

Appendix K: Air & Energy

As a result of the Issue Identification Panels, there were **three goals** that emerged in the area of air and energy.

These three goals were voted on by respondents who participated in the subject matter expert survey.

Table 1. Percent of subject matter experts who prioritized each goal in the area of Air & Energy

		Count	Percent selected
Goal 1.	Minnesota achieves reliance on non-polluting, renewable energy in all sectors (including transportation, building, industry, agriculture, and others).	120	75%
Goal 2.	Minnesota has a growing consumer and manufacturing economy that is increasingly non-toxic and is efficient regarding use of resources and waste production.	32	20%
Goal 3.	Minnesota reduces indoor and outdoor air pollution, with a significant positive impact for Minnesota's most vulnerable communities.	6	4%
	<i>Other</i>	1	1%
	Grand Total	159	100%

Subject matter experts who participated in the Prioritization Panel were asked to review strategies recommended by survey respondents relating to Goal 1. All of the strategies submitted by survey respondents are included in the next section below. Panel participants were invited to revise strategy ideas or come up with their own, and as a group they prioritized five strategies that would be necessary to achieve the goal. Those five strategies, in no particular order, are:

- Encourage bundling renewable energy production and battery storage.
- Demonstrate the ability and statewide potential to generate solar energy on perennially vegetated lands, reducing CO2 and water runoff, while making the enterprise economically viable.
- Incentivize the use of non-polluting renewable energy in agriculture, industries, and commercial transportation.
- Demonstrate community-scale, net zero renewable energy systems.
- Fund energy efficiency improvements and renewable energy for rental properties, small businesses, and schools.

The following provides the full list of strategies for the area of **Air & Energy** that were recommended by subject matter experts who responded to the survey. They are organized by goal.

Please Note: These strategy recommendations are provided verbatim, as they were submitted through the survey. Therefore, they may contain errors or typos. They have also **not** been vetted for alignment with the ENRTF mission or charge, and may therefore not be allowable strategies for the ENRTF to pursue or include in its strategic plan.

Goal 1 – which 75% of survey respondents prioritized: Minnesota achieves reliance on non-polluting, renewable energy in all sectors (including transportation, building, industry, agriculture, and others).

- Making renewable resources based products more accessible to people and building infrastructure for sustainable use of such products
- Research on understanding all impacts of resource/energy use and extraction - not just direct impacts.
- Demonstrations
- More Solar farms are popping up all the time
- Provide incentives for rapid adoption of proven renewable energy and energy conservation technologies and behaviors. Provide dis-incentives for continuing those practices that contribute to pollution.
- Make this a law that is enforced by the PCA.
- Renewable energy should be the most important goal. Research, measurement and education should all work together toward this goal. I don't know exactly how.
- Take a look at what some of the Northern European countries are doing in relation to sustainable clean energy. Some of these countries (Sweden & Norway) are really working hard to make this happen successfully.
- Financial investment in renewable resources.
- Demonstration and measurement
- energy storage for solar and wind generation
- Technology transfer, ENRTF funds can be directed to investigate and support the strategies to transition MN economy and ways of life into non-polluting/renewable options.
- Support GreenStep Cities and GreenStep Schools in reaching city officials and schools. These organizations have the framework to make a big impact by implementing clean energy strategies and educating our youth.
- More research on renewal energy is needed
- Encourage solar and wind power development through incentives and tax breaks.
- Research to identify sustainable energy resources and ways to ensure they can be distributed throughout the state in a cost-effective manner
- Research and demonstration projects in renewable energy
- Increase accessibility of renewable energy to consumers.
- education
- Divesting
- Fund the research and development of innovative new technologies; subsidize their implementation, even if they aren't currently cost effective;
- If a project offers an opportunity to reduce reliance on vehicular transportation (e.g. new or maintaining bike access)
- Green Energy Grants
- Funding more renewable energy projects.
- Once again, education through our schools and through local town hall meeting events, etc. to share information about how renewable energy sources can also help our communities to be healthier and save millions of dollars in health care costs in the long run.
- Continue with solar and wind sources but make it available LOCALLY for benefit.
- Support the use of electric vehicles and small engines
- Moving in this direction is key to our well-being. Help Minnesotans engage in these topics in their own spheres of influence, e.g., home projects, yard projects, community green space.
- Research
- Renewable energy that also does not pollute, like perennials, not corn or soybeans.

