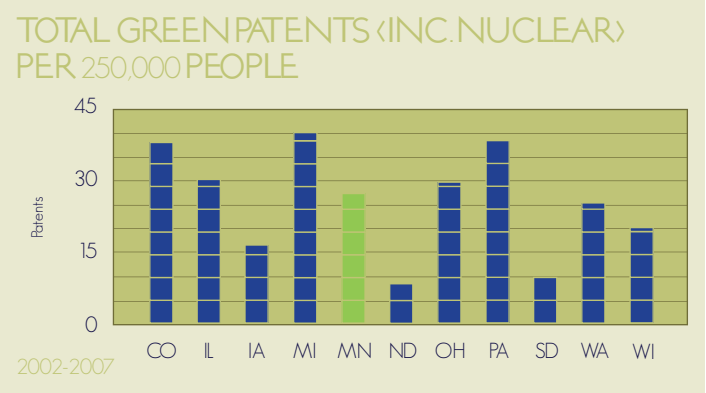
FEDERAL GREEN R&D FUNDING

Minnesota ranked slightly better in terms of numbers of green R&D awards between 2002 and 2007 coming in tied for 6th (with Iowa) out of the nine states. However, Minnesota fared worse when considering total R&D funding over the same time period where it ranked 7th. With regard to these totals, Minnesota came closer to its peers in R&D funding than in the programmatic funding. Minnesota was only $33 million below the third ranked state (IL) than the $71 million difference between it and WA when in the above charts.

The lower number of R&D awards in Minnesota does not appear to coincide with the low number of total unique recipients over the 2002 – 2007 time period. For instance, while Minnesota's 77 R&D awards went to only 24 recipients, Wisconsin had 132 awards and 25 recipients, Michigan 239 awards and 35 recipients, Illinois 217 awards and 46 recipients, and Ohio had 277 awards with 54 recipients. This being so, it appears that Minnesota does not lack the diversity of organizations engaging in green research and development, simply lower levels of such a concentration.

To this point, it is also important to look at where the research is being led. Of most importance to majority of states when it comes to total funding for green R&D is the level of university engagement. This is not the case in Minnesota where funding to the University of Minnesota totaled nearly $6 million, but funding for 3M-related research and development topped more than $10.5 million. Contributing to this fact is the low number of awards to the University, especially compared to the benchmark states. Only 32% of the green R&D awards went to the University of Minnesota compared to 50% to universities and colleges in Ohio and nearly 70% in Michigan. This would seem to suggest that there is not the focus on green-related R&D in Minnesota as there is in competitor states. This could bode badly for Minnesota as many jobs and opportunities are often created out of the technology transfer from university projects. If Minnesota does not better target its research, it may fall further behind other states in the region and country, and lose out on capturing a larger portion of the green market.

One other element may also contribute to the gap that Minnesota sees between itself and the benchmark states in terms of green research and development. First is the presence of other for-profit or non-profit research institutions. Minnesota has a very strong and important presence in this regard from 3M, and to a much lesser extent the Green Institute.[23] However, benchmark states not only have more colleges and universities



engaged in green R&D and programs, but they also have greater numbers of these other types of research-supporting organizations. For instance, Wisconsin has organizations such as the Michael Fields Agricultural Institute, and companies conducting energy efficiency-related research such as Dresser, Inc, Virent Energy Systems, and Waukesha Engine. Ohio has the Battelle Memorial Institute, the Ohio Aerospace Institute, and Nextech Materials, while Michigan has extensive university systems along with the presence of the auto industry.

In terms of total R&D for all projects (not just green), Minnesota lags all the benchmark states with the exception of Iowa, North Dakota, South Dakota, and Wisconsin[24]. However, when one considers population, Minnesota does much better. Using this measure, Minnesota leads states such as Illinois, Michigan and Wisconsin, and is only slightly behind Ohio. Using a per capita analysis, Colorado and Washington stand out and greatly outrank the rest of the field[25]. This is likely due to their smaller population sizes and Washington's leadership in private R&D with companies in the computer and aerospace industries. Colorado also has a smaller population and the presence of federal labs. Minnesota does well due to its smaller population combined with industry leaders such as 3M and Medtronic, as well as research conducted through the University of Minnesota. However, when one considers patents, Minnesota is the clear leader. On a per capita basis, Minnesota generated over 1,800 patents per 250,000 people for 1994 - 2007. In the last few years, Minnesota has kept up the pace and created nearly 900 patents per 250,000 people. These patents include not only inventions, but also changes in processes, and design.[26] Clearly, Minnesota is logging innovations at a high rate than other states. Unfortunately, these figures run counter to what is being measured in green patents. Minnesota needs to align the innovation resources that it clearly possesses in order to carve out a larger market share in green innovation.

SUMMARY

Minnesota ranked below average in both the number of awards and the total amounts across the board for green R&D and programmatic measurements. The recipients of green programmatic grants were heavily weighted toward state agencies and governments, while R&D funding tended to go toward university-led projects.

To combat these trends, Minnesota must continue to bolster and support private research as well as university partnerships with private industry to better capture green R&D dollars as well as enact state-led strategies that can align with federal green initiatives. Failure to do so will see Minnesota's regional competitors further distance themselves in these regards. Overall, Minnesota generated significantly fewer patents than Michigan, Illinois, and Ohio, and had slightly fewer patents than Washington (80 less). On the other end, Minnesota had over 100 more patents than Wisconsin, and greatly outpaced Iowa, South Dakota, and North Dakota.

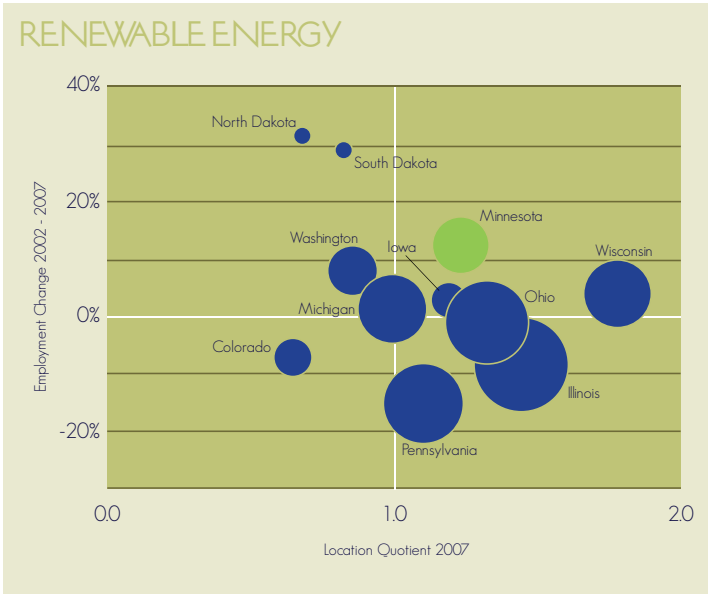
While Minnesota's leadership over Wisconsin and Iowa is certainly positive, the amount by which it lags Michigan, Illinois, and Ohio is cause for concern. The breakdown by category indicates that the total patent count results stay fairly uniform throughout the patent analysis.

RENEWABLE ENERGY: INDUSTRY SIZE AND PATENTS

Renewable Energy includes industries related to the production of energy from natural resources such as sunlight, wind, rain, geothermal, and biofuels such as corn, soybean, and wood products. The Renewable Energy category also includes industries related to all forms of waste heat recovery and industries that utilize biomass (animal waste, crop waste etc) for energy including cogeneration.

As noted in the previous section the renewable energy sector demonstrates the strongest area of opportunity for Minnesota. GSP Consulting believes that this category can demonstrate growth both from the retention and expansion of existing firms as well as the attraction of new firms to the state. As states throughout the region and the country continue to implement renewable energy portfolio standards there will be continued growth in this sector. The overall size of this industry in Minnesota is in the middle compared with the benchmarked states but has experienced significantly greater employment growth than the other states with the exception of North and South Dakota whose industries are much smaller. Much of this employment growth has been in the wind sector but our analysis also shows that the state has positive assets to pursue additional solar related manufacturing opportunities. Minnesota ranks 3rd in wind energy capacity installed with 1,299 MW and the 25 by 2025 standard will drive growth in all renewable energy sectors.

The market growth of each of these Renewable Energy sectors is combined with an above average location quotient which makes a very strong case that the renewable energy industry presents a growth opportunity for Minnesota.



Biofuels and Bioenergy

Biofuels are liquid fuels derived from nonfossil biomass (recently living organisms and their metabolic by-products). While biofuels are generally thought of as vehicle fuels, they can be used in any application that currently uses liquid fuels, e.g. in generators or cooking stoves. Biogas is also sometimes included as a biofuel when it is used in engines instead of liquid petroleum gas (LPG) or compressed natural gas (CNG). Currently, the two main biofuels are ethanol and biodiesel. Ethanol is currently produced from sugar crops such as sugar beet and sugarcane, or starch crops such as corn and wheat. Biodiesel is made from plant oils such as soybean oil, palm oil and rapeseed oil.

"First-generation" biofuels employ relatively simple and well-established technologies and use edible food crops as feedstocks. "Second-generation" biofuels use more advanced technologies to capture and convert the energy contained in cellulose from a wide range of feedstocks including poplar trees, grasses such as switchgrass and miscanthus as well as waste. Algae based biofuels are often considered to be "third generation." Second and third generation are also referred to as "advanced biofuels" with regard to the federal renewable fuels standard (RFS).

Biofuels are a sub-category of bioenergy, which refers to any energy sourced from non-fossil biomass used for heat, electrical power, or transport. Bioenergy currently accounts for roughly 10% of total primary energy supply globally but most of this energy is consumed as wood for cooking in developing countries. Biofuels make up only a small fraction of current bioenergy use.[27]

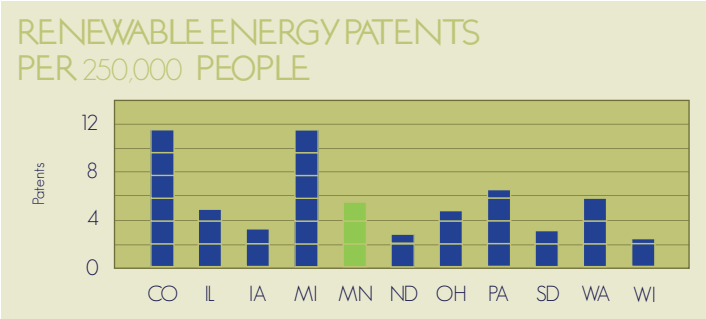
Combined Heat and Power (CHP)

Combined heat and power (CHP) or cogeneration, offers Minnesota an excellent opportunity for energy reuse and efficiency for new and existing power plants, as well as other structures such as buildings. Through the installation of an integrated energy system, CHP can provide Onsite generation of electrical and/or mechanical power, waste-heat recovery for heating, cooling, dehumidification, or process applications, and seamless system integration for a variety of technologies, thermal applications, and fuel types into existing building infrastructure.[28] CHP allows for easy generation of electric and thermal energy from a single fuel source.

CHP also offer greater economic opportunities within the energy industry, even those already utilizing biomass. A recent report asserts that 2 years of employment are created through CHP verses just 1.27 years of employment that are created per GWh electricity produced.[29] According to the Oak Ridge National Laboratory[30], CHP would bring significant economic benefits to the U.S. if the investment were made. Nationally, the U.S. is already avoiding more than 1.9 quadrillion Btu of fuel consumption. In terms of reducing CO2, this is equivalent to taking more than 45 million cars from the road. However, if 20% of U.S. energy generation came from CHP, the results would be staggering. They would include:

- A 60% reduction of the projected increase in carbon dioxide (CO2) emissions by 2030—the equivalent of removing 154 million cars from the road
- Fuel savings of 5.3 quadrillion British thermal units (Btu) annually—the equivalent of nearly half the total energy currently consumed by US households
- The creation of 1 million new highly-skilled, competitive "green-collar" jobs through 2030 and $234 billion in new investments throughout the United States

CHP offers a high level of opportunity for Minnesota to increase its energy conservation, and save businesses and energy producers money over the life cycle of the CHP technology. CHP will also enable great job creation, enhancing Minnesota as a center of green job activity.



RENEWABLE ENERGY PATENTS

Looking at renewable energy patents on a per capita basis, Colorado and Michigan, have a wide margin over the rest of the benchmark states and Minnesota. It is encouraging that Minnesota's relative share is greater than that of Illinois or Ohio. However, the presence of the auto industry in Michigan, and the push toward renewables in Colorado have helped those states not only achieve large patent numbers in this category, but also far and away the largest amounts on a per capita basis. Colorado's patent recipients are led by the Midwest Research Institute, the aerospace industry, and the presence of the National Renewable Energy Lab in Golden, Colorado. Certainly the presence of this federal entity is helpful in spurring on innovation in renewable energy. While Colorado has patents across the renewable energy spectrum, it is particularly strong in solar, having nearly triple the number of solar-related patents as Minnesota.

Minnesota is greatly behind Michigan and to a lesser extent Pennsylvania and Washington. The strength of Michigan's renewable energy industry is once again driven by the presence of the auto industry as they seek to develop alternative fuels, specifically in ethanol and methanol. Other companies such as Delphi Technologies and Ethyl Technologies are also present in the state and submitting patents for alternative fuel technologies. Michigan also has a robust solar industry with the presence of United Solar Systems and Energy Conversion Devices, Inc. Michigan State University is represented with patents for various alternative fuel applicable technologies.

Minnesota differentiates itself from its regional peers with a much higher rate of patents in the wind industry. Companies like Power Group International, Seagate, and Navitas Energy along with a number of others are responsible for this leadership. Minnesota also has a significant number of patents for solar technology, led by the presence of 3M and the University of Minnesota.

The state of Washington is strong across the board (especially considering its size) in renewable energy patents. Washington also has a higher than average number of patents applied toward the wind industry. These efforts are led by the Boeing Corp. as well as several wind turbine companies.

While Iowa has significantly fewer renewable energy patents, it also has strength in the wind industry and will likely continue to be a strong regional competitor with Minnesota for the wind generation market. Iowa also has educational and public policy initiatives around this segment which could lead to more rapid development than Minnesota's industry without a similar commitment on the Minnesota side.

Corn-based and Cellulosic Biofuel Production

The success of Minnesota in the ethanol realm is due in large part to a combination of political leadership and strong agricultural resources. Minnesota has made a significant investment in the production and consumption of alternative fuels, particularly the use of ethanol. By 2013, automotive gasoline sold in the state must contain a 20% blend of ethanol. In 2008, 1/4th of Minnesota's corn stock is projected to be utilized in the production of ethanol.[31] As of August 2008, there were 19 ethanol plants in Minnesota up and running and 3 additional plants under construction. The current 19 have a production capacity of 850 million gallons while the 3 new plants will add an additional production capacity of 270 million gallons.[32]

The Federal Trade Commission has reported that "in recent years, the amount of ethanol blended into domestic gasoline has exceeded the requirements set forth by the RFS because of the positive economics of blending ethanol."[33] Rising fuel prices helped to drive demand for ethanol blend gasoline production and consumption. According to the US Energy Information Administration, the amount of gasoline blended with ethanol in every month of 2008 has outperformed the same month from 2007. However, September saw a significant drop off from August production levels, and this decline may continue as the price of oil and gasoline decrease.[34]

Within the renewable energy industry there is a growing trend toward the production of cellulosic biofuels which Minnesota should look for ways to take advantage of. Doing so will help the state continue to grow its share of the renewable fuels market.

Growth Potential

Growth potential for the ethanol industry appears to come in two forms. First, increased efficiency and technological development in traditional plants, and second, the rise of cellulosic-based ethanol.

More traditional power plants are opting to recapture heat and develop methods for combined heat and power (CHP). Ethanol plants should be no exception. The recapture of heat could also help ethanol plants avoid having to burn off volatile organic compounds (VOCs). The capture and sequester of carbon dioxide emissions remains an opportunity for ethanol production as well. CO2 could be captured and used to grow algae, which in turn can be a source of biodiesel. The utilization of multiple purposes within an ethanol plant would have both cost and environmental benefits. These savings could help the traditional corn ethanol industry keep pace (in terms of cost) with the growing cellulosic ethanol industry outside the state, while at the same time providing time for Minnesota to develop its own cellulosic capabilities.

Greater technological development can decrease cost and give rise to new market opportunities. ICM, a Kansas-based ethanol producer, has developed a system whereby corn components are separated prior to ethanol production in a dry mill process. Such a process allows ICM the option to engage in food-grade production in addition to recycling the corn processing co-products to provide the actual energy needed to run the plant. A successful operation will also add up to 7 jobs to the existing plant.[35]

Secondly, cellulosic-based ethanol is seen to offer great opportunity for the ethanol market. The benefit of cellulosic ethanol as opposed to a crop such as corn or soybeans, is that input products like switchgrass have limited other uses and can also be grown on marginal lands. However, this latter fact is likely to be more beneficial to states outside of the Midwest, and thus provide greater competition for Minnesota in the larger ethanol market. The fact still remains, however, that the federal government has mandated the development of the cellulosic ethanol market (in large part due to the perceived environmental benefit) and Minnesota must adapt if it is to continue to be a leader in ethanol production and export. While it is currently only a fraction of the market, the federal government is expecting cellulosic ethanol production to grow by 2900% between 2010 and 2015, and another 433% between 2015 and 2020.

Corn Starch-Based Ethanol and the Growing Interest in Cellulosic-Based Ethanol

Minnesota's ethanol industry is already a significant economic engine and employer. As of 2006, Minnesota was exporting 53% of its ethanol production and employed over 10,000 direct and indirect employees in the industry. By the end of 2008 this industry has been projected to increase to over 18,000 jobs and account for nearly a $5 billion economic impact.[36]

Both of the avenues toward generating ethanol yield environmental benefits, specifically, with regard to blended automotive fuel. According to the Renewable Fuels Association,[37] ethanol blends decrease vehicle CO2 emissions by up to 29%, lead to reductions in smog levels, and further

research continues to decrease the amount of water needed for ethanol production.

Considerations toward ways to grow Minnesota's cellulosic-based ethanol production come more to the forefront when one looks at the federal renewable fuels standard (RFS), which seeks to promote the use of cellulosic biofuel production. In fact, by the full implementation of the current RFS in 2022, cellulosic biofuel production is expected to grow from 100m gallons of production in 2010 to 16 billion gallons. Traditional renewable biofuels such as corn-based ethanol are supposed to reach their peak of 15 billion gallons in 2015.[38]

This federal mandate must be given due consideration by Minnesota as it plots its own renewable fuels strategies and seeks to remain a leader in ethanol production. The ethanol industry success within Minnesota may be short lived without proper planning. Recent projections put the cost of corn-based ethanol production at up to $1.65/gal (depending upon the cost of corn) and cellulosic-based ethanol at $2.65/gal (down from $5/gal in 2001).[39] However, "The DOE has set targets for technological advances that would reduce the cost of producing cellulosic ethanol to $1.07 per gallon by 2012, which would make cellulosic ethanol competitive with corn-based ethanol (in 2004 corn and crude oil prices)."[40]

The ramifications of a national focus toward cellulosic ethanol could be significant for Minnesota's corn starch based ethanol industry, both on the growers and producers. There are significant costs associated with completely retooling a traditional ethanol plant to enable cellulosic ethanol production. Adding the pretreatment equipment needed for cellulose ethanol production to a traditional 25 million gallon capacity ethanol plant would increase the cost of constructing a plant from $30 million to $136 million.[41]

However, there are several impediments to rapid increases in national cellulosic ethanol production such as the cost of treatment enzymes, as well as the transportation of inputs. Russell Herder notes that "To produce a like volume of biofuels from most cellulosic sources will require significantly higher volumes of feedstock – creating challenges in terms of harvesting/gathering, transportation and storage. For example, instead of one truckload of corn coming into a biofuels plant, there may be six to ten truckloads of cellulosic feedstock (or more) needed to produce the same volume of ethanol, depending on the cellulose source."[42] Clearly there are several pitfalls the cellulosic industry must overcome before it begins to challenge the traditional ethanol market. These challenges should give Minnesota the time it needs to further develop its own cellulosic ethanol industry.

Technological development is an area where Minnesota may be able to make strides to bridge the gap between these two ethanol production techniques. There is technology currently being navigated which would use biowaste such as cornstalks and cobs in the cellulosic production. Minnesota is already moving in this direction with the announcement of an MN Dept. of Agriculture $1 million matching award to the Central Minnesota Cellulosic Ethanol Partners (CMECP) for a Phase II feasibility and engineering study for the construction of a commercial 10 million gallon/yr cellulosic ethanol plant proposed to be adjacent to CMECP's existing ethanol plant in Little Falls, MN.

Minnesota also currently has two plants that produce ethanol from biomass. According to DEED, the previously mentioned "Central Minnesota Ethanol Co-op, a farmer-owned plant in Little Falls, uses a gasification system that can convert fuel, such as biomass, into a gas mixture called syngas, which can be used to generate electricity. Moreover, this production facility uses surrounding forest wastes in place of natural gas to produce ethanol. Chippewa Valley Ethanol Co. of Benson has successfully integrated gasified biomass in place of natural gas as a fuel source for ethanol processing."[43] It seems clear that innovation surrounding the ethanol process can be utilized and promoted by Minnesota to help traditional ethanol producers remain cost competitive and even expand their opportunities.

Recommendations for Minnesota's Ethanol Strategy

Minnesota has many resources on which to build its renewable fuels industry. Several opportunities would seem to naturally follow to help MN continue its strength in renewable fuels. Since the Federal Government has mandated the increased production of cellulosic biofuel, Minnesota should look at ways to:

- Promote the building of new cellulosic ethanol plants
- Support the retooling of current corn-starch based plants, including assistance with heat capture, developing methods for greater combined heat and power, and further promotion of carbon sequestration
- Invest in university and industry research and development focused on innovative inputs for cellulosic ethanol production, ways to decrease water use, heat and emissions capture, and co-product recycling
- Invest in the biofuel supply chain. Minnesota is a leading ethanol producing state, but does not appear to manufacture the components that are required for the production of biofuels. Leading companies such as SRS Engineering and Greenline are located in California. Fostering home grown manufacturing companies would not only allow producers to buy within state, but also put the suppliers and producers much closer geographically which could allow for the development of better products due to increased communication. Doing so could foster a Minnesota-based expertise in biofuel equipment.

The successful implementation of public policy, financial assistance, and basic R&D will cut the cost of ethanol production further and allow Minnesota to continue to be a leader in both biofuel employment and production.

Recommendations for Minnesota's Renewable Energy Sector

Based on a review of Minnesota and the benchmark states, we offer the following recommendations to support the growth of green jobs in the Renewable Energy category:

- Create a grant and/or loan program to assist in the adoption of renewable energy technology not covered by Minnesota's Conservation Investment Programs (CO, MI, OH, IL, WI, PA, ND, SD)
- Provide tax credits for installation of renewable energy systems (ND) or tax exemptions for development of co-generation facilities (IA, IL)
- Encourage ongoing development of specialized training programs to support industry growth (IA, MI)
- Develop a biogas and biomass to energy grant program to support development of this market (IA)
- Create a pre-seed investment/ grant program to support the development and adoption of new renewable energy technologies (MI, OH, PA)

GREEN PRODUCTS: INDUSTRY SIZE AND PATENTS

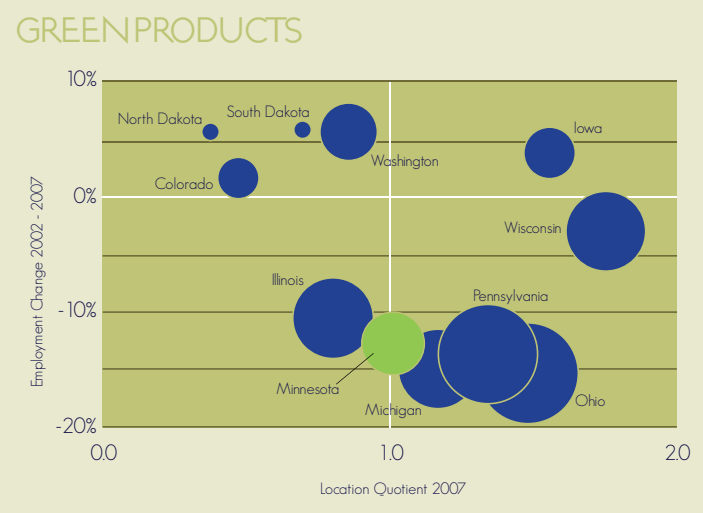
Green Products are industries related to the manufacture of products that reduce environmental impact and improve the use of resources such as energy efficiency, water conservation and materials use and re-use.

Minnesota has a significant amount of employment in the green products sector. Due to the market growth of green building and energy efficiency technologies and products, we believe that the green products sector represents the second-best category of economic opportunity for the state.

While the state has seen some job loss, this is not uncommon due to the overall restructuring in the U.S. manufacturing base that has continued to occur over the past decade. While the trend line over the past five year has demonstrated job loss we are predicting employment expansion in the subcategories of Consumer and Building with the two sectors adding over 1,000 new jobs with the low estimate and over 2,000 on the high end.

Sub Category	2002 Employment	2007 Employment	% Change	Location Quotient
Building	55,992	49,227	-12%	1.04
Consumer	13,177	11,248	-15%	0.85
Industrial	47,788	42,626	-11%	1.08
Transportation	8,912	10,820	21%	0.51

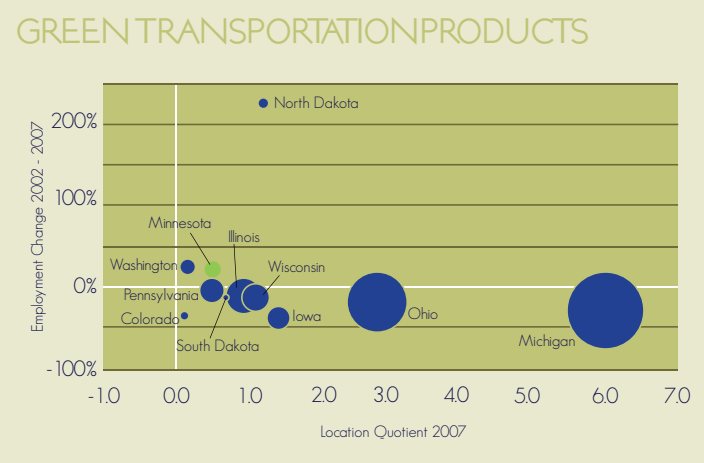
One bright spot for Minnesota in green jobs creation is the growth of employment in the transportation sector. Companies like New Flyer are continuing to grow and report future opportunities to continue this pace. The chart above illustrates



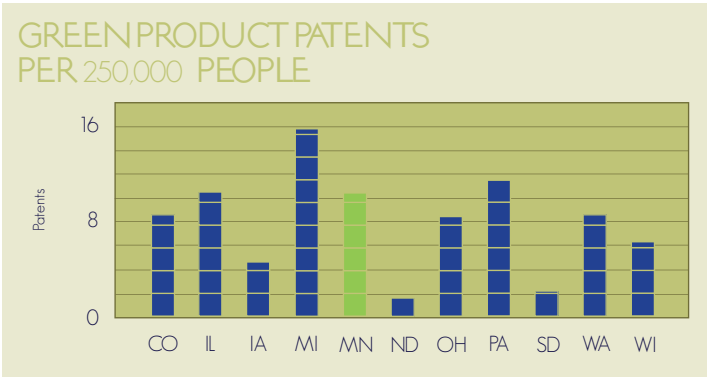
the green product related industries in four sub categories. As you will note two of the four categories have demonstrated job loss but have a positive location quotient.

Green Transportation Products have demonstrated good job growth with only North Dakota having a faster growth rate. Michigan and Ohio are clearly the leaders in this area but with recent events there may be an increasing opportunity for the green Transportation market to grow elsewhere in the U.S. and Minnesota appears to be well positioned.

As Minnesota looks to support the adoption of green manufacturing practices by its manufacturers of products, it should consider the model developed by the Manufacturing Extension Partnership, a federally funded program that supports centers throughout the country. These centers consult with



small to medium sized businesses on the implementation of Lean Manufacturing principals. In Minnesota this organization is called Enterprise Minnesota[44] and the majority of the companies it serves, as they adapt Lean Manufacturing, see this as the first and critical step to becoming green.



GREEN PRODUCT PATENTS

On a per capita basis, Minnesota ranks well against the field in the production of green product patents. Michigan is the only state that significantly outranks Minnesota, and this is due to the presence of the automotive industry. While Illinois and Ohio vastly outrank Minnesota in the sheer number of patents in this category, Illinois' margin is only slight and Minnesota has more patents when the counts are normalized. Pennsylvania creates approximately 1 more patent per 250,000 people than Minnesota. Pennsylvania's strength comes from its is base of university and industry-led research, particularly, chemical companies such as Air Products and Chemicals and DuPont, and power and transmission companies like General Electric and Westinghouse.

The strength of Michigan's number of green product patents is largely led by the automotive industry in and the strength of the R&D sector in Illinois and Pennsylvania. In Illinois this is a results of a combination of efforts through academia(in large part University of IL and University of Chicago), the presence of national labs, and numerous strong R&D companies and organizations in the fields comprising green products such as Honeywell, the Gas Technology Institute, and British Petroleum.

Minnesota's patent activity in these fields is led by 3M but is followed by a host of other organizations with much smaller impacts. Its strongest elements are with regard to recycled products and processes, as well as fuel cell technology. However, these positive areas are overshadowed by greater numbers in both subcategories by the leading benchmark states.

GREEN BUILDING EXPLAINED

The term Green Buildings has several definitions including buildings that:

- Are LEED (Leadership in Energy and Environmental Design) certified by the United States Green Building Council
- Are certified by Green Globes as high performance
- Are Energy Star rated
- Include environmental preferred and energy efficient design and operational features

According to the United States Green Building Council (USGBC), buildings are responsible for 72% of electricity consumption, 39% of energy use, 38% of all carbon dioxide (CO2) emissions, 40% of raw materials use, 30% of waste output (136 million tons annually), and 14% of potable water consumption. The built environment represents a tremendous opportunity for the production, installation, and use of energy efficient building products. States that can promote the green building sector stand a better chance of capturing this market.

With these programs in mind, Minnesota can position itself to take advantage of the national green building product market that is estimated to be worth as much as $90 billion by 2013. This sector comprises primarily manufacturing and production management jobs, but also have cross-over potential into green services such as various types of installers and construction trade jobs.

One of the most significant near term economic opportunities for Minnesota is in the area of energy conservation in existing buildings. A McKinsey study indicates that policies aimed at utilizing existing technologies to boost energy efficiency can lower energy demand by more than 20%.[45]

Each green building standard or definition has its own sets of considerations and priorities that it places on a building's attributes, from energy and water use to materials and construction methods. For purposes of this analysis and report, we have utilized data supplied by the United States Green Building Council.[46] The USGBC is the leading certification program and has the most comprehensive data on the level of green building in the United States.

One such set of data relates to the number of projects that are certified in a particular region. A project becomes certified when it applies for and successfully receives, based on a defined points scale, a positive decision from the USGBC.

There are several categories of LEED certification including LEED for:

- New Construction
- Existing Buildings
- Commercial Interiors
- Residential, single and multi
- Neighborhood Development (pilot)

Each category includes a rating of bronze, silver, gold or platinum, with the rating being defined by the number of points received in the scoring program.

GSP Consulting analyzed data supplied from the USGBC to determine how Minnesota compared to the benchmarks states in the number of projects[47] that are LEED certified. The following chart demonstrates that Minnesota ranks 8th of the 10 benchmark states in both the number of projects and the overall square footage that is LEED certified.

GSP Consulting also reviewed where Minnesota ranks compared to all fifty states. As the chart indicates Minnesota ranks 24th in the country for the number of LEED certified projects.

An increase in the number of LEED certified buildings can have positive impacts that go beyond the intended environmental and energy efficiency benefits. In addition an increase in the pursuit of LEED and other green standards will increase green jobs related to design and construction of green projects and the manufacture of green products.

In addition to LEED certification residents of Minnesota may also pursue Minnesota Green Star[48] certification. Minnesota GreenStar is a green building standard and certification program for both existing and new homes that promotes healthy durable, high performance homes.

Recommendations for Minnesota's Green Products Sector

Based on a review of Minnesota and the benchmark states we offer the following recommendations to support the growth of green jobs in the Green Products category:

- Expedite the permitting process (state and local collaboration) for building green, including LEED and GreenStar (Chicago, IL)
- Provide Grants specifically for the implementation of solar systems, including the rehabilitation of Orphan Solar (CO, PA, and OH). Could also be a property tax assessment reduction for solar systems (IL, IA)
- Create a grant program or tax abatements for high performance green buildings (PA, OH)
- Create a pre-seed investment/ grant program to support the development and adoption of new green building technologies (MI, OH, PA)
- Support the development of transportation plans that consider hybrid and or renewable energy vehicles (MI, OH, PA)
- Work with Enterprise Minnesota and/or provide state financial support to increase the capacity of the center to be able to provide Lean and Green consulting services to small and medium size manufacturers in the state (PA)

LEED CERTIFICATIONS

BENCHMARKS

State	# Bldgs.	Square Ft.
WA	117	12,731,128
PA	109	8,161,480
IL	89	21,263,591
MI	86	9,279,103
CO	75	7,403,996
OH	48	5,671,323
WI	40	5,025,078
MN	23	1,746,896
IA	15	688,246
ND	1	79,336
SD	0	0

TOP STATES

State	# Bldgs.	Square Ft.
CA	250	35,176,333
WA	117	12,731,128
PA	109	8,161,480
OR	102	12,566,627
MA	102	10,655,253
IL	89	21,263,591
MI	86	9,279,103
NY	83	11,963,939
TX	79	9,055,371
CO	75	7,403,996
VA	63	7,082,158
GA	62	5,362,574
NC	49	4,232,153
AZ	48	5,949,452
OH	48	5,671,323
FL	42	3,313,366
NJ	41	5,067,057
WI	40	5,025,078
MD	35	4,431,358
DC	33	4,223,498
CT	29	2,332,426
MO	29	2,330,525
SC	25	1,795,073
MN	23	1,746,896
ME	22	745,819

ENVIRONMENTAL CONSERVATION: INDUSTRY SIZE AND PATENTS

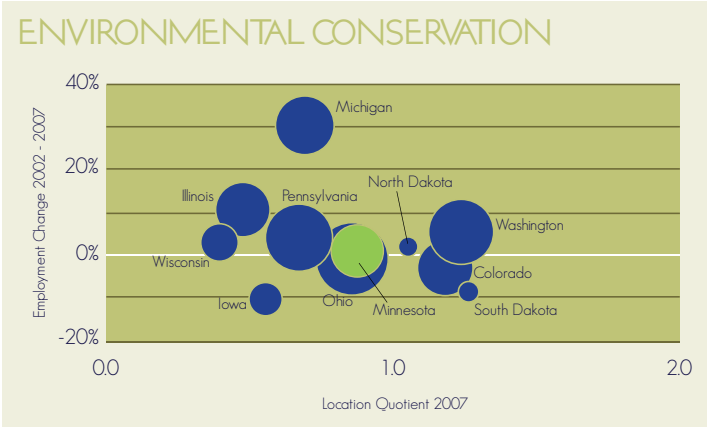
Environmental Conservation includes industries related to conservation of air, water and land, including air emissions control, monitoring and compliance, water treatment, water conservation, wastewater treatment, land management (including prairie), natural pesticides, natural fertilizer and aquaculture.