- Continue to support renewable energy projects
- Continued research and development on cost effective capture and storage of renewable energy. Storage is the key to renewable energy sources that are intermittently available during the course of a day...for example sun and wind.
- Marketing of opportunities
- demonstrations of new products or technology in renewable energy generation and use
- Development and implementation of statewide strategy to achieve those goals. Unclear if LCCMR has a significant role in this, however.
- Research that identifies 'best' energy options.
- Support outreach and education to citizens about personal impacts of energy use and air pollution impacts (can be through K-12, community groups etc)
- Demonstrating the long-term economic benefits of clean energy.
- Research
- We need to demonstrate ways to achieve our goals.
- Research
- funding for research to include investigating and demonstrating new methods (things that may not be 'mainstream' but have potential applications).
- Fund demonstration projects to help accelerate adoption of new technologies.
- I believe our future is sustainable, renewable energy, to include bundling energy production and battery storage to become self sufficient. This could be a funding goal, especially for key assets like city water and sanitary sewer systems, and hospitals.
- R&D for developing MN-specific strategies
- Provide funding for decentralized renewable energy
- We start by maximizing our efforts to offsetting the greenhouse gasses that are emitted into the atmosphere we can eliminate the effect it has. Currently we do offer some support in this effort but i think we should be doing even more and should increase that offset even further. We can do so by developing projects through mitigation measures that will further offset greenhouse gasses. Renewable energy has to be the main point of discussion when identifying a proper way to move forward.
- Continue promotion of habitat friendly solar projects
- Education regarding the problems that conversion to more renewable energy solves - the payoffs to people's health and the environment they enjoy
- demonstrating the ability to generate solar energy on perennially vegetated lands making the entire enterprise economically viable while reducing CO2 and water runoff.
- Focus on developing new renewable energy sources that will sustain MN for the next century. Need to promote research that industry is not willing to take on for various reasons. MN needs to be a leader in this area to protect our resources and our economy. We can't take the easy route like North Dakota and pump oil and mine coal for short term solution to a long term problem of energy needs. Also, ND's strategy is out of date and out of touch.
- Support policy that directs Minnesota to do so
- Demonstration projects that show the viability of EV transportation and net zero new construction in highly visible applications
- There is constant resistance to changes in energy, mostly based on outdated information and an the thought that renewable energy technologies will not change. Education and research to address the knowledge and practical gaps in renewable energy will help move people to more sustainable systems.
- Research and demonstration in associated with substantial development seem key here.

- Develop incentives for agriculture, forest industries, and commercial transportation to increase use of non-polluting, renewable energy.
- Economic and engineering studies demonstrating feasibility and cost effectiveness of efficient energy utilization
- Increased use of renewables should have significant positive impacts on air pollution and manufacturing. Increase research, measurement, and education to quantify.
- I think the weak link is energy storage for solar and wind - needs research and funding for pilot projects.
- Clean and renewable energy is a central challenge of our time. Minnesota should lead through research and development of new energy conversion and storage technologies.
- Create incentives for businesses and other organizations to convert to renewable energy sources.
- Support for innovative ideas to reduce pollution, conserve energy and/or reduce waste.
- renewable energy mandate
- More research is needed in this area. This would be a huge achievement.
- Education about the feasibility and best practices to achieve goals.
- Research to improve renewable energy technologies.
- Requiring counties and cities to have a solar and electric vehicle implementation plans to their comp plans aligned with state goals, gov't must lead.
- Support move away from coal and petroleum for energy and transportation
- Partner solar energy research and demonstration with energy storage.
- Agriculture-More research/investment on perennial non-invasive agricultural crops, more diversified crops, more alternating crop strips, and cover crops more widely used=less fertilizers needed, less wind and water erosion, less time/fuel spent working soil and planting, less herbicides needed
- Funding incentives for energy efficiency improvements not only for homeowners but rental properties, businesses, schools, etc.
- Improved subsidies for renewables, particularly towards innovation research
- Demonstration of how the newest renewable strategies can be implemented by Minnesotans in their homes and businesses
- Many different demonstration projects to help develop a regenerative economy
- Research
- Providing support to model strategies to achieve the goals.
- Mix of solar, wind, biomass, natural gas and hydro power depending on location, resources and community capability
- Support projects that assist in the development of renewable energy infrastructure for MN.
- research to support MN energy transition and independence
- Invest in renewable energy such as solar for the public sector (schools, local govt).
- Support research into more perennial crops rather than just corn and soybeans
- Not sure on technology here but private-public partnerships would be key.
- Phrase environment in economical terms rather than environment to fend off political criticism
- Research on viable personal, motorized-vehicle transportation that is non-polluting;
- Help make geothermal, wind and solar power more available to small businesses and private homes.
- Tax policy that would create incentives for movement in the desired direction
- More grants for people to switch to renewable resource use
- Education and outreach
- Mobilize students in every school and community to promote sustainable practices and technology. Learn by doing- Do by learning.