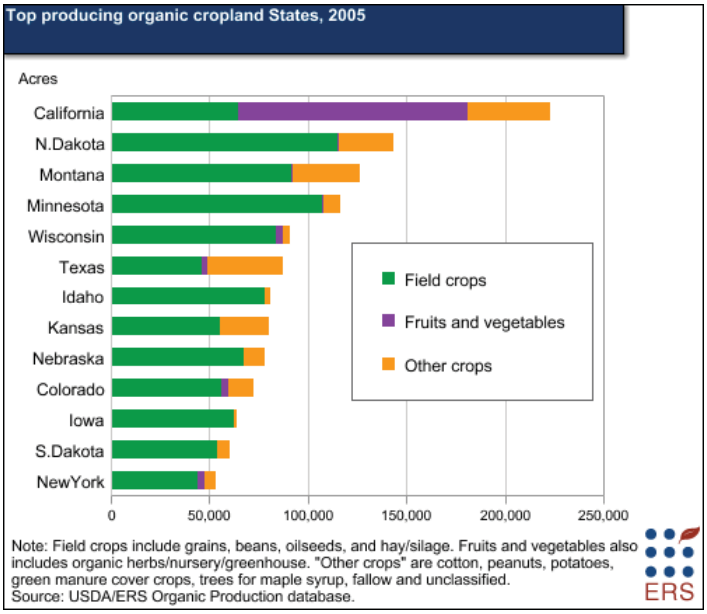
The environmental conservation sector in Minnesota provides the state with a good opportunity releative to regional competitors. The indsutry employment currently ranks behind only Ohio, and slightly behind Michigan, and Illinois within the region (Minnesota also ranks behind Washington and Pennsylvania). However, while it has seen much slower growth than Illinois or Michigan, its location quotient is significantly better (.86 compared to .39 for WI, .47 for IL, and .68 for MI).

Green Jobs from Food Production

Minnesota like its peer states is demonstrating the creation of green jobs in the areas of organic, natural and urban farming, all parts of the food economy. As part of this market analysis we sought to analyze the existing employment base in these sub sectors of the food economy, but did not uncover significant data to document the level of activity in natural and urban farming. Anecdotal information indicates that these areas need to be explored as part of an ongoing green jobs discussion. For organic farming, we were able to identify a handful of information sources and offer the following.

Minnesota is a leader in Organic farming in terms of the numbers of operations and acres of cropland that are certified organic. As the figure on the next page illustrates Minnesota ranked 4th overall in organic cropland and 3rd in organic field crops.





Minnesota's percentage of acres devoted to organic farming mirrors that of the U.S. at 0.5% of all available acreage. While no data is specifically available on the number of jobs directly associated with organic farming we estimate that approximately 500 of the state's 97,013 farm jobs are with organic farms. As this subsector of agricultural production continues we expect to see a larger number of jobs associated with organic farming.

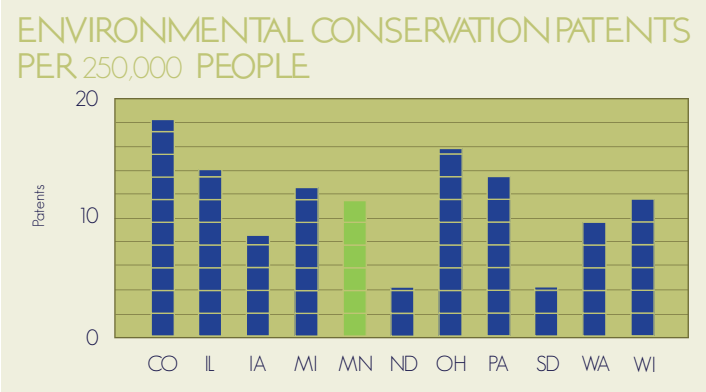
What is not known at this time is how many jobs in the food production sector overall should we associate as green jobs. This market analysis is restricted from exploring this topic further due to a lack of information and time to research and or develop estimates. GSP Consulting is suggesting that the Action Plan include a recommendation to explore the food production sector in more detail to define the size of the employment base and opportunities to increase it in the near and mid-term.

GREEN JOBS FROM WATER CONSERVATION AND REUSE

While energy production and use are often at the forefront of green jobs discussions, of growing concern and import is the issue of water conservation. In western states there are significant problems of supply, while in many other states the problems are more infrastructure related. Regardless, there stands to be great opportunity for those who are skilled in water system monitoring and installation.

Water treatment and infrastructure stand as significant opportunities for green jobs. As the backlog of water-related projects grows, demand will increase for the supply of water efficiency and recovery products, as well as for installers, and technicians to monitor new systems. The Association of State and Interstate Water Pollution Control Administrators found that 26 states have $10 billion in approved water projects. Additionally, the National Governors Association reported that there are $6 billion in ready-to-go water-related projects, which could quickly be obligated. Clearly state and local water infrastructure is in disrepair. President Obama is proposing significant funds for water infrastructure projects. Minnesota should ensure that the training resources are adequate to meet the growing needs.

Additionally, water efficiency and reuse industries will likely see significant growth. California has the most comprehensive legislation on water recycling, known collectively as the Title 22 rules. It seems that in the western U.S. both public policy and the markets are driving demand for greater water reuse due to the lack of supply. In fact, a recent paper from scientists at the Scripps Institute projected that there is "a one-in-two chance that the reservoir system of Lake Mead and Lake Powell on the Colorado River, which provides drinking water for 25 million Americans in seven states, will essentially run dry by 2021. The system has already dropped to 50 percent capacity."[49] In Orange County, CA a state of the art water purification facility has been developed which will clean wastewater to provide the equivalent of 10% of the region's drinking water needs.[50] However, Minnesota cannot rest upon its laurels and vast water resources. Industrial and energy plants use great quantities of water produce their end good. It is likely that there will eventually be mandates on the industry to treat and reuse the water as a form of environmental protection, especially as the American Ground water association has stated that 1/2 of all water wells in Minnesota will go dry by 2030 due to aquifer depletion. In fact there is already forward-thinking state legislation being prepared in Minnesota which would require the state to begin to adopt some of the policies found in California's Title 22 to meet these future challenges. Minnesota should take the opportunity to work with industry to develop water-related goals and projects. Doing so will require Minnesota to develop and train its own workforce in these arenas, and thus help to strengthen Minnesota's pre-existing water industries. As other states begin to deal with their own water infrastructure, and look toward the future of greater water reuse, Minnesota firms will already possess the necessary expertise needed to tackle these complex problems.



ENVIRONMENTAL CONSERVATION PATENTS

For patents that serve to better use pre-existing resources, Minnesota is outpaced by Colorado, Ohio, Illinois, Pennsylvania, Michigan, and Wisconsin on a per capita basis. This may be due to the large manufacturing base in several of these states, as producers seek to find ways to utilize water more efficiently, and provide for cleaner air. Additionally, the strong presence of the energy industry in several of these states may help to explain why Minnesota is lagging. However, Colorado appears to have across the board leadership on many of the subcategories. While no one patent holder or industry stands out among the rest, there does seem to be a slight focus toward pollution and emission control technologies. The overall strength in environmental conservation may be attributed to Colorado's generally progressive attitude toward the environment is helping to drive the innovation market in this area.

Ohio's high number can be attributed to the number of results for patents concerning pollution reduction, emissions control, and wastewater management. These concentrations likely stem

from the presence of the power-generation industry where Ohio ranks as the seventh largest electricity generator (in terms of Megawatthours) and is the third largest producer of coal-generated energy.[51] It should also be noted that Illinois ranks ahead of Ohio as the fifth-largest generator of total electricity. As the federal government has forced this industry to reduce emissions, an industry in products and methods has formed to take advantage of mandated changes. Numerous Ohio patents are assigned to companies such as General Electric, ClearStack Combustion, and Standard Oil. Ohio's strong manufacturing base is also represented with the presence of Procter & Gamble and Owens Corning as they have devised products and systems that meet the goals of environmental conservation.

Wisconsin's strength in this category comes from a focus on biodegradable products as well as energy efficiency. Its patent holder leaders cover a wide range of companies, although 3M and Kimberly Clark are very well represented.

Minnesota's areas of strength are in biodegradable products, wastewater treatment, and pollution control technologies. However, while these patents are the state's strongest, the patent count lags that of other states at the subcategory level. 3M leads the overall patent count although this data does not account for patents filed by a company but utilized in operations in another state. The University of Minnesota and Donaldson Company are also strongly represented.

Recommendations for Minnesota's Environmental Conservation Sector

Based on a review of Minnesota and the benchmark states we offer the following recommendations to support the growth of green jobs in the Environmental Conservation category:

- Create a program that provides grants for pollution control technology. (PA)
- Seek to align recently passed Natural Resource and Cultural Heritage program funding initiative with opportunities for green jobs growth.
- Explore the food production sector, including organics, local, conventional, natural, traditional, and urban farming, to define the size of the employment base and identify opportunities to increase the number of green jobs in these segments.
- Promote the farm to school and farm to home pilot projects in urban, rural, and reservation communities to encourage healthy eating for our children and strengthen local economies.
- Pursue legislation similar to California to require water recycling by industry.
- Identify training needs for workforce that would support new models of water conservation and reuse.

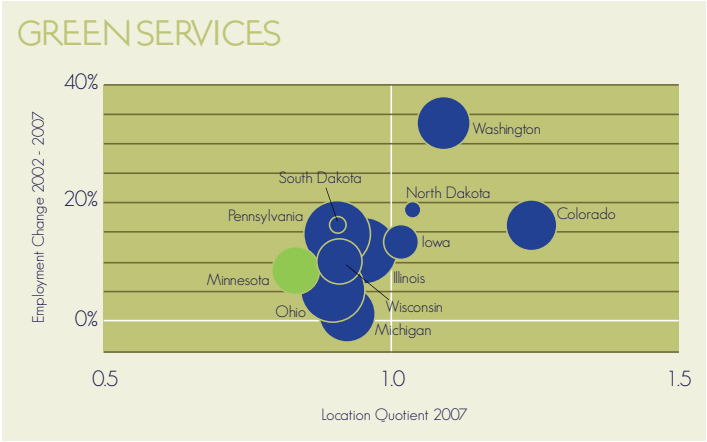
GREEN SERVICES: INDUSTRY SIZE AND PATENTS

Green Services are industries and occupations that are providing a range of services that are helping to build the green economy, utilizing green products and technologies, building energy infrastructure, farming, and recycling and waste management.

The green services sector is an area that can both lead and lag the growth of the other categories that we have defined. On one hand services such as technicians performing energy audits and companies recycling materials are both producing the demand for green products and they are also enhancing the supply of products and utilizing renewable energy sources.

The services sector is served well by the trade unions as they have aggressively been seeking green job training opportunities.

Though Minnesota lags the field in terms of industry concentration, the difference is not terribly great. In fact, only Washington, Colorado, North Dakota, and Iowa have location quotients greater than 1. However, while Minnesota has seen greater growth of this category of industries than Michigan or Ohio, the Dakotas, Pennsylvania, Colorado and Washington maintain much stronger growth levels, with the remainder only slightly more so. What is of concern when taking growth into consideration are the current sizes of the category in benchmark states. Washington's growth seems to be primarily coming from green services related to the building industry. Our analysis indicates growth in all services from architectural design, landscaping, building contractors and maintenance. Illinois and Wisconsin both have larger sizes and faster growth rates. Iowa's industries that make up green services are slightly smaller but again, have a greater rate of growth.



Minnesota should seek to build upon its strengths in professional, scientific, and technical services, such as architects, engineers, and technicians as this industry has an extremely strong LQ (1.90), and also has a larger share of employment than any of the benchmark states. Additionally, this industry, while still small relative to other industries, has seen explosive growth over the past 5 years.

One key area that Minnesota can grow its green services sector is around those services related to buildings. We currently estimate that 9,524 people are in jobs related to green services that support buildings and estimate that this sector will add almost 3,000 jobs by 2020. We have identified growth opportunities in the areas of architecture, landscape, building maintenance and all types of building contractors. This would include individuals involved in performing building retrofits to enhance energy efficiency. This is a significant growth

opportunity in the near future as the technology to reduce energy consumption exists and simply needs to be deployed in buildings. Of course the primary limitation to this is the ability for organizations, private companies and individuals to finance upfront costs. This is an area that has been discussed widely by the Green Jobs Task Force and specific ideas to support the adoption of energy efficiency are being considered for the Action Plan.

Recommendations for Minnesota's Green Services Sector

Based on a review of Minnesota and the benchmark states we offer the following recommendations to support the growth of green jobs in the Green Services category:

- Minnesota should seek to convene various potential green services organizations to educate and explore opportunities for green jobs growth. These would include but are not limited to:
  - Architects and landscape designers
    - + Pursue increasing awareness and certification through programs like LEED AP[52]
  - Contractors and Maintenance professionals
    - + Pursue Green Advantage[53] and/or other formally recognized programs
  - Banking and investment groups
  - Insurance industry representatives
  - Local government and economic development professionals
- Develop awareness and if necessary funding to encourage the adoption of energy efficient technologies by commercials, industrial and residential buildings.
- While the education pipeline is critical in all of the green jobs categories it is certainly important here to match up private sector needs with the education and training delivery system.

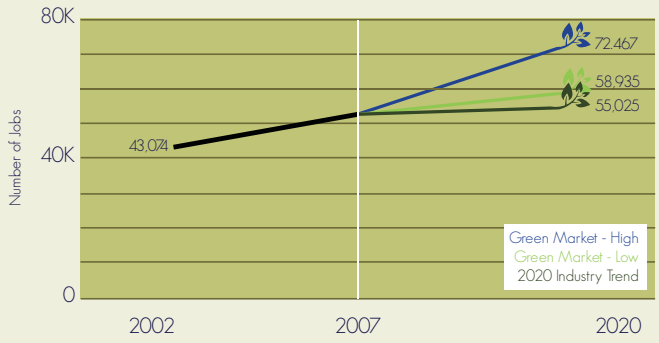
THE GREEN JOBS SECTOR IN MINNESOTA

Much of the analysis that has been performed so far is meant to help understand the existing base of firms and employees in Minnesota. In addition we have sought to estimate the number of green jobs currently and then through the year 2020. In estimating this data it is important to consider that the United States is indeed in a recession and that there is continuing uncertainty in many of the markets that are predicted to support green jobs. At all times we took a conservative approach to these estimates. It is also important to note that these estimates are being made without any consideration for specific impacts of an Action Plan and/ or federal activity that accelerates our market assumptions. The chart below illustrates the number of green jobs in Minnesota according to GSP Consulting predictions.

By utilizing our approach we estimate that by 2020 Minnesota can expect somewhere between 55,025 and 72,467 jobs.

- The lower number considers that Minnesota demonstrates green job growth similar to the national averages
- The middle number assumes that Minnesota grows at the pace that it has demonstrated over the past few years. This figure while not significant is positive in the light of recent announcements by the state economist that Minnesota is poised to lose over 55,000 jobs in the next few months. This prediction comes at a time when Minnesota has seen 30,500 jobs lost between November 2007 and November 2008.
- The higher number of 72,467 assumes that Minnesota fully achieves the RPS and Minnesota firms perform well at accessing the growing green market.
- It is further assumed that there will be activities supported by the Action Plan that will increase these estimates and deliver even more green jobs for Minnesota. See the Action Plan Potential Impacts memo for this analysis.

GREEN JOBS ANALYSIS AND PROJECTIONS



From GSP Consulting Analysis

The chart that follows shows the breakdown of green jobs for each of the four categories. Using this chart, one sees that while Environmental Conservation has the most significant 'green share' making up the sector total, the projected growth from 2007 to 2020 is limited. The Renewable Energy sector is projected to grow the most using either the low or high estimate at 2,761 to 8,981 jobs respectively.

Projected growth for Green Services closely follows with Green Products a more distant third. The movement by product manufacturing companies towards green products is critical to their future growth potential and will preserve manufacturing jobs in the state.

GREEN JOBS ANALYSIS									
Category/Sub Category		Buildings	Consumer	Industrial	Transptn.	Total			Grand Total
MN Establishments (Green Related) 2007	1,620	1,707	233	1,377	233	3,550	27,017	2,319	34,506
MN Employees 2007	20,908	49,227	11,248	42,626	10,820	113,921	215,180	57,072	407,081
MN Green Jobs Estimate 2007	11,367	3,700	3,093	1,734	1,014	9,541	22,441	9,477	52,827
% of Jobs Considered Green	54%	8%	28%	4%	9%	8%	10%	17%	13%
Green Market Low Estimate 2020	11,514	4,309	3,217	1,851	963	10,340	24,844	12,238	58,935
Green Market High Estimate 2020	12,032	4,880	3,588	2,689	1,483	12,640	29,337	18,458	72,467

In terms of growth rate, all sectors are expected to see positive growth using either the low or high job projections. Renewable Energy again appears to be the best investment as projected employment growth of green jobs in this industry is anywhere from 29% - 95%. Green Products projected growth is 8% - 32% and Green Services is at 11% - 31%. The growing use of renewable energy as demanded by the market combined with state and federal mandates probably helps to explain the expected green job explosion in the Renewable Energy Sector.

This contrasts sharply with the much smaller projected green jobs growth in Environmental Conservation. As green jobs already account for 54% in this sector, the most easily transferred traditional jobs to green jobs may have already happened within these industries. Also important to consider is that Minnesota is already a regional leader in this category, having only slightly fewer total employees in this sector than the much larger states of Illinois and Michigan, while greatly outpacing both Minnesota and Iowa. Even Ohio with its much larger number of Environmental Conservation jobs has a lower ratio of Environmental Conservation jobs to population than Minnesota. Minnesota may already be peaking while other states in the region are still working on increasing their own employment numbers in this category.

Green Jobs: Wages and Economic Impact

GSP Consulting analyzed data from the Federal Bureau of Economic Analysis and the Bureau of Labor Statistics to estimate the current and projected economic output related to the four categories. The following chart illustrates that the 2007 output of firms and employees related to green is close to $11 billion. Our projections show this figure growing to between $13 and 15.5 billion by 2020.

Green Jobs: Industry Multipliers

When measuring an industry sectors total impact on a community it is also important to consider the indirect and induced economic benefits. One method of doing this utilizes economic impact modeling that computes this information. The chart below illustrates the average industry multipliers for each of the sectors that we have identified. What this data tells us is that for each Renewable Energy job there are an additional 5.1 jobs created in indirect and induced services. This means that over 38,000 additional jobs are supported by the current direct renewable energy jobs in Minnesota. The chart summarizes the other sectors.

Category	Avg. Industry Multiplier	Direct Green Jobs	Indirect & Induced Green Jobs
Renewable Energy	5.1	9,477	38,856
Green Products			
Buildings	3.3	3,700	8,510
Consumer	3.6	3,093	8,042
Industrial	4.9	1,734	6,763
Transportation	3.8	1,014	2,839
Green Services	2.6	22,441	35,906
Environmental Conservation	2.7	11,367	19,324
Total Jobs		52,826	120,239

FINANCIAL IMPACT OF GREEN JOBS	# of Green Jobs	Green Job Wages (Total)	Green Output - 2007 ($1,000)	Low Output - 2020 ($1,000)	High Output - 2020 ($1,000)
Renewable Energy	9,477	$671,143,263	$2,622,337	$3,386,331	$5,107,444
Green Products	9,542	$484,943,644	$2,138,513	$2,317,438	$2,832,922
Green Services	22,441	$1,085,343,578	$4,244,618	$5,455,051	$5,548,866
Environmental Conservation	11,367	$556,192,797	$1,911,818	$1,936,479	$2,023,598
Total	52,827	$2,797,623,282	$10,917,286	$13,095,299	$15,512,830

GREEN JOBS: OCCUPATIONAL ANALYSIS

GSP Consulting reviewed the industry data and then crosswalked this information with the types of occupations that a person may pursue to get involved in these green job areas. GSP reviewed more than two dozen studies and reports and conducted expert surveys and focus groups to define what occupations were "green." Then GSP refined this list into two groups, those that were generally acknowledged as green occupations which improve the environment, such as Conservation Scientists or Foresters and those which may have more negative impacts that can be reduced based on how the work is done, such as Chemical Engineers, Power Plant Operators or Hazardous Material Removal Workers. A third group was developed for occupations that were not generally in industries dealing directly with the environment but that could have a positive environmental impact depending upon both the focus and action of the job.

Pure Green or the Greenest (Tier 1) - Sample

- Agricultural engineers
- Environmental engineering technicians
- Soil and plant scientists
- Conservation scientists
- Foresters
- Hydrologists

Green Impacts (Tier 2) - Sample

- Chemical engineers
- Industrial engineers
- Materials engineers
- Operating engineers and other construction equipment operators
- Plumbers, pipefitters, and steamfitters
- Hazardous materials removal workers
- Power plant operators
- Cleaners of vehicles and equipment

We then projected the occupations employed by the target industries.

GSP projected the growth occupations based on the projected growth in green jobs using the high market estimate. The occupational projections assumed that the occupational structure of the industries would not substantially change, so that if managers comprised 5% of industry employment today, they would still comprise 5% of industry employment in 2020. These projections do not include the creation of new green occupations, such as Sustainability Coordinators, that may be employed in green industries as well as throughout the economy.

Finally, GSP also sought to identify which occupations were projected to see the greatest job growth between now and 2020. Bolded occupations on the chart below are those that were included in the categories of most green jobs. Landscapers and civil engineers were in the tier 1 grouping, and construction laborers were in the tier 2 of this category. It is important to note that the remaining occupations have the potential to be green depending upon the particular job function. The fact that the top two occupations tend to be green jobs further reinforces the importance of placing resources into industries that will benefit and capture the green job market. The long term benefits of this are an increased regional share of the green industry, market, and capacity, and long term economic development as the entire country makes its way toward a greener and more sustainable economy.

Code	Title	Projected 2020
37-3011	Landscaping and groundskeeping workers	618
17-2051	Civil engineers	239
51-7011	Cabinetmakers and bench carpenters	215
49-9051	Electrical power-line installers and repairers	129
47-2061	Construction laborers	119
43-9061	Office clerks, general	105
17-2141	Mechanical engineers	101
11-1021	General and operations managers	91
49-3041	Farm equipment mechanics	86
43-6014	Secretaries, except legal, medical, and executive	81

GREEN JOBS COMPARED WITH OTHER SECTORS

In order to understand the significance of green jobs it is important to compare job numbers to other Minnesota industries. While green jobs do cut across traditional industry and sector divisions, the evaluation is still worthwhile. For instance, the BioBusiness Alliance of Minnesota estimates that there are approximately 35,000 Minnesota employees in the bioscience industry[54]. The Minnesota Department of Employment and Economic Development estimates that the Computer and Electronic Product Manufacturing Industry currently employs about 40,000 while the Computer and IT Service Industry employs over 35,000 people.

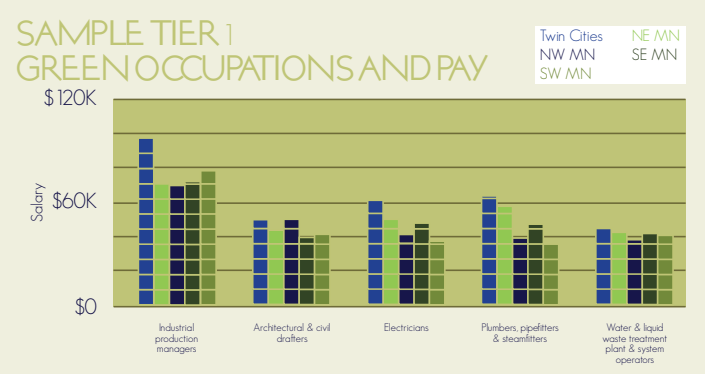
GREEN OCCUPATION WAGES

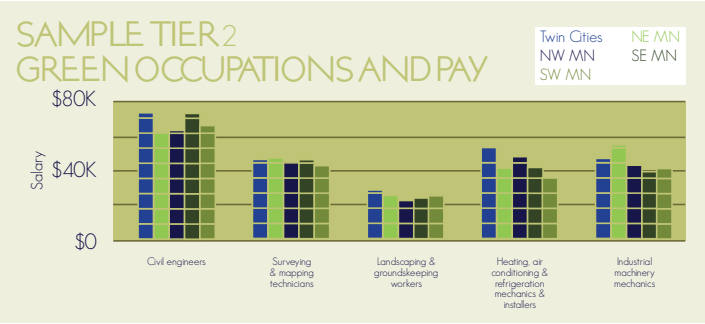
There do appear to be wage differentials between jobs located in the Twin Cities, and similar occupations located elsewhere in Minnesota. However, while this trend is apparent, is does not appear to be completely overarching. Using Bureau of Labor Statistics data one can see the mean wage for particular jobs throughout Minnesota.

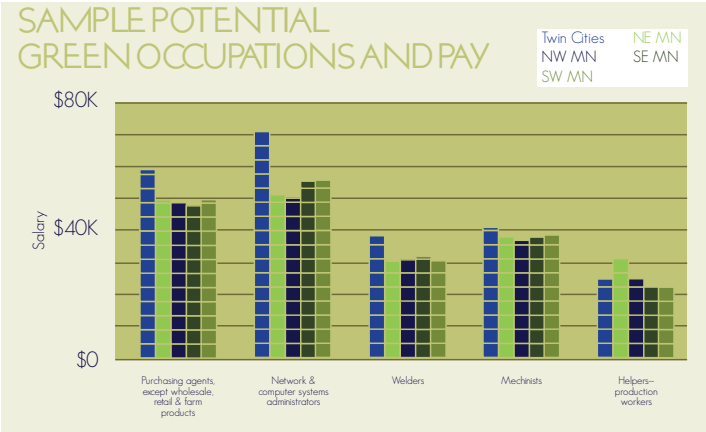
With occupations classified as most green-civil engineers earned an average of $73,690 in the nonmetropolitan southeast portion of the state compared to $73,580 in the Twin Cities, $65,280 in southwest Minnesota, $62,990 in the northwest, and $62,470 in the northeast. Heating, air conditioning, and refrigeration mechanics and installers earned the most in the Twin Cities region, while industrial machinery mechanics earned the most in northeast Minnesota.

For the second tier of green occupations there does appear to be more of a pronounced difference between the Twin Cities and the non-metro regions of Minnesota. This is especially apparent in trade occupations. While many of these jobs generally do not require significant post-secondary education, there are often apprenticeships required to become successful, and these can take several years to complete, in addition to on the job training. The difference between the Twin Cities and the rest of Minnesota may be at least partially due to prevailing wage regulations. For instance, the commercial prevailing wage for a pipelayer in Hennepin County (combining the basic and fringe rates) is $41.93. In Otter Tail County this rate is $35.83, in Carleton County $34.83, and in Brown County $22.00.[55]

Finally, for potentially green occupations there is a mix as to whether the Twin Cities pay better wages. In general, the wage levels are slightly better. However these differences are greatly pronounced in jobs with high earning potentials (often due to the high levels of education that are required). Examples of these would be chief executives,engineers, and managers. Again, in trade occupations one sees that the Twin Cities pays higher rates. This is again probably due to the strength of the prevailing wage in the Minneapolis-St. Paul region. However, for industries that fall between these two, there does not appear to be a significant difference in pay. While there may be slightly higher levels in the Twin Cities, it is likely that these levels are can be explained by the higher cost of living in Minneapolis-St. Paul.







As the education and training requirements increase for occupations, so does the difference between pay in the Twin Cities and in the non-metro regions of Minnesota. Similarly, occupations traditionally represented by the building and construction trades and unions pay significantly more in the Twin Cities. This is likely due to prevailing wage laws that require greater payment in Minneapolis-St. Paul. For those jobs that do not fit into either category, it appears that the Twin Cities do not pay significantly more, and in some cases less than in other regions. A good example of this are forest conservation technicians whose average wage in the Twin Cities is $34,680, but $36,860 in northwest MN and $37,990 in northeast MN. It makes sense, then that there are higher average wages in the regions of Minnesota where the forestry industry is located.

GREEN OCCUPATION TRAINING

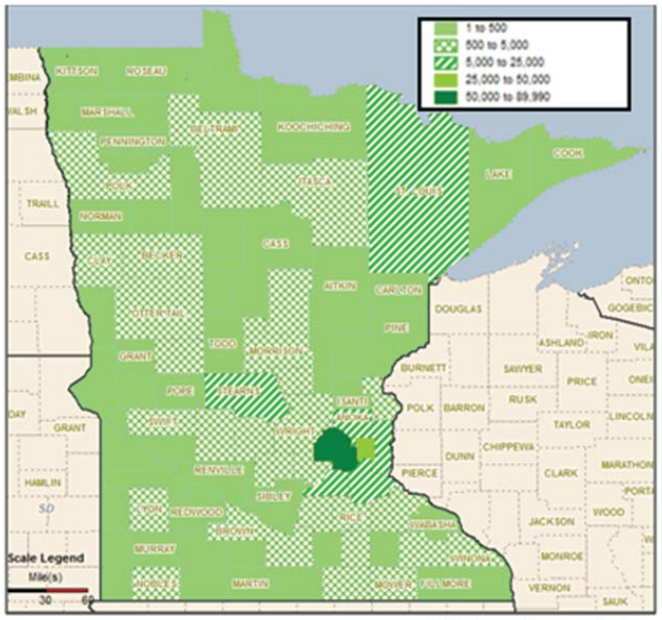
For green occupations in Minnesota, many similar skills are found across the board. Basic math skills are required for most jobs, even those that do not require higher levels of education. Similarly, interpersonal skills and the ability to work well with other remain important. As far as education levels required, there appears to be a trend toward having at least some college or post high school educational experience. This is especially true for occupations identified as "most green" and for supporting occupations of the green economy. However, there are still many green jobs where post-secondary training is not required. Even for jobs that do not require a bachelor's degree, there is often significant on the job training that is necessary. One cannot simply walk in off the street and hope to be qualified for a green job. Like any good job, there are time, training, and educational commitments that may precede a successful applicant.

According to the US Bureau of Labor Statistics' Occupational Employment Statistics Survey, among the occupations identified as most green (green occupations with a clear green focus in green industries) 31.7% reported having only a high school education, while 20.3% reported having at least some college and 46.3% reported they had at least a college degree. 38 occupations were categorized in this grouping. Jobs in this category included civil and environmental engineers, environmental scientists, landscaping and grounds keeping workers, and agricultural equipment operators.

The Tier 2 green group of jobs also included green occupations in green industries. This collection was represented by such jobs as industrial production managers, chemical engineers, logging equipment operators, boilermakers, and septic tank servicers. Overall, 59.6% reported having just a high school degree with 25.1% possessing some post-secondary education and just 14.4% having at least a college degree. Overall there were 110 jobs identified in this second category.

The potentially green group of occupations totaled 430 different types of jobs. These were tasks that could be considered green depending upon the individual jobs, but were not located in specifically green industries. Examples of these occupations include chief executives, purchasing agents, information technology workers, teachers, lawyers, salespeople, and crane operators. These jobs are often the support or service mechanisms behind green industry, and as thus, are often difficult to differentiate from their traditional economy counterparts. Of these jobs, workers reported that 35.8% of them had just a high school diploma, 29.9% had some post-secondary schooling, and 33.7% had a college degree or greater educational training.

Green Related Jobs by County (2007)



Source: GSP Consulting analysis

GREEN OCCUPATION GEOGRAPHY

The opportunity for green jobs is located throughout the state. As the map below shows the industries that have been defined for the four green jobs categories are located throughout the state and employ residents of every community. The largest concentrations are located in around the Twin Cities regions, with strong populations also located in St. Louis and Stearns Counties. This makes sense as these are counties with large populations in general. Jobs in the Renewable Energy and Green Products sectors may not have a preference for metropolitan areas but base their business location decisions more on production cost, and proximity to resources, as well as workforce talent. However, the Green Service sector is made up of supporting systems that often locate to a much higher degree in urban or suburban areas, and are made up of a variety of occupations including lawyers, accountants, and salespeople. As the Green Services sector employs many more employees than the other three sectors, a greater presence of green jobs in the more urban areas of Minnesota is expected.

EDUCATIONAL RESOURCES

"Green" has been and is a welcomed initiative on the higher education campuses of the state. These efforts are reflected in institutional cafeterias where organic and locally grown produce have been requested by students and offered by administrations for several years to the board rooms where decisions to build structures that carry LEED certification have been made, to the provosts offices where academic programs addressing sustainability and interdisciplinary scientific analysis of complex environmental issues are being designed. These developments are taking place on both public and private college campuses. As part of this research we have reviewed what activities are going on throughout Minnesota's education and training providers. Identifying their efforts is critical in insuring alignment between green jobs opportunities and the skills that are required. The following is a summary of what we were able to identify:

UNIVERSITY OF MINNESOTA

With its charter to teach, conduct research and provide outreach, the University has many venues where it can influence green jobs development in the state.

- The University's Institute on the Environment and within it the Institute on Renewable Energy and the Environment (IREE) was designed to capture the interdisciplinary nature of this field. It brings together, supports and funds research from 10 colleges within the University covering the gamut from anaerobic digestion to solar energy to housing design for energy efficiency.
- The College of Design with its Center for Sustainable Building Research with its widely recognized solar research and efficient building design work being done with a national leader in residential development is one such example.
- The College of Food, Agricultural and Natural Resources Sciences conducting research on ethanol feed stocks and enhanced agricultural production is another.
- The University has the Natural Resources Research Institute (NRRI) in Duluth, where applied research is conducted in multiple arenas applicable to green technology advancement. Applied research success can coordinate with feasibility study funding through IREE as a precursor to commercialization of the technology. Processes that enhance ethanol production efficiency or effective means by which waste products can be utilized for energy are examples of work done through NRRI.
- University of Minnesota Extension, as the outreach arm of the University, carries responsibility for sharing the opportunity and supporting the development that can take place in society flowing from university endeavors. This work is now conducted through regional offices as versus county offices and is divided into specialty centers covering: community and business development, leadership and youth development, natural resource and agricultural development, etc. This information delivery and support system is recognized throughout much of the state.
- The Academic and Corporate Relations Center (ACRC) was recently developed as the business "front door" to the University. Among the areas where its services can be helpful is in guiding businesses and individuals to the appropriate parties within the University to assist with research projects or in identifying opportunities for commercialization of existing University research. The Office of Commercialization has been formed to facilitate this

process.

- The Humphrey Institute on Public Affairs serves as a center for public discourse and study regarding public policy considerations as society faces the inevitabilities of constant change. Within the Institute, again, there are centers, one of which is the Center for Science, Technology and Public Policy. It is among those whose focus incorporates economic impact of sustainability and green technology developments.
- The University of Minnesota, Morris Campus is a national leader in the adoption of green practices. This leadership began on Earth Day 2000 and has already demonstrated significant accomplishments including:
  - Up to 60% of the UMM's electricity comes from Wind Power
  - Developing a biomass gasification demonstration project on campus
  - Creation of an environmental studies major
  - Focus on water conservation and recycling

MINNESOTA STATE COLLEGES AND UNIVERSITIES

Like the University, the Minnesota State Colleges and Universities (MnSCU)[56] are actively working to increase their direct communication with the business community and their support of it. Presidents are meeting with business CEO's and custom training programs are present on the 32 campuses within the system. This positioning can support both leading and serving green job development. The system recognizes that it is just beginning to get its arms around the green economy. The system is taking the approach that to supporting state business developments and workforce preparation, it should be through creating programs and through imbedding green skills into the current curriculum.