- Incentivize the transition from fossil fuels at an accelerated capacity,
- I think we should be looking at nuclear as a potential clean energy. There definitely are some challenges with this kind of energy, however, this country should have the technology and ability to implement nuclear. This may be a lost cause however, because nuclear has a huge stigma attached to it.
- Outreach/education
- Research and Development of new technologies.
- Discourage use of corn-based ethanol fuel for operating vehicles.
- Education that helps consumers understand the true costs (financial and environmental) from using different energy sources.
- Education
- research
- Education
- More e-car charging stations
- Taking down fossil fuel empires.
- Continue to provide cost incentives for businesses and communities to invest in renewable energy. Many homeowners want to do the right thing but cannot afford solar panels and residential wind turbines. We want clean energy and we want to support businesses that invest in clean energy.
- Support solar energy on ROOFTOPS
- Share research and techniques through workshops and other sources of info.
- Easy to use on-line assessments/models to run for your life situation. I have not found an easy/good model to assess my energy use and improvement opportunity.
- promoting change in building and transportation practices
- Incentivizing (carrot and stick) industry to use renewable energy.
- Use state departments and properties as demonstration - state agencies use renewable vehicles, state buildings rely on renewable energy, state lands (e.g. farm lands) are used as test plots for potential energy crops
- More research is needed to assess the "life-cycle" impacts and develop new technologies and processes using local resources
- Demonstration and outreach
- Provide incentive programs for the industry to achieve success.
- Cultural Change needs to take place and this is one area where education could be done to inform the public about the possibilities for doing things different.
- Linking solar and wind projects
- Fund strategies that facilitate this goal
- Education, outreach, and research that can help manage potential land use disputes of increasing renewable energy development in rural MN
- Create incentives and educational and financial assistance to farmers who want to run small organic farms that also sustain biodiversity.
- Enhance education and outreach to inform citizens about how they can contribute to air and energy conservation.
- Demonstrations particularly for agriculture to show practical value of regenerative agricultural practices
- Research and outreach to provide practical strategies for farmers to use less fossil fuels.
- Fund local gov't transitions to solar and electric vehicles
- Education on life cycle of products.
- Develop sustainable and environmentally benign strategies for said technologies.

- Strategic investment in common sense renewables (wind, solar, geothermal, wave action?! (north shore and large lakes) where appropriate and sensible) as a state (start with public buildings, state park facilities etc) and from outside sources like the federal government and for profit companies.
- Fund solar plus electric vehicle charging projects at workplaces to offset the cost of on-peak charging taking place at workplaces.
- Subsidies for organizations to install renewable energy elements, like rooftop solar.
- Increase affordability (and thus access) of renewable energy options
- Help fund policy analysis and efforts to changes policy to support a net zero economy
- Demonstration
- Provide education facilitated by professionals
- Support projects that assist individuals in converting to renewable energy sources.
- Like Xcel Energy tries to brand itself as an environmental advocate, environment needs to brand itself as business/utility fiscal bottom line
- Implementation of non-polluting electrical-generation capabilities including dispersed-grid solar (on buildings and houses as opposed to solar "farms")

Goal 2 – which 20% of survey respondents prioritized: Minnesota has a growing consumer and manufacturing economy that is increasingly non-toxic and is efficient regarding use of resources and waste production.