- Two schools stand out for early green business workforce support: St. Paul College and Minnesota West Community and Technical College, with campuses in: Worthington, Pipestone, Jackson, Canby and Granite Falls. St. Paul College is recognized for its "green" manufacturing, "green" construction and LEED certification programs and the latter for wind power and biodiesel/renewable energy technician certifications and associate degrees.
- $1 million dollar Department of Labor grant to increase capacity for energy related education and training in high growth fields, the MnSCU system is creating career pathways for employment in renewable energy as part of the grant funded project:
  - MnSCU is working with the Minnesota Energy Consortium to identify skills that are needed across the renewable energy field for development of a new Energy Technology Associate of Applied Science degree.
  - The grant funded project will also expand distance-based learning opportunities in renewable energy fields.
  - The next semi-annual renewable energy production survey will show what positions are needed by the industry. In conjunction with DEED, ISeek.org (online job search) will be modified to create an energy jobs channel.
- Programs that are in development at the present time include: Building Energy Technicians (energy auditing) at Hennepin Technical College
- Century College is developing a Sustainable Energy Program which will offer courses beginning in the Fall of 2009. Currently five study tracks are being proposed:
  - Certificate of Renewable Energy Systems
  - Advanced Certificate: Solar Thermal Energy Practitioner
  - Advanced Certificate: Solar Photovoltaic Energy Systems
  - Diplomas: Solar Energy Technology - Technician
  - Associate in applied Science - Solar Energy Technology
- Currently nearly all of the MnSCU campuses have some programs into which green and sustainable technology curriculums could be added. They range from sustainable tourism, to water quality technician, to biochemistry, to regulatory affairs and services, to agronomy technician, to powerline technician, to counselor education and they include all the construction trades.
- MnSCU is the largest provider of customized training in the state, providing another vehicle for green related training as the capacity expands within the system.
- The Fond du Lac Tribal and Community College is working with the Native American community in business development through course offerings. Having recognized potential workforce opportunities in green industry, Native Americans have come together to create a "Green Jobs for Brown People" initiative.

PRIVATE COLLEGES

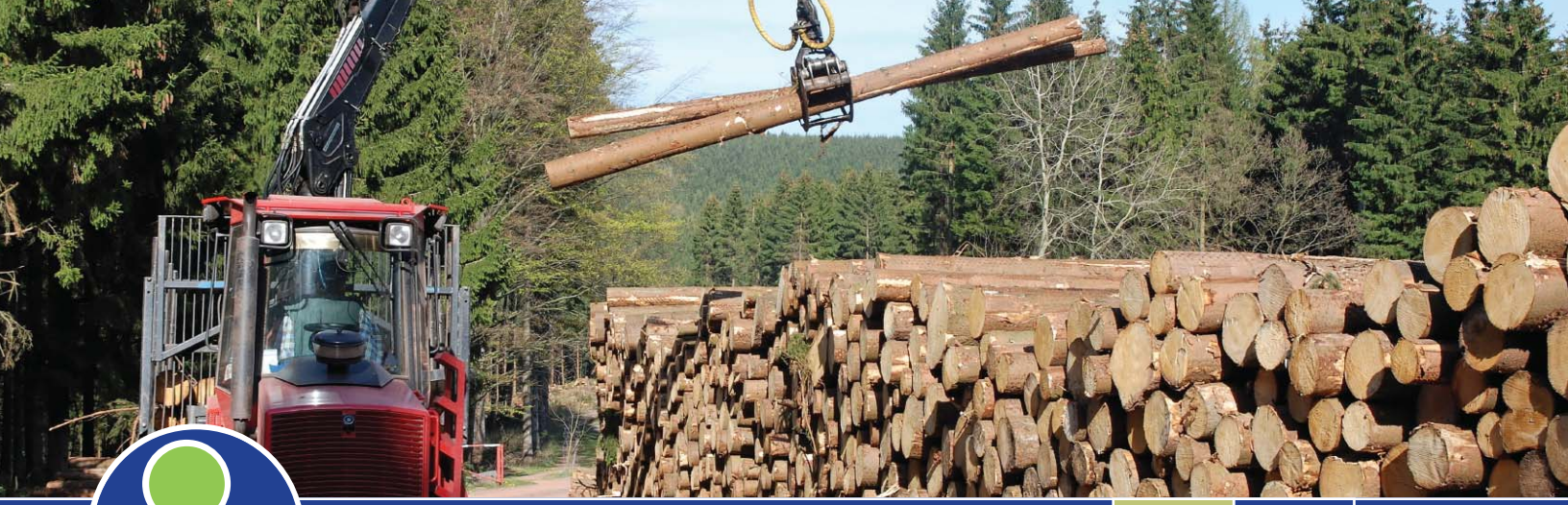
Liberal arts study lends itself to broad consideration of societal direction; accordingly, environmental studies and sustainability are incorporated into curriculums and have been degree programs at many of the private colleges for several years. By their nature, they do not lead to clearly defined green career pathways. Green research and breakthroughs do take place on liberal arts campuses, though, and one recently did in Minnesota when a Cloquet, MN student who expected to pursue a film major ended up in chemistry.

The combination of student Brian Krohn's research, the teaching of chemistry professor Arlin Gyberg and Augsburg alum Clayton McNeff led to the discovery of the Mcgyan Process to produce biodiesel in a cleaner and more environmentally friendly way. This research has been recognized by the recent

naming of Kohn as one of 32 Rhodes Scholars for 2009. At Oxford University in England next fall, Krohn will study environmental change and management in order to combine public policy expertise with the scientific knowledge he has gained at Augsburg.

Other programs include:

- The 17 liberal arts schools comprising the Minnesota Private Colleges have both historical focus on the sciences and increasing focus on green and sustainability in their curriculums whether within the sciences or across the disciplines.
- Carleton College and St. Olaf College, both located in Northfield, MN, have wind turbines on their campuses. A wind turbine may be in the future for Gustavus Adolphus College, as well.
- St. Olaf opened its new LEED certified Regents Hall mathematics and natural sciences building in 2008. The facility is expected to earn LEED platinum status. One of the disciplines the building will house is the school's nationally recognized green chemistry program. Through a green focus and resultant technique and processing materials changes, green chemistry, more environmentally sensitive, meets an increasing industry imperative.
- St. Thomas convened a 2007 summer seminar to review with faculty, campus-wide, how sustainability could be reflected throughout their curriculum. Resultant courses include: chemistry environmental-problem solving courses addressing ethanol production and international justice and peace studies looking at world climate concerns and the groups participating in addressing the issue. They have introduced a new environmental science interdisciplinary major (not environmental studies) which will view complex environmental issues through the combined lenses of geology, biology and chemistry. Traditionally the geology program has prepared students for careers in the full breadth of environmental consulting.
- Bethel University also has an environmental science major as well as environmental studies major. Green technology courses include sustainable living and transforming technology, an environmental perspective. The campus's new Brushaber University Commons will have a green roof. Macalester College installed the first large-scale urban wind turbine in St. Paul in April 2003. Excel Energy donated the turbine and Macalester paid for the installation. Although the turbine produces a fraction of total power consumed by the college, its presence gives students first-hand knowledge of renewable energy technology in action.
- Carleton College requires all new construction be LEED certified. The new Center for the Arts is planned to be LEED Silver certified and could possibly obtain a Gold certification. Also, two newly constructed residence halls are LEED Gold certified.
- Hameline University CREED: Communities for responsible Energy/Environment Demonstration (CREED) Project. The CREED Project has been taking the initiative to address the declining numbers of youth entering the STEM fields by getting the message of opportunity into our high schools and middle schools. In partnership with Hamline University's Center for Global Environmental Education (CGEE), CREED has designed and offers graduate semester C.E. courses in the Energy Efficiency and Renewable Energy (EERE) series, which lead up to a qualifying Energy Certificate. This 12 credit series starts with a two credit "Energy Basics" course which is a recommended prerequisite for the four intermediate level courses: "Mathematics for Energy Problem Solving," "Solar Direct," "Solar Meteorological," "Energy Entrepreneurship" or "New Energy Technologies."



WORKFORCE SERVICES IN MINNESOTA

In the following section we will explain how the current workforce service system operates.

The Department of Employment and Economic Development (DEED), since its formation through the merger of economic and workforce development is positioned to address economic competitiveness in an integrated manner. Divisions within the department focus on business and community development including international trade development, workforce development services and business services and unemployment and rehabilitation services. Recent additions to focus have been offices addressing entrepreneurship and science and technology. Multiple streams of federal money and targeted state appropriations support these various activities. The structure of service delivery is influenced by the mandates of state and federal statutes.

The primary stream of funding for workforce services is the Federal Workforce Investment Act (WIA), which includes Titles 1 and 1B - Youth/Adult and Dislocated Worker Programs (DWP); Title 2 - Adult Basic Education (ABE); Title 3, the Wagner Peyser Act - job services and business services; Title 4 - Vocational Rehabilitation Services. The service delivery model for these funds is in part statutorily proscribed, is collaborative and includes: a state Workforce Investment Board and local Workforce Investment Boards (WIB) which oversee workforce service delivery in defined Workforce Service Areas (WSA). In Minnesota, the state Workforce Investment Board is the Governor's Workforce Development Council (GWDC). Within each Workforce Service Area, the WIB's and the Workforce Development Division (WDD) within DEED work closely in delivery of services thro ugh the Workforce Centers.
WIA funds flow to the governors of the states. In Minnesota WIA Title 1, Title 3 and Title 4 are directed to the Commissioner of DEED and Title 2 goes to the Department of Education. WIA Title 1 and 1B are allocated by formula to Local WIBS and the rest stays with the state. WIA Title 3 & 4 are delivered by the state and operated in partnership through the local Workforce Centers (state and local partnership). Local WIB's have the prerogative to deliver Title 1 & 1B directly or to contract out through an RFP process to non-profits or State Services. Within the Federal distribution formula is an allowance for limited discretionary funds. In Minnesota, collaborative and comprehensive analysis of economic competitiveness potential and integrated workforce service delivery to develop that potential is a part of the focus for these discretionary funds.

These federal funds, in conjunction with targeted state funding, support the programmatic work delivered through the Workforce Center System across the state, of which there are 47 Centers. These Workforce Centers are geographically dispersed across the state and organized into statutory Workforce Service Areas (WSA) for administrative oversight. There are 16 WSA in the state overseen by local Workforce Investment Boards (WIB) appointed by local elected officials. The WIBs must submit service delivery plans to the state for approval; however, they have some latitude to approach the workforce needs of their region independently. The membership of the local WIB's is to be representative of the employers and employment needs within the region they serve. There is a vertical but not a hierarchical relationship between the GWDC and the WIBs; accordingly there is no direct reporting relationship but rather a shared focus, which provides opportunity for shared training and planning. The Governor's Workforce Development Council, with a representative membership from major state agencies receiving federal funds influencing business development and the human capital side of workforce development (human services, education) and a wide cross section of society, including geographic representation, serves as the state

Workforce Investment Board and is advisory to the Governor.

DEED developed six Regional Administrator positions to help integrate the combined efforts of the economic development and workforce development services within DEED, and to encourage effective, highly collaborative relationships between the Workforce Center System and businesses regionally – thereby developing a statewide understanding of regional capacity for competitiveness in a global economy. One of the areas of service in which these Regional Administrators have provided leadership is in the analysis of regional strengths and resultant potential for collaboration within education, workforce and economic development in relation to industry sectors and clusters. Significant federal funds have been leveraged through these efforts and regional grants (FIRST Grants – Framework for Integrated Regional Strategies) have been awarded to further the process across the state.

The Minnesota Job Skills Partnership Board (MJSP) serves business and workforce development through training assistance. The Board awards grants to help Minnesota businesses partner with educational institutions in developing incumbent employee training. In addition to that program, the MJSP Board also has statutory authority over the state and federal Dislocated Worker Programs, where funds are allocated to service providers for training and services to laid-off Minnesota workers who meet specific eligibility requirements. The MJSP Board consists of 12 directors, representing higher education, business and labor, as well as legislators.

MJSP Training awards are from the General Fund. Must be matched dollar to dollar for the Partnership and $1 to 50 cents for Pathways (for lower income workers) by the employer who will benefit from the newly trained individuals. MJSP awards do not exceed $400,000. The Minnesota State College and University system (MnSCU) is the recipient of 80 to 90% of the MJSP training awards. DEED provides administrative support to the Board.

The merged DEED organization melds different points of focus, different client bases and different modes of service: economic development, local and regional economies, individual companies, business enhancement services and resources, industry clusters, a variety of workforce populations, and delivery of multiple programs serving these populations even including administrating the Social Security Disability Insurance program for the Social Security Administration. From a structure perspective, program delivery mandated and supported by WIA funds defines the greatest portion of the Department design. Enhancing the vision of all participants in this complex program area to include opportunities that lie beyond traditional service delivery is an acknowledged challenge before the state.

To increase Minnesota's global competitiveness in a 21st Century economy, DEED's Workforce Development Division (WDD) has been leading the dialogue on the need for transformative engagement through collaboration, working across systems and state agencies to build an integrated approach that aligns strategic investment and provides focused support to increased competitiveness at the regional economy level.

Research and the Minnesota experience support the concept of and the effect of industry clusters in increasing the competitiveness of regional economies and driving the State's economy forward accordingly. The confluence of increasing understanding of and commitment to inter-related approaches to challenges and opportunities, collaboratively identified, and hard economic times presents the state with an opportunity. Evolving and emerging industry clusters that can be vital to our economy can be identified, and established industry clusters may be nurtured for sustainability and growth. Resource challenges can drive collaboration and provide increased opportunity for creative approaches to solutions; however, there is no replacement for the commitment of leadership at the regional and state levels to keep Minnesota on the competitiveness curve.

The strength of our response as a state to the challenges and the opportunities of the times will be influenced by the degree to which we can leverage our resources across broad sections of our: local, regional and state levels of government, population and private sector.

The "green economy" is providing an opportunity for dynamic engagement across sectors and clusters of distinguishing industries that are key economic drivers to regional economies. Our commitment to planned business development, independent entrepreneurial growth and open innovation requires a ready and able workforce. State investment in human capital, creating "on and off ramps" to skills training and credentialed career pathways for youth and mature workers, are viewed as essential to securing our competitive advantage. Effectively using the potential within the WIBs, within DEED and within Regional Economic Development Councils can begin this process.

Green Economy Training in Action

One of the best examples related to the green economy is the work being done by Minnesota's Renewable Energy Marketplace. The MNREM[57] is an industry-led consortium of economic development, workforce development, education and workforce leaders that provides the framework and commitment to transform the 36 county region of South Central, Southwest, and West Central Minnesota from primarily agriculture-dependent to a knowledge and innovation-based economy that capitalizes on the region's strength in agriculture and renewable energy. Critical emerging industries based in renewable energy and biosciences are revitalizing the inherent know-how and spirit of entrepreneurship in the region, and will form the foundation for the regional transformation. Industry sectors targeted for the focus of the MNREM initiative include renewable energy, value-added agriculture, agri-bioscience, and the supporting industries. This initiative was awarded $5 million through the federal WIRED initiative.

GREEN JOBS PROGRAMS IN BENCHMARK STATES

In order to identify what other states are doing to support green jobs and green market development, the GSP Consulting team analyzed each of the benchmarks states activities. It should be noted that many of the programs described on the following pages are still relatively new in their existence and therefore it is difficult to gauge the overall success of the programs. What is clear is that each state is attempting to support the growth of green jobs in some way.

The states that have been chosen for this benchmarking activity were done so for the following reasons:

- Wisconsin – identified green economy leadership, progressive policies, neighboring state
- Iowa – identified green economy leadership (especially wind), aggressive economic development, neighboring state
- North Dakota – green economy activity, neighboring state
- South Dakota – green economy activity, neighboring state
- Colorado - identified green economy leadership, progressive policies
- Illinois - identified green economy leadership, progressive policies
- Ohio - identified green economy leadership, progressive policies, aggressive economic development
- Pennsylvania - identified green economy leadership, progressive policies, aggressive economic development
- Michigan - identified green economy leadership, progressive policies, aggressive economic development
- Washington - identified green economy leadership, progressive policies

The following pages provide highlights on the various programs that these states have that can support green jobs development. Much of this information was obtained via searching through the states website and press releases. DEED assisted GSP Consulting with identifying what states are doing relative to marketing their green jobs activity. While none of the benchmark states specifically markets their green jobs related programs each does spend significant resources on marketing their state for economic development purposes with estimates ranging from $1 to $15 million per year. These dollars support green economic development as well as other sectors and as this market areas has become better identified as a growth area, a larger percentage of the dollars are focused on green jobs.

MINNESOTA

Overview of the State's green jobs activity

As highlighted throughout this report Minnesota is a leader in adopting policies that support the growth of the green economy. The following information highlights some of the programs that are available to support economic growth (green and other):

Minnesota Office of Energy Security. The Minnesota Office of Energy Security was created within the Minnesota Department of Commerce by Governor Pawlenty's executive order in January of 2008. The office coordinates energy and climate issues throughout the administration, allowing the public easier access to energy information and technical assistance.

Minnesota Investment Fund. Grants are awarded to local units of government who provide loans to assist expanding businesses (maximum of $500,000 per grant). Only one grant per state fiscal year can be awarded to a government unit. At least 50

percent of total project cots must be privately financed through owner equity and other lending sources (most applications selected for funding have at least 70% private funding). Grant terms are for a maximum of 20 years for real estate and 10 years for machinery and equipment. Interest rates are negotiated. The program is funded through state and federal funds with $5.1 million available for the current fiscal year. DEED currently has a pipeline of businesses which, if all projects go forward, would use all current state and federal funds. There is no base appropriation; all state funds are derived from loan repayments. The state receives federal funds as the economic development set-aside from the Community Development Block Grant program. One "green business," Ever Cat Fuels in Isanti (a renewable fuel manufacturer) has received assistance this fiscal year.

Job Opportunity Building Zone (JOBZ). Enacted on January 1, 2004, the JOBZ initiative is Minnesota's primary rural economic development stimulus program. The program provides substantial tax relief to companies that start up or expand in targeted areas of Greater Minnesota from the date they sign a business subsidy agreement until the program expires on December 31, 2015. The program identifies 10 zones encompassing more than 300 communities in every region of the state (except the 7 Twin Cities metro area counties). Business and local government jointly apply to DEED for approval of application, based on several criteria such as jobs created, wages, return on investment, and local distress. Because this is a tax credit program, there is no appropriation, and no limit to remaining usage.

Redevelopment Grant Program. The Redevelopment Grant Program provides competitive grants to local units of government for site preparation costs at previously utilized property. This land recycling program provides cities with clear land to entice private development, creating jobs, housing units and increasing the local tax base. Program is fund by state general obligation bonds. Currently $2.9 million is available for a February 2009 award cycle. The program currently includes in its project ranking system language that promotes the green economic as described in Minn. Stat. § 116J.437.

Minnesota Technical Assistance Program (MnTAP) provides pollution prevention assistance and practical alternatives for minimizing industrial waste.

The Small Business Environmental Assistance Program (SBAP) of the Minnesota Pollution Control Agency provides free, non-regulatory, confidential environmental assistance to small businesses. The focus is on compliance assistance, but there is also an emphasis on pollution prevention opportunities.

Enterprise Minnesota is a non-profit business consulting organization that helps small and medium-sized Minnesota take advantage of expert business solutions to compete and grow profitably. The organization is one of 59 affiliate organizations connected to a national network of Manufacturing Extension Partnership (MEP) organizations funded in part by the U.S. Department of Commerce.

UMD's Natural Resources Research Institute (NRRI) fosters the economic development of Minnesota's natural resources in an environmentally sound manner to promote private sector employment. NRRI provides a variety of services to give business a competitive edge.

Renewable Development Fund[58] The Renewable Development Fund is financed by Xcel Energy ratepayers to promote the start up, expansion and attraction of renewable energy projects and companies in the Xcel Energy service area. It also stimulates research and development into renewable energy technologies. Both efforts are designed to increase the market penetration of renewable energy resources at reasonable costs.

Project funding to date has been in the form of grants and renewable production incentive (REPI) payments. RDF grants have been awarded to research Universities, non-profit organizations, commercial businesses, and governmental agencies. Grants support commercial technologies and research and development.[59] The REPI is paid to qualifying small wind, biogas and hydroelectric projects operating and generating electricity in Minnesota.

The RDF is governed by a seven member RDF Advisory Board consisting of two representatives of environmental organizations, one representative of the Prairie Island Indian Community, an industrial/commercial ratepayer representative, a residential ratepayer representative, and two representatives of Xcel Energy. The RDF Advisory Board selects proposals for grant funding, identifies funding priorities, and assures that Minnesota Public Utilities Commission (MPUC) RDF initiatives are met.

Since 2005 over $75 million has been awarded from the Fund with the last set of awards occurring in April 2008.
Minnesota Chamber WasteWise. Minnesota Waste Wise is a member-supported, nonprofit affiliate program of the

Minnesota Chamber of Commerce that provides confidential, non-regulatory waste reduction and recycling services to Minnesota businesses. Minnesota Waste Wise offers on-site waste assessments, technical assistance, education and training programs, workshops, and networking opportunities for its members. More information can be found at: http://www.mnwastewise.org/

Minnesota Energy Smart. Saving energy is smart business. Energy Smart helps Minnesota businesses achieve cost savings through energy efficiency by connecting businesses to existing Conservation Improvement Programs offered by their energy utilities, as well as other energy efficiency tools and resources

offered to the Minnesota business community. Energy Smart directs businesses to the information they need to make informed choices about their facilities' energy use and efficiency upgrade options, highlighting potential cost savings or available financial incentives. Created for business by business, Energy Smart was developed by Minnesota Waste Wise in affiliation with the Minnesota Chamber of Commerce. More information can be found at: http://www.mnenergysmart.com/.

Minnesota Trade Associations/Unions can help train workers to prepare for new challenges or changes in a particular industry.

Agricultural Utilization Research Institute provides expertise and assistance in the development of innovative and value added uses for agricultural products. Expertise includes food product development, industrial product development, co-product utilization, and renewable energy project development.

WISCONSIN

Overview of the State's green jobs activity

Wisconsin Governor Jim Doyle has a comprehensive green plan entitled "Clean Energy Wisconsin, a Plan for Energy Independence." Outlined in a spring 2008 Report, it entails promoting an affordable, renewable, and diverse energy supply with targeted investments in job creation and new business opportunities while improving the environment.

Goals were set in 2006 by a consortium including industry, environmental groups and scientific leaders. They include:

- Generating 25% by 2025 for both electricity and transportation fuel (estimated to generate $1 Billion for the state's economy);
- Capturing 10% of the market share for the production of renewable energy and bioproducts (estimated to create 20,000 jobs);
- Research leadership recognized nationally in groundbreaking research that will increase affordability and availability of alternative energies;
- Commercializing bioproducts in Wisconsin for high paying jobs.

The state has created a number of programs and incentives to meet 2006 goals:

- The state is requiring utilities to devote 1.25% of annual operating revenue to efficiency and renewable energy programs. Focus on Energy- Renewable Energy Grant Programs $500,000 aggregate for all FOE grants to any individual or business during each fiscal year. Grants are offered for the following areas: Business & Marketing, Feasibility Study, Development, and Implementation. In 2007 the grant program helped 12,800 businesses and 214,800 families for a combined benefit of $32.5 million.
- Business and Job Development: $150 million Energy Independence Fund Grant and Loan Program to make state a leader in renewable energy. A total of $15 million is expected to be awarded annually through three competitive application cycles. Typical awards will range from $100,000 to $500,000 per project, although no minimum or maximum amounts are specified.[60]
- Industry Skills Partnership: Grants totaling $850,000 are providing industry, tech colleges and workforce development boards with the ability to train.
- School Renewable Energy Projects – 14 school districts are eligible for $14 million in federal Clean Renewable Energy Bonds (CREBs).These schools can receive equipment to generate up to 5 megawatts of power. Teachers can be trained through the National Education Foundation and the project can be incorporated into curriculum
- Making $4 million in grants available for the construction of the first soybean crushing facility in the state. The facility must have the capacity to process more than 20 million bushels of soybeans annually. This is in conjunction with a $0.10/gallon tax credit for biodiesel fuel producers in Wisconsin that produce at least 2.5 million gallons diesel annually. The tax credit takes effect in 2009.
- Along the same lines, each service station that installs or retrofits pumps to E85 or 20% bio-diesel will be eligible for a tax credit. The tax credit would cover up to 25% of the retrofit cost or $5,000. Total initiative costs $2 million.

Wisconsin has something quite close to an Energy Czar. The Office of Energy Independence (OEI) was created as part of Executive Order # 192 in April of 2007.

- The office is responsible for drafting and implementing economic development policy around energy independence within the state.
- Individual communities have formed voluntary agreements with OEI with the intent to match state levels of renewable energy consumption and conservation. The agreements are known as Energy Independent Community Partnerships.
- The Energy Independent Communities, along with the University of Wisconsin, collect data on consumption and conservation practices to help keep the state informed about the direction of conservation efforts. The data is also used to track the progress made towards fulfilling Wisconsin's 25% by 2025 initiative.
- In return for their efforts, Energy Independent Communities receive access to state and federal funds as well as technical assistance to meet their goals.

NORTH DAKOTA

Overview of the State's green jobs activity

Green investment in North Dakota is a multi-faceted approach led by the Governor. The plan focuses on education, economic development, agriculture, energy and quality of life. Nowhere

in the plan is green investment targeted specifically, but the individual areas can all benefit from green practices. The North Dakota Department of Commerce created a one stop shop for businesses as part of a comprehensive effort to grow their economy. They have a strategic plan to grow value-added agriculture, advanced manufacturing, technology, tourism, and energy jobs. This strategic plan has created more than 30,000 new higher paying jobs since 2002.

The Department of Commerce focused on developing partnerships to achieve growth in targeted industries – with education, with state and local economic development personnel.

- Industry and University officials created the Centers of Excellence as a cornerstone piece in the economic development agenda. The center receives $20 million annually through the Department of Commerce.
- In 2 years the center has leveraged $70 million in additional research and development funding for agriculture, renewable energy, advanced manufacturing and business technology.

A number of tax credits were made available to drive business expansion within the state:

- Beginning August 1, 2008 the state's research and development tax credit rate increased to 25 percent for the first $100,000 of research expenses and 20 percent for expense amounts over $100,000. These rates are effective until 2018, after which the rate for expenses in excess of $100,000 drops to 8 percent.[61]
- Any North Dakotan tax payer may invest in a qualifying North Dakotan business and receive a 45 percent tax credit towards their investment for that year up to $112,500.00. This investor tax credit can be applied over a four year period.
- An $8 million increase in funding of workforce development initiatives resulted in the expansion of the Internship Employment Tax Credit. The credit is equal to 10% of the compensation paid to an intern. Compensation paid to up to five Interns is eligible for the credit. The program also acts as an incentive for businesses to recruit interns from North Dakotan colleges and universities.
- Also part of the workforce development initiative is a career specialist program designed to expose high school students to career opportunities within the state.
- Innovate North Dakota is a new technical assistance and mentorship program aimed at helping young North Dakotans to realize that they can grow their ideas within the state.

In addition, the states' Renewable Energy agenda includes:

- $3 million of tradable income tax credits for installation of geothermal, solar and wind energy devices.
- A discount on property taxes for wind generation units from 3 to 1.5 percent.
- A $7.3 million Governor's Ethanol Production Incentive Fund; counter-cyclical support for ethanol plants.
- A $2.2 million sales and use tax exemption for materials used to construct co-generation power plants in conjunction with value added agriculture projects.
- An incentive to purchase environmentally preferable paper and printing products by the state.
- Expansion of Value Added Agriculture Investment Tax Credits with the potential to generate investments in 10 projects per year, including renewable energy projects. Five projects with $10 million in investments could result in $100 million in projects over the biennium.
- A requirement for ethanol blend pumps to have an ethanol promotion label.
- $5 million bio-fuels Partnership in Assisting Community Expansion (PACE) – an interest buy down for renewable fuels, dairies, ranching operations and E-85 pumps limited to $500,000 for each new bio-fuels facility.
- Renewable Energy Grant Fund was established by the Legislature in 2007 under the control of the North Dakota Industrial Commission. The law provides that the Industrial Commission shall consult with the Renewable Energy Council (REC). The Program's responsibilities include providing financial assistance as appropriate to foster the development of renewable energy, including wind, bio-fuels, biomass, solar, hydroelectric, geothermal, and hydrogen. $20 million is available for the program with $3 million from state general appropriations and $17 million from Special Funds.
- Lignite Vision 21Program is the product of cooperation between government agencies, elected officials, and the lignite coal industry. The North Dakota Industrial Commission committed $10 million in direct contributions and an additional $26 million in tax incentives for the construction of clean coal power plants. Three to four clean coal plants are in development including a coal to liquid facility and a gasification facility. Currently North Dakota has roughly 4,000 MW of coal fired generation capacity.
- Wind power provided 164MW in 2006 with 1,500MW planned for 2020.[62] Also the North Dakota Transmission Authority wants to expand wind exports to 4,000MW.

For Consideration in Minnesota

Putting the Centers of Excellence funding in the Dept of Commerce Budget makes the economic development focus crystal clear.

- They are using tax credits as incentives – they have a proven record of effectiveness
- Their focuses are on industries that build economies, grow financial worth – that add value to a resource (with the

exception of tourism that brings in new money). They are not focusing on education, healthcare etc.
- North Dakota has put in place state authorities that can enable addressing development issues if they are road blocked by neighboring states.
- Incentives to build co-generation power plants in conjunction with value added agricultural projects is prudent. (The amount of waste heat in the US assessed from a BTU potential perspective, at present, is the equivalent of the BTU capacity of oil contained in a cube 7 football fields long and wide and three miles high.)

SOUTHDAKOTA

Overview of the State's green jobs activity

Governor Mike Rounds places considerable focus on the energy economy and appears to be actively outlining an agenda. South Dakota has tripled its ethanol production since 2002 and is now first in the nation in farmer-owned ethanol plants. In 2000, the state drafted an aggressive economic policy to increase the state gross domestic product by $10 billion by 2010. State officials believed this goal could be met by supporting business expansion and manufacturing industries. The $10 billion growth target was met two years early in June 2008. The creation of an ambitious workforce program and a series of business loan programs contributed to the impressive growth rate. South Dakota has the business environment that supports business expansion and manufacturing – that is evidenced by the Gross State Product growth in magnitude and pace. The state can position itself as a leader in economic growth as long as it can meet the growing demand for trained labor and talent.

Workforce 2025 is a collaboration of the Department of Education, the Department of Labor, the Board of Regents, and the Department of Tourism & State Development. The mission of Workforce 2025 is to ensure South Dakota has a competent and qualified workforce to allow for economic growth and expansion.[63] There are 5 action programs:

- SEEDS – A searchable database of internships and apprenticeships for high school youth interested in pursuing a science, technology, engineering, or math field. The students earn real world experience while employers build pipelines for new talent.
- ROOTS – web-based return home campaign reporting 2000 serious inquiries in 18 months and 400 proven move backs of families.
- GROW DAKOTA – Designed to educate high school and college-aged South Dakotans about the education options available to them across the state. Included are resources to scholarships, vocational training, and flex credits which are transferrable throughout the South Dakota higher education system. There are also links for parents on college preparatory courses.
- BUILD DAKOTA –Developing strategies to address immediate, intermediate and long-term challenges facing industries statewide. The primary industries in focus are: Manufacturing, Construction, Financial Services, Healthcare, and Energy and Communications Infrastructure.
- LIVE DAKOTA –A web-based employment resource designed to keep the Generation Y'ers in South Dakota. The site highlights local in-demand careers and the benefits of living in South Dakota.
- The Revolving Economic Development and Initiative (REDI) Loan program offers low interest loans available to start-ups and businesses that are expanding or re-locating. Twenty-two companies have benefited creating 856 jobs all with health insurance. Currently the average wage is $15 per hour. Borrowers need 10% equity position and REDI can cover up to 45% of project cost. Land, building and equipment qualify as well as fees and services. The typical Interest rate is 3% amortized over 10 years for equipment and 20 years for land and buildings. These incentives brought a molded fiberglass production facility going into Aberdeen, South Dakota. The facility brings with it 750 jobs building turbine blades for General Electric's worldwide industry standard 1.5 megawatt turbines.

South Dakota changed the way they tax wind production facilities in 2003 to provide development incentives. They now have 44 MW in production and 141 MW under construction with thousands more in the planning stages. Babcok and Brown of Sydney, Australia, is launching a $1 Billion effort to build 567.5 MW of wind power in South Dakota, Texas, and Wisconsin. Currently, Babcok and Brown has 1,600 MW of installed capacity making it one of the top 5 developers in the U.S. The biggest challenge to wind energy production is transmission costs. Oftentimes the price can total a million dollars per mile placing added importance on existing line capacity.

For Consideration in Minnesota:

For a small state, the Workforce 2025 is a compelling set of initiatives. Their support of ethanol as a primary target may be an issue later as the market continues to evolve.

ILLINOIS

Overview of the State's green jobs activity

The Governor has worked with the legislature and various state agencies over the past 5 years to position Illinois at the forefront of alternative energy efforts. The Renewable Fuels Development Program was established in June 2003 by Governor Blagojevich under the Renewable Fuels Development Act (Public Act 93-0015). The program is designed to increase the production of ethanol and biodiesel fuels in Illinois and expand the market and demand for Illinois agricultural products. He also participates in the Midwest Governor's Association efforts on energy and environment

and Illinois has signed the MGA accord on greenhouse gas reduction. The Midwest governors are working on comprehensive regional policy approaches on energy and environment issues that could play a role in green economic development.

The Bureau of Energy and Recycling is contained within the Illinois Department of Commerce. In part, their mission "seeks to demonstrate the economic development benefits, including job creation, of energy efficiency, renewable energy, and recycling through a variety of programs and services. Further, Bureau programs will demonstrate that economic development, sustainable energy, and recycling practices and environmental protection go hand in hand." A number of incentive programs are administered through the bureau:

- This law creates a substantial budget for programs and incentives to reduce electrical energy usage and demand for customers of ComEd and Ameren Illinois. During the first year, there will be approximately $50 million devoted to various sectors of utility customers. ComEd and Ameren Illinois will focus approximately $38 million on residential, commercial and industrial customers and the Illinois Department of Commerce and Economic (DCEO) will utilize about $12 million on the low income and public sectors. During the second year, there will be over $100 million for programs and by the third year, over $150 million, by far the largest opportunity Illinois has had for energy efficiency and demand reduction.
- The Illinois Legislature has been active in working on legislation that provides resources for alternative energy investment, grant dollars for a variety of "green" initiatives, etc. For example, in November 2008 the legislature passed SB1987 – a clean energy bill that will put Illinois coal to work to produce electricity and substitute natural gas, while doubling the State's commitment to renewable energy resources and creating thousands of new jobs.

The Illinois Treasurer's Office sponsors the Cultivate Green Program which enables businesses, npo's, and local governments to secure below market interest rate loans for the purchase and/or installation of renewable energy equipment. Loan amounts can range between $10,000 and $10 million. Renewable energy equipment includes solar panels, solar thermal energy systems, small wind systems, or any system approved by the Treasurer's Office that will result in a net energy efficiency improvement.

Chicago as such a large city has an economic role and their development of energy standards and building codes could be viewed as important policy drivers. The establishment of GreenCorps Chicago, a green jobs training program, and their expedited building permit process are just two examples. In general, Illinois seems to have a multi-pronged approach but with a focus on alternative energy development and using that as a foundation to drive innovation, technology and accompanying job growth. Importantly, they are also focusing on clean (next-gen) coal technology – and depending on how one looks at this, it could be considered relative to green economy.