- Research and innovation
- provide more incentives to wind and solar
- Waste minimization and re-use. Find an economic process to benefit from the waste re-use.
- If, and that's if, we've done enough research and measurement, we need to move toward developing tangible, measurable ways to show change; and legislators need to support changes that could impact MN businesses. This goal would seem to be the route toward achieving the other goal choices listed.
- Facilitating meaningful partnerships between various stakeholders: researchers, private industry, non-profits, government sector to develop and implement innovations.
- Fund more air quality research
- Promotion of reuse and waste reduction
- education and research
- Research and implementation of environmentally friendly manufacturing techniques and products
- Identify key areas needing improvement and create a work plan to get to that goal
- Research on relative and real costs of different businesses, e.g., consider ecosystem services costs of a business in addition to actual costs.
- More research on recycling additional household and industrial waste is needed to increase cost effectiveness.
- research and implementation of diversified options
- Promote widespread and expanded recycling and reuse of discarded materials
- better testing residue of pesticides in surface and ground water with lower levels reported and not limited to EPA standards
- Partnership and publicity for companies that are already doing these things.
- Research and education on the environmental and health effects of everyday products we take for granted and don't think about their long-term impact, particularly plastic bags and excess packaging.
- promoting transportation mechanisms that rely on clean fuels

- Develop local recycling industry - do not ship overseas or out of state
- Emphasis on renewable, bio-based materials from Minnesota 's farms and forests
- Communicate best practices that are proven to work to the larger manufacturing community.
- Catalyze research and technical assistance activities to ID and create new best practices. Support technical assistance to bring these new best practices to businesses and embed them in business culture.
- Focus on diversifying energy production including research on new renewable energy options. Full reliance on renewable energy may not be achievable, but energy conservation should be part of the solution. Education for consumers on alternatives and energy conservation practices.
- Continued research in this area will help develop and improve processes that are eco friendly.
- Fund to bridge the gap between the research and the company to implement some technologies for minimizing environmental pollutions
- This isn't really my area of expertise; but I'd say we need to look more closely at some of impacts of the renewable strategies we're already putting in place (e.g., significant runoff and its impacts from impervious solar panel "farms/gardens."
- demonstration
- Find ways to utilize waste products without damaging the environment.
- Meet with key groups and develop action plans
- Passing results of research onto users
- Additional research at higher education institutions and industry through grant proposals.
- working together with industry.
- Present the information to Minnesotans in a fun and engaging way, rather than technical lingo.
- connecting communities through bike paths to encourage less driving, more biking and better health as a result
- increased state regulation regarding packaging materials and bags, especially plastic
- Application of circular economy concepts, goals, policies and incentives
- Provide cost sharing or rebates
- Support internship programs to engage student workers for experiential hands on internships that teach sustainable operations practices and simultaneously embed these practices within participating businesses. This also has work force development aspects so our next generation of business leaders has understanding of the business case for sustainability from firsthand experience.
- Research to understand the tradeoffs and between renewable energy and the environment and minimize the risk (i.e. wind turbines and birds and hydrokinetic and fish)

Goal 3 – which 4% of survey respondents prioritized: Minnesota reduces indoor and outdoor air pollution, with a significant positive impact for Minnesota’s most vulnerable communities.

- Measurement
- Hopefully a focus on this will also encompass a move to non-polluting renewable energy. I had trouble making the choice between these two. Both are very important. Minnesota must hold the line as EPA slips in enforcing and improving air pollution.
- Environmental justice is a key component of this goal and these are the folks who don't know how to call attention to the injustices pushed upon them by society. We need to do a better job of figuring out how much these communities are being impacted and then work to resolve these injustices and improve their air quality; this should provide a health care cost savings in the long run.

Other goal ideas offered by subject matter expert survey respondents for the area Air & Energy:

- Minnesota reduces indoor and outdoor air pollution, and energy consumption, with a significant positive impact for Minnesota's most vulnerable communities.

Other strategy ideas offered by subject matter expert survey respondents for the area Air & Energy:

- Assist communities in strategically increasing canopy cover in areas with high rates of vulnerable populations reducing energy needs and reducing particulate matter and other pollutants.