- Renewable Energy Business Development Grant Program– The purpose of this grant program is to support domestic renewable energy technologies through the development of renewable energy businesses and component manufacturers. The program will support expenses related to the development of business plans; engineering designs and drawings; advanced market studies and financial analyses; equipment purchases; information dissemination; and other unspecified business development activities. Grant awards will vary, but are generally limited to $1 million.[64]
- Special Assessment for Solar Energy Systems – Illinois offers a special assessment of solar energy systems for property-tax purposes. For property owners who register with a chief county assessment officer, solar energy equipment is valued at no more than a conventional energy system. Eligible equipment includes both active and passive solar-energy systems.[65]
- Biogas and Biomass to Energy Grant Program– The grant program will provide a 50% cost-share for energy feasibility studies or for the installation of equipment for these purposes. The maximum grants available for feasibility studies, biogas projects, and biomass projects are $2,500, $225,000, and $500,000, respectively.[66]

IOWA

Overview of the State's green jobs activity

The Governor worked with the legislature to create the Iowa Office of Energy Independence (IOE) designed in part, to develop industries that promote the environment and bring good paying jobs to Iowa. The IOEI and the state legislature created The Iowa Power Fund in 2007 with the aim of increasing the research, development, production, and use of biofuels and other sources of renewable energy to improve energy efficiency and reduce greenhouse gas emissions. The fund receives $25 million annually through the state legislature. Gov. Chet Culver has helped lure five wind turbine manufacturers to set up facilities in the state, bringing 1,500 jobs and $185 million worth of investment.

The state legislature created the Underutilized Property Redevelopment Tax Credit that encourages brown field redevelopment and offers special incentives for green development. If the investor redevelops the property to meet the standards of certain "green" development certification programs, additional tax credits are available. Brownfield sites meeting the green development standards are eligible for an additional 6 percent tax credit and grayfield sites are eligible for an additional 3 percent.

Since taking office, Governor Culver has made wind energy a major component of his plans to make Iowa the national leader in renewable energy research, development, and production. Over the past 17 months, more than 2000 green-collar jobs have been added to Iowa's economy. Six major wind energy manufacturers have located or plan to locate or expand their wind manufacturing operations in Iowa – Acciona in West Branch, Siemens USA in Fort Madison, Clipper Wind in Cedar Rapids, Hendricks Industries in Keokuk, and TPI Components and Trinity Industries in Newton.

The Iowa Value Fund is the primary tool for economic investment and can be utilized for green industry growth and economic development.

The Iowa Alliance for Wind Innovation and Novel Development is a partnership with state and local governments, community colleges, Regents Universities, the private sector, and the federal government. It is designed to serve as a catalyst for the growth of wind energy, and to support and to facilitate the research and training needs of wind energy companies.

Agriculture and Energy – Iowa's economy is heavily agricultural and no surprise that focus on ethanol and biofuel is an important component of their energy independence programs. Iowa exports more ethanol than it uses according to recent reports.

Specific programs include:

- Corporate and Personal Tax Credit for Renewable Energy Production is available for Solar Thermal Electric, Photovoltaics, Landfill Gas, Wind, Biomass, Hydrogen and Anaerobic Digestion. The credit is 1.5¢/kWh or 1.0¢/kWh for 10 years after facility begins producing energy. Credits in excess of tax liability in a given year may be carried forward up to 7 years
- Property Tax Exemption for Renewable Energy Systems including: Passive Solar Space Heat, Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Photovoltaics, Wind. This exemption is for 100% of the project value and available to Commercial, Industrial, Residential and Agriculture Sectors
- Wind and Solar Energy Equipment Sales Tax Exemption-eligible technologies include Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Solar Thermal Process Heat, Photovoltaics, Wind, Solar Pool Heating. This tax exemption is available to commercial, residential, general public/consumer and agricultural sectors and is a 100% sales tax exemption. This statute exempts from the state sales tax the total cost of wind energy equipment and all materials used to manufacture, install or construct wind energy systems. The exemption does not apply to equipment used to construct a plant to manufacture wind energy systems.
- Iowa Energy Bank – is a state loan program that can be used for Efficiency and Renewable technologies including:
  - Lighting, Lighting Controls/Sensors, Chillers, Furnaces, Boilers, Heat pumps, Air conditioners, Caulking Weather-stripping, Building Insulation, Doors, Custom/ Others pending approval
  - Passive Solar Space Heat, Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Photovoltaics, Wind, Biomass, Hydroelectric, Renewable Transportation Fuels, Geothermal Heat Pumps

  Eligible applicants include Nonprofits, Schools, Local Government, State Governments and Institutional entities.

For Consideration in Minnesota:

Iowa, like many other states including Minnesota is attempting to define what it means to grow a green economy. They appear to be a little more advanced in their focus to include citizens, as well to provide easy to access resources to both citizens and businesses. Iowa has a business tax climate ranked 44/50 and that can be a barrier to business growth (MN is 41/50) across economic sectors; although Iowa has been effective in attracting energy related manufacturers, etc in recent years due to aggressive marketing, recruitment, and incentive efforts. Minnesota may want to re-access how it markets itself, what government officials are the point persons on the effort, and continuing development of public/private partnerships – including universities – for job training and research and development efforts.

COLORADO

Overview of the State's green jobs activity

Colorado has created a clearinghouse called ColoradoENERGY.org is designed to be the place to start when looking for energy efficiency or renewable energy information for Colorado. The website is meant to be a resource for finding energy efficiency or renewable energy organizations or companies within the state of Colorado. It will also provides with information you need to make your home or business more energy efficient The site is supported y the Governor's Energy Office(GEO), E-Star Colorado, Center for Resource Conservation and the S.S. Department of Energy, Denver Regional Office.

Anaerobic Digestion Feasibility

The GEO understands that the first step to a successful Anaerobic Digestion (AD) project is a thorough feasibility study. As a result, the GEO will partner with facilities or farm owners and anaerobic digester experts in supporting the costs of a feasibility study.

Clean Energy Fund - New Energy Economy Development (NEED) Grant Program

The 2007 Colorado Legislature provided funding ($10 million

from gaming fees) to the GEO for the purpose of creating the Clean Energy Fund. The Clean Energy Fund will provide revenue to advance energy efficiency and renewable energy throughout the state of Colorado through the NEED grant program.

Clean Energy Fund - Solar Innovation Grant (SIG) Program
The Clean Energy Fund Solar Innovation Grant (SIG) will support innovative programs that can demonstrate a strategy and implementation plan for breaking down financial, educational, political, and technical barriers to greater penetration of solar electric and solar thermal technologies in the residential and commercial sectors.

Colorado Carbon Fund
The Colorado Carbon Fund is partnering with The Climate Trust to identify and evaluate new and verifiable energy efficiency and renewable energy projects that reduce greenhouse gas emissions. The Colorado Carbon Fund is currently soliciting high quality greenhouse gas offset projects located in Colorado.

Small Hydro Program
The GEO offers funding and technical assistance for feasibility studies for small hydro projects. If you are interested in applying for feasibility study funding, please indicate your funding needs in the

Solar Rebate Program
Once energy efficiency has been optimized, grid-tied, net metered solar photovoltaic (PV) systems offer the option to further offset electricity costs. Grid-tied PV systems allow the owner to send excess energy back into the grid and benefit the owner by mitigating the susceptibility to fluctuations in the price of electricity. In addition, distributed solar electric systems decrease the demand for electricity generated from centralized fossil fuel plants, which leads to reductions in greenhouse gas emissions.

- The Solar Rebate Program offers rebates of up to $9,000 per solar electric system ($4,500 from the GEO and $4,500 from the local Program Partner) to qualified homeowners.
- Rebates of up to $15,000 per system are available to small businesses.
- Only residential and small business, grid-tied, net metered systems are eligible.
- The Solar Electric Program is not available in Investor-Owned Utility (Xcel Energy and Aquila) service territories.
- Solar Electric Program participants are required to demonstrate that an energy audit has been performed prior to system installation.
- The rebate is available statewide through local Program Partners.

Orphan Solar
Many solar systems installed during the 1970s and 1980s have fallen into disrepair or have been taken off-line. The Solar Rebate Program offers rebates for repairs made to these systems to provide homeowners with an incentive to re-commission these older systems.

- The Solar Rebate Program provides rebates of up to $3,000 ($1,500 from the GEO and $1,500 from Program Partners) to qualified homeowners.
- Domestic solar hot water and space heating applications are both eligible within this program.
- The rebate is available statewide through local Program Partners

The Colorado Office of Economic Development offers a number of incentives that are available to green businesses:

- The Job Creation Performance Incentive Fund (PIF) provides a performance-based incentive payment to qualifying companies that have created net new jobs paying above average wages. The program is designed to support and encourage new business development, business expansions and relocations that have generated new jobs throughout the state.
- The Enhanced Incentive Program (EIP) provides an additional performance-based incentive payment to companies that have qualified under the Job Creation Performance Incentive Fund and have created new jobs paying average wages that are even higher than required under the PIF program. The program is designed to support highly desirable and high-impact job creation opportunities.
- The Manufacturing Revenue Bond Program provides favorable tax-exempt Private Activity Bond financing targeted to small manufacturers in Colorado. The program provides for the financing of real estate, machinery, and equipment associated with expansion projects specific to manufacturers. Borrowers must meet all eligibility thresholds and federal tax code requirements, and often must compete for available volume, which is capped statewide under federal rules

Vestas, the Danish Wind Turbine manufacturer received $1.5 million from the state Job Creation Performance Incentive Fund program and the City of Pueblo has pledged over $11 million in local economic development funds.

PENNSYLVANIA

The state has been very aggressive at supporting renewable energy companies and technology but it has not yet translated into a green jobs agenda. The state's economic and workforce development agencies are just beginning to look at green jobs and how to align their existing programs with the emerging opportunities.

In 2004 Pennsylvania passed a $2 billion economic stimulus program that included $1.6 billion in proceeds from bonds and the remaining support from tax credits and investment guarantees. The stimulus package included support for all business sectors including advanced manufacturing and energy. The economic stimulus support came on top of an annual economic development commitment of over $300 million in grants, loans, and investment.

In addition the Energy Development Authority was created in 2004 provides $75 million in bond funds for alternative energy. The state also created an Energy Harvest Program which provides $15 M for energy and cleantech deployment.

In 2008 Pennsylvania passed the Energy Independence Act, a $650 million package of grants, loans, and tax incentives. $500 million of the program goes to renewable and energy efficiency technologies including:

- Solar Energy - $180 M to support the development of new solar capacity
- Adoption of Clean Energy Technology - $165M to assist business and organizations adopt the use of renewable forms of energy
- Consumers - $92 M rebate program for consumers upgrading appliances and heating and cooling systems to be more energy efficient
- Start-up technology investment - $40 M to work with the states Ben Franklin Technology partners network to develop new green businesses
- Pollution Control Equipment - $25 M to introduce new technologies
- High Performance Buildings - $25M to support the development of high performance buildings

The details of these programs are still being worked out and are expected to be launched in early 2009.

For Consideration in Minnesota:
Pennsylvania like many of the states reviewed has taken a portfolio approach to their green jobs activity – adding new programs and modifying some existing initiatives to serve the growing green jobs market.

MICHIGAN

The Governor wants Michigan to be the Nation's leader in alternative energy technology and jobs. The Governor has sponsored a number of programs and initiatives including: The Michigan Green Jobs Initiative, Alternative Energy Development, Job Creation and Economic Stimulus. Governor Granholm identified four key areas for diversifying and growing the state's economy. One of those key areas is alternative energy. Also, the governor approved an increase in the Department of Environmental Quality general fund budget that would prevent any proposed fee increases for businesses during this economically challenging year. The moratorium is made possible through a one-time refinancing of some state bonds.

Michigan has developed a strategic plan to attract energy business investment in four key areas: wind energy, biofuels and materials, solar and energy storage and energy efficiency. As part of this job creation and economic stimulus package, the Governor has outlined new tools for growing the alternative energy industry including Centers of Excellence. Four alternative energy companies in Michigan will partner with universities to co-locate to conduct research and create new jobs. Funding for these centers will be set aside in the 21st Century Jobs Fund. The 21st Century Jobs Fund is a $2 billion initiative conceived by Governor Granholm, approved by the Michigan Legislature, and administered by the Michigan Economic Development Corporation to accelerate the diversification of Michigan's economy.

The Department of Labor and Economic Growth oversees the No Worker Left Behind Program, a training initiative, which includes the Michigan Green Jobs Initiative. The Michigan Economic Development Corporation is the economic development arm for the State and oversees programs such as the 21st Century Jobs Fund and the Centers for Energy Excellence. Senate Bill No. 1380 This Bill established a Centers of Energy Excellence (COEE) Program to promote the development, acceleration and sustainability of energy excellence sectors in this state

Senate Bill No. 213 "Clean, Renewable and Efficient Energy Act" requiring energy providers to adopt efficiency controls and programs, promote the development of clean energy, renewable energy, and energy optimization through the implementation of a clean, renewable, and energy efficient standard.

The Michigan NextEnergy Authority (MNEA) was created to promote the development of alternative energy technologies and to provide tax incentives for business activities and property related to the research, development and manufacturing of those technologies. Under the MNEA, an Alternative Energy Zone (AEZ) has been created within Wayne State University's Research and Technology Park in Detroit to promote the research, development and manufacture of alternative energy technologies. Tax benefits will be available for companies located here that are engaged in these activities.

The Michigan Green Jobs Initiative, part of the No Worker Left Behind Program is designed to help make sure the emerging industries and green economy have the trained workers they need to grow and prosper. The Initiative is targeting these sectors; alternative energy production and efficiency, green building construction and retrofitting, agriculture and natural resource conservation.

For Consideration in Minnesota:

Minnesota should consider adopting some of the seed funding and business incentives programs that MI employs to attract and grow green related businesses. Additionally, creating centers of excellence or smart zones around university research centers present the potential for company and job creation harnessing research and innovation in these areas and environment. The Michigan Pre-Seed Fund supports start-up companies with early stage capital. The Fund is targeting emerging technologies including alternative energy. Companies that have matured beyond the concept development and analysis phase are eligible for $50,000 to $250,000 in funding to garner follow-on investment.

OHIO

The Governor is supportive and recognizes the potential that green tech/clean tech presents in terms of job and wealth creation. The Governor's main economic development arm is the Ohio Department of Development (ODOD) and it's Third Frontier Program. "By strategically focusing Ohio Third Frontier resources toward the development of advanced energy technologies, we can begin to unleash the economic potential for this emerging industry," said Lieutenant Governor Lee Fisher.

Ohio Department of Development (ODOD) through technology-based economic development programs including the Third Frontier Project and Edison Centers, the ODOD provides a number or resources and services for the biomedical, fuel cell and other targeted technology-based industries. Ohio is focusing on alternative and renewable energy technologies such as wind, solar, biofuels, energy storage and fuel cell technologies as well as ways to make coal cleaner.

Advanced Energy portion of the bipartisan Job Stimulus package (HB 554) The bipartisan Job Stimulus package approved in June 2008 includes $150 million in funding focused on increasing the development, production, and use of advanced energy technologies in the state, and is divided into two parts:

- $66 million for clean coal technology projects administered through the Ohio Air Quality Development Authority (OAQDA)'s Ohio Coal Development Office (OCDO).
- $84 million for non-coal-related projects in three $28 million annual appropriations administered by OAQDA.
- Ohio Advanced Energy Fund (OAEF): Provides grants for installation of energy conserving devices and technologies. The Distributed Energy and Renewable Energy Grant is offered under the fund. Applicable sectors include: Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Solar Thermal Process Heat, Photovoltaics, Landfill Gas, Wind, Biomass, Municipal Solid Waste, and CHP/Cogeneration. Funding limits include:
  - Distributed Energy: $100,000
  - Non-residential Renewable Energy (traditional ownership): $150,000
  - Non-residential Renewable Energy (third-party ownership): $200,000
- The Industrial Energy Efficiency Grant is also offered under the OAEF:
  - The grant funds 25% of project cost up to $50,000 for commercial and industrial applications of Lighting, Lighting Controls/Sensors, Chillers, Furnaces, Boilers, Heat pumps, Air conditioners, CHP/Cogeneration, Compressed air, Energy Mgmt. Systems/Building Controls, Building Insulation, Windows, Motors, Motor-ASDs/VSDs, Comprehensive Measures/Whole Building, Custom/Others pending approval and Geothermal Heat Pumps, CHP/Cogeneration, and Daylighting,
- Third Frontier Fuel Cell Program: grants to support the growth of Ohio's fuel cell industry through collaborations that involve Ohio higher education institutions, non-profit research organizations, and Ohio companies. Projects must focus on research and development that addresses technical and cost barriers to commercialization and adapting fuel cell components produced in Ohio for use in fuel cell systems.
- Third Frontier Advanced Energy Program: Grants to accelerate the development and growth of the advanced energy industry in Ohio by direct financial support to organizations seeking to commercialize new products, manufacturing processes or technologies, or to adapt or modify existing components or systems that can reduce the cost of advanced energy systems or address technical and commercialization barriers.
- Innovation Ohio Loan Fund: Created to assist existing Ohio companies develop next generation products and services within certain Targeted Industry Sectors by financing the acquisition, construction, and related costs of technology, facilities, and equipment. The Innovation Ohio Loan Fund (IOF) provides competitive financing terms on loans to finance projects that will positively impact Ohio by creating high-value jobs, increased tax revenues, and improve the economic welfare of the State while addressing an identified need in the capital-funding continuum. The IOF is intended to supply capital to Ohio enterprises having difficulty securing funds from conventional sources due to technical and commercial risk factors associated with the development of the new product or service. The IOF can finance up to 75 percent of a project's allowable costs to a maximum of $2 million and a minimum of $500,000.
- Wright Centers of Innovation - grants to support large-scale world-class research and technology development platforms designed to accelerate the pace of Ohio commercialization. Wright Centers are to be collaborations among Ohio higher education institutions, non-profit research organizations, and Ohio companies in the areas of advanced materials, bioscience, power and propulsion,

information technology and instruments, controls and electronics.

- Cincinnati property tax abatement for Green Buildings:
  - Buildings must attain LEED certification to receive 100% abatement for up to 15 years. There is a $500,000 maximum abatement except for LEED Platinum which has no abatement threshold. The abatement applies to all structures, commercial, industrial, residential, and multi-family residential.
- Energy Conversion Facilities Property Tax Exemption:
  - A lifetime property tax exemption for all properties used in the replacement of fossil fuel resources with alternative fuels. Applicable technologies include Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Solar Thermal Process Heat, Photovoltaics, Landfill Gas, Wind, Biomass, Municipal Solid Waste, and CHP/Cogeneration.

WASHINGTON

Governor Gregoire has worked with the legislature to position Washington as a leader in moving toward a comprehensive approach to developing a green economy. Earlier this year, the Governor signed legislation making Washington just the fourth state in the nation to adopt comprehensive limits on global warming pollution, and the first state to develop a plan to train the state's work force for the transition to clean energy. The Climate Change Framework/Green-Collar Jobs Act 08' (aka HB 2815) requires quantifiable reductions in greenhouse gas pollution- specifically transit. The goal is an 18% reduction in vehicle miles traveled by 2020. HB 2815 includes:

- Creation of Green Industry Skill Panels (GISP's).
  - Identifies Green areas of investment and aligns public/private funding to meet needs.
- Creation of a Green Collar Jobs Training Fund.
  - 2009 disbursement administered by State Board for Community and Technical Colleges
  - Awards competitive grants to training providers identified by GISP's as experts in implementing effective Green education.
- - Funding amounts have not been allocated.

Also in 2008, the governor signed the Western Climate Initiative, the final design for the regional market-based climate program that reduces global warming pollution to promote a thriving economy and protect public health.

Specific programs include:[67]
Evergreen Sustainable Development Standard for Affordable Housing targeting low income housing. The Washington State Department of Community, Trade and Economic Development (CTED) created the Evergreen Sustainable Development Standard, a set of green building criteria that will be required for any affordable housing project applying for state funds through the WA State Housing Trust Fund (HTF) beginning in July 2008. New construction projects must earn a minimum of 50 points and rehabilitation projects must earn 40 points. The standard is based on a point system which awards points for a variety of sustainable building practices including:

- Site location and neighborhood planning
- Water conservation
- Energy efficiency and the incorporation of renewable energy technologies
- Environmentally-conscious construction practices, building materials and improved indoor-air quality.

Density Bonus for Green Buildings: The Mayor of Seattle signed new downtown zoning legislation on April 12, 2006 which established an incentive for the construction of green buildings. The incentive applies to buildings in the central office core and adjoining areas. Commercial and residential buildings in those portions of downtown which achieve a minimum LEED certification at the Silver level can be built to greater heights and/or greater maximum floor areas.

Tax Abatement for Solar Manufacturers: 40% reduction of state's business and occupation (B&O) tax.

King County - LEED Grants Program: $20,000 -$30,000 depending on the performance level achieved, and the type of building. 50% of grant amount will be funded upfront upon completion of the Green Building Grant Agreement, and the remaining 50% will be awarded after the project is completed. Applies to Commercial, Nonprofit, Multi-Family Residential, Institutional buildings. Eligible technologies include: Passive Solar Space Heat, Solar Water Heat, Solar Space Heat, Photovoltaics, Wind, Biomass, Geothermal Heat Pumps, Daylighting.

Bonneville Environmental Foundation's Solar 4R Schools: A private grant program financing 100% of costs for 1.1 kW systems and up to 33% of costs for other renewable energy systems. The Bonneville Environmental Foundation's (BEF) Solar 4R Schools program began in 2002. The program seeks to install small-scale solar systems at schools interested in increasing the visibility of renewable energy. Successful projects will include outreach and educational components to encourage adoption and use of photovoltaics.

Green Building and Energy Reduction Standards for State Agencies: Creates energy standards for public buildings. The goal is a 10% reduction in energy purchases from fiscal year 2003 levels. Also required is that all new state construction projects must meet the LEED "Silver" Standard, or other green building standards. Building projects of over 25,000 square feet entering the pre-design phase from 2005 to 2007 must either meet the Leadership in Energy and Environmental Design (LEED) "Silver" Standard, be certified by the Department of General Administration (GA) to meet state standards for forest

products as defined by the Washington Forest Practices Act, or to be sustainable forest-certified by a credible third party.

Overall, Washington State ranks sixth among the 50 states for adopting programs and policies that promote energy efficiency as the fuel of choice on the road to energy independence, according to a national scorecard released by the American Council for an Energy Efficient Economy.

In order to implement the Climate Change Framework/Green-Collar Jobs Act 08' (HB 2815), The Employment Security Department (ESD) and Washington State University, will conduct a survey of employers to establish a baseline and projections for green economy jobs. The report will also identify "high demand" jobs. Their report is expected by January 2009.

The Workforce Training Education and Coordinating Board will use the ESD labor market report to plan recruitment and training strategies for specific green industry and small businesses. The State Board of Community and Technical Colleges will also build on the ESD labor market report. They will create a Green Industries Job Training Account in the State Treasury, and will distribute grants for:

- curriculum development;
- retraining dislocated workers for high-wage green industry jobs;
- workforce education for target populations; and
- adult basic/remedial education tied to occupational skills training.

They will also identify job-specific training programs offered by qualified post-secondary institutions leading to credentials or degrees in high demand occupations.

NOTES

The following are notes regarding this report. An additional appendix is being published that provides detail on the formulas and specific industry classifications.

BUSINESS CLIMATE RANKINGS

1. From Forbes Magazine:
http://www.forbes.com/2008/07/30/virginia-georgia-utah-biz-cz_kb_0731beststates_table.html

1 Index based on cost of labor, energy and taxes.
2 Measures educational attainment, net migration and projected population growth.
3 Measures regulatory and tort climate, incentives, transportation and bond ratings.
4 Reflects job, income and gross state product growth as well as unemployment and presence of big companies.
5 Reflects projected job, income and gross state product growth as well as business openings/closings and venture capital investments.
6 Index of schools, health, crime, cost of living and poverty rates.

2. Site Selection Magazine:
http://www.siteselection.com/issues/2007/nov/cover/

3. Corporation for Enterprise Development:
http://cfed.org/focus.m?parentid=34&siteid=2346&id=1600&year=2007&stateid=23

PATENT METHODOLOGY

The number of issued patents is often a good measure of research activity that surrounds a particular subject area. To measure patents activity surrounding green jobs in Minnesota and the bench mark states of Illinois, Iowa, Michigan, North Dakota, Ohio, South Dakota, Washington, and Wisconsin, US Patent and Trademark Office data was searched using a number of key words and phrases.

GSP used 89 words and word combinations to assess the number of issued patents in the categories of Green Products, Green Services, Renewable Energy, and Environmental Conservation. These searches were combined with wildcard characters as well as proximity requirements. For instance, using the search term "generat$" will give the results for generate, generator, and generated. When this is combined with the word "wind" with a proximity requirement of 3 words (wind and generat$ must be within 3 words of each other for the record to be found), one gains a reliable and accurate list of Minnesota patents having to do with wind generation.

While the patent data dates ranged from 1969 through June, 2008, the vast majority of patents were issued within the past 15 years. This appeared to be the case across the sectors that were searched.

Once the outcomes for each state were compiled at the word search level, the results of each individual search were put into 1 of the 4 green job categories. As was expected, no patents could easily be classified under Green Service, and thus all patents were placed in 1 of the 3 remaining categories. Duplicate results were then filtered out of each category to get the final results.

R&D METHODOLOGY

GSP utilized grant information compiled by the US Census Bureau's Federal Assistance Award Data System (FAADS)

through OMB Watch's FedSpending.org data tool. This strategy allowed for multiple government agency databases to be compiled and searched simultaneously. GSP utilized the same word and word combination search methods described in the Patent Methodology section to pull down awards related to green technologies, processes, and projects by searching the awarded project descriptions. The results were then compiled into two categories; awards that went to projects for research and development, and awards that went to projects containing more programmatic ends. These awards were compiled for each fiscal year from 2002 to 2007.

RESEARCH METHODOLOGY

The amount of research that is occurring in Green technologies is also important. Unfortunately, there is no classification for such research as it is spread across many agencies, fields and programs. GSP developed a database of federal spending from FedSpending.org that included all federal grants and contracts from 2002 to 2007 for Minnesota and the benchmark states. This amounted to a database of nearly 700,000 federal awards. From the project descriptions of those awards, we identified the research and program funding that was relevant to a set of 88 key words. GSP then used the listing of agency programs to identify research funds versus programmatic support.

Key words for Green Research

(note some of the words are truncated or appear to be misspelled, but this was necessary because we used wildcard characters to search for variations of words).

Alternative energy
Alternative fuel
ammonia electrolysis
Ammonia energy
Ammonia power
anaerobic
aquaculture
Battery vehicle
Biodegrad
Biodiesel
Biofuel
Biomass
Clean air
Clean energy
Clean power
Clean water
Co2 low
Co2 reduc
Cogenerat
Compact fluorescent
Conserv energy
Conserv power
Conservation
Electric vehicle
Emission low
Emission reduc
emissions control
emissions sensor
Energy Efficien
energy recover
Environmentally friendly
Ethanol
Fuel cell
Geothermal
green building
Harmful Exhaust
Harvest energy
Heat recover
Hybrid vehicle
hydro electric
Hydroelectric
Hydrogen power
Hydrogen vehicle
Indoor air quality
Low voc
Methanol
Natural fertilizer
natural gas
Natural pesticide
Natural product
non toxic
Nontoxic
nuclear energy
nuclear power
nuclear reactor
Organic + food
Photovoltaic
Pollut
Recycl
Renewable
Resource management
Solar energy
Solar farm
Solar generat
solar panel
Solar power
Steam energy
Steam power
Steam recover
Sustainable
Switchgrass
Waste energy
Waste heat
Waste power
Waste recover
Waste water
wastewater
Water recover
Wave energy
Wave farm
Wave generat
Wave power
Wind energy
Wind farm
Wind generat
Wind power
Wind turbine
Wind propeller

Program Code and Title	Classification
66.708: Pollution Prevention Grants Program	Program
81.117: Energy Efficiency and Renewable Energy Information Dissemination, Outreach, Training and Technical Analysis/Assistance	Program
66.708: Pollution Prevention Grants Program	Program
81.119: State Energy Program Special Projects	Program
66.419: Water Pollution Control State and Interstate Program Support	Program
81.087: Renewable Energy Research and Development	Research
47.041: Engineering Grants	Research
12.431: Basic Scientific Research	Research
66.606: Surveys, Studies, Investigations And Special Purpose Grants	Research

EMPLOYMENT PROJECTIONS

The employment projections were preparing using employment data from the Bureau of Labor Statistics Quarterly Census of Employment and Wages (QCEW). GSP employed several methods to forecast the growth of the various target industries and green segments.

First GSP estimated how much of each industry was involved in green products or services. In some cases GSP found estimates in published articles or reports that identified the green share of a larger segment, such as McGraw Hill's estimates for Green Building Products. In other cases, GSP found had estimates of the sales of Biofuels that could be applied to sales of all liquid fuels to estimate the market share. In still other cases, GSP used industry input-output data to determine how much fabricated metal goes to green industries and used those values. Few of the federal industry classifications known as NAICS codes align with green industries, except for Hydroelectric Power Generation (we assumed all of the employment and output was green). In a few other cases, we had no data on which to base our estimates but we assumed market shares of 75% due to the nature of the sector; this included industries such as Remediation Services, Materials Recovery Facilities, Administration of Air and Water Resource and Solid Waste Management Programs.

Once we estimated how much of the target industries were green, GSP forecast the growth of the industry. For these forecasts we used several methods.

1. Forecasts of green markets. GSP reviewed a number of reports on various green market segments, such as biofuels, solar and wind. Many of these provided forecasts for the growth of those segments or provided data from which annual growth rates could be calculated. GSP provided low and high estimates of the market growth.
2. Industry trend in the US. GSP assumed that the Minnesota industry would grow at the same rate as the U.S. trend for that industry from 2002-2007. In most cases, this provided the most conservative estimate of growth.
3. The U.S. green trend. The U.S. Conference of Mayors has estimated that there are 750,000 green jobs in the U.S. today. They predict that number will grow to 4.2 million in thirty years. This equates to a 6% annual growth rate. This estimate is based on the assumption that Minnesota's green industries will each grow at this rate. This is the most optimistic projection for growth.

Projections and forecasts are frequently wrong, and this is particularly true during volatile economic periods such as the current economic situation in the United States and when fundamental economic interdependencies are changing, which is occurring with the emergence of Green industries. Part of the problem with forecasts is that they are often mis-used. Since a forecast is at best a calculated guess that relies on a web of assumptions, the forecast is really an assessment of the strengths and weaknesses of the economy at a particular point in time. As those factors change, the accuracy and /or probability of the forecast is affected. The factors that affect these forecasts include the following

- Consumer preferences for clean, green and renewable
- State and federal regulatory policy to increase the cost of pollution and waste
- State and federal incentives such as Renewable Portfolio Standards
- The price of oil, coal and non-renewable alternatives
- Perceptions of the security and reliability of imported energy

END NOTES

1. This analysis does not contemplate job loss due to green economy policies or actions by the state. GSP Consulting did not identify any evidence of direct negative consequences associated with any of the previously adopted legislation.

2. A summary of these meetings including the agenda, speakers and number of attendees is in the appendix

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4. Urbanchuk, John. "Contribution of the Ethanol Industry to the Economy of the United States," Report Prepared for Renewable Fuels Association by LECG LLP. Updated 19 Feb 2007. <http://www.ethanolrfa.org/resource/reports/#EconomicImpacts>

5. Urbanchuck, John. "Contribution of the Biodiesel Industry to the Economy of the United States," Report Prepared for National Biodiesel Board by LECG LLP. Updated 30 Sept 2007. <http://www.biodiesel.org/resources/reportsdatabase/reports/gen/20060930_gen373.pdf>

6. United States Geothermal Energy Market Report. GLITNIR Geothermal Research. September 2007

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9. http://www.bccresearch.com/report/MST036B.html

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11. Bustamante, David. "U.S. Environmental Policies." Rotary Club Milano Ovest. Milan, Italy. 07 Feb 2007

12. Ibid.

13. Organic Trade Association's 2007 Manufacturer Survey

14. The Association of State and Interstate Water Pollution Control Administrators

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17. "Freedonia Market Research Analyzes the Waste Remediation and Collection Services Industry." TWNKeys. 22 May 2008. Trans World News. 25 Nov 2008 <http://www.twnkeys.com/NewsStory.aspx?id=47719&cat=24>.

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21. See: http://www.taxfoundation.org/research/topic/37.html

22. Information on all rankings can be found in the appendix

23. More info at: http://www.greeninstitute.org/

24. National Science Foundation, Division of Science Resource Statistics. Federal Funds for Research and Development: Fiscal Years 2002 - 2007

25. Per capita analysis was conducted using population estimates generated by the 2005 – 2007 American Community Survey conducted by the U.S. Census Bureau

26. "Extended Year Set - Historic Patent Counts by Country/State and Year, All Patents, All Types Report" U.S. Patent and Trademark Office http://www.uspto.gov/go/taf/reports.htm

27. "Fact Sheet on Biofuels – World Conservation Congress 2008" International Union for Conservation of Nature. http://cmsdata.iucn.org/downloads/biofuels_fact_sheet_wcc_30_sep_web.pdf 2008

28. Combined Heat and Power Partnership – U.S. Environmental Protection Agency http://www.epa.gov/chp/index.html

29. Thornley P, et al. Quantification of employment from biomass power plants. Renew Energy (2008), doi: 10.1016/j.renene.2007.11.011 http://www.tyndall.manchester.ac.uk/publications/Quantification%20of%20employment%20from%20biomass%20power%20plants%202008.pdf

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31. Agricultural Marketing Services Division, Minnesota Department of Agriculture. "Ethanol Plants in Minnesota." October, 2007.

32. Adiarte, Arthur L. "Putting the Green in Gasoline" MN Department of Employment and Economic Development. http://www.deed.state.mn.us/lmi/publications/trends/next/green.htm

33. Federal Trade Commission "2008 Report on Ethanol Market Concentration" http://www.ftc.gov/os/2008/11/081117ethanolreport.pdf

34. US Energy Information Administration http://tonto.eia.doe.gov/dnav/pet/hist/mferius1m.htm

35. Herder, Russell "Talent Development Issues & Opportunity in the Biofuels Industry" Agriculture Utilization Research Institute. 2008

36. Agricultural Marketing Services Division, Minnesota Department of Agriculture. "Ethanol Plants in Minnesota." October, 2007. – NOTE the employment and economy figures were calculated by MDA using the IMPLAN input-output model and include direct, indirect, and induced impacts

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39. US Department of Commerce "Energy in 2020 – Assessing the Economic Effects of Commercialization of Cellulosic Ethanol" http://www.ethanolrfa.org/resource/cellulosic/documents/cellulosic2007.pdf Nov. 2007

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41. Ibid pg 6

42. Herder, Russell "Talent Development Issues & Opportunity in the Biofuels Industry" Agriculture Utilization Research Institute. 2008

43. Adiarte, Arthur L. "Putting the Green in Gasoline" MN Department of Employment and Economic Development. http://www.deed.state.mn.us/lmi/publications/trends/next/green.htm

44. For more information on Enterprise Minnesota and Lean Manufacturing see the Minnesota resources section of this report on page 47

45. "Curbing Global Energy Demand Growth: The Energy Productivity opportunity", May 2007, http://www.mckinsey.com/mgi/publications/Curbing_Global_Energy/index.asp

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57. For more information see: http://www.mnrem.org/wiki

58. Information copied from "http://www.xcelenergy.com/rdf"

59. See the appendix for a list of projects including descriptions and amounts awarded.

60. http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=WI56F&state=WI&CurrentPageID=1&RE=1&EE=1

61. http://www.expansionmanagement.com/statespotlights/North_Dakota/18691

62. Energy Information Administration. Renewable Energy Trends in Consumption and Electricity 2006. Released July 2008.

63. http://workforce2025.com/

64. http://www.dsireusa.org/library/includes/map2.cfm?CurrentPageID=1&State=IL&RE=1&EE=1

65. Ibid.

66. Ibid.

67. http://www.dsireusa.org/library/includes/map2.cfm?State=WA&CurrentPageId=1&EE=0&RE=1

For more information on this market analysis, please contact Rich Overmoyer at rich@gspconsulting.com or 412.765.1180.