Importance of Innovation

Economic prosperity depends on being able to adapt to a changing environment. Innovation, and the productivity and employment that it can spur, is essential for economic growth in the Chicago region. Innovation can be thought of as "the ability to conceive and develop new products, new services, new technologies, new ways of organizing work, and new business models…requiring the ability to invent and commercialize new products, processes and business models,"[1] Since innovation is generated by the private sector, the role of the public sector is to find ways to help spur innovation by supporting ideas, institutions, and relationships in the private sector that enable innovation. The public sector should be especially concerned with providing support and services that are essential to innovation, but that the private sector is unlikely to provide. There are several public sector activities that can help industries to innovate and grow; these activities are what the Chicago metropolitan region should be focused on.

How this moves us toward the Regional Vision:

Innovation is one of the central overarching themes of the *GO TO 2040* vision. The key themes of the GO TO 2040 vision that are centered on innovation are: sustainability, energy, education, economic competitiveness, and transportation. Innovation is key to creating economic prosperity and employment opportunities in these areas. Recommendations to support regional innovation will help the region advance in these areas. Specifically, for:

- **The Environment** Businesses, government, educational institutions and people acting individually will innovate to more efficiently minimize and mitigate the environmental impacts from their activities, including climate change. This will better enable them to adapt to changing environmental conditions and will establish the region as a leader in this area.
- **Energy** The region's businesses, governments, and educational institutions will remain innovative leaders in green building techniques and conservation design, promoting energy efficiency and conservation of water and other resources. The region will also take national leadership in the research, development, production of green energy generation equipment, and in retrofitting existing structures for maximum energy efficiency.
- **The Economy** The region will be a center of innovation across all disciplines; creativity and entrepreneurial activity will be encouraged.
- **Education** The region's world-renowned institutions of higher education will continue to be centers for learning, innovation, and basic and applied research, generating new ideas and inventions, educating the region's students and attracting students and researchers from around the globe
- **Transportation** Our region will use new technologies and other innovative means to address our transportation challenges and minimize their environmental impacts. The freight system will be improved to increase efficiency and interconnectedness, strengthening our position as a national and international center for goods movement and intermodal logistics.

CMAP has been assisted in our research on innovation by municipal economic development officials, innovation focused organizations, private businesses, and the public. CMAP commissioned research on the generation of innovation in the Chicago area by RCF Economic and Financial Consulting, Inc; RCF produced several reports that detailed how and where innovations are generated by the private sector, universities and other research institutions (such as national laboratories), and the public. This research describes the role of innovation in economic growth and its importance to the long-term success of the

[1] Brookings Institution *Metro Policy: Shaping a New Partnership for a Metropolitan Nation.* 2008.

local economy. These reports provided an analytic framework, pointed to areas for further research, and made concrete recommendations for increasing innovation in the region.

CMAP's Economic and Development Committee generated several useful ideas based on these reports. They suggested that policy recommendations on innovation should be considered in terms of research (finding information about existing practices), collaboration (building partnerships to encourage innovation), and implementation (acting on innovative policy actions that can be accomplished in the short term). The Committee outlined several research goals and has initiated a collaborative effort with CMAP to begin supporting innovation. Several research agenda items have been generated, and several policy actions have been suggested and discussed. These efforts are ongoing and expected to continue through implementation of the *GO TO 2040* plan.

At the same time as the committee's involvement, CMAP staff have worked in parallel by reaching out to stakeholders not traditionally involved with innovation policy in order to get external viewpoints and opinions on how to spur innovation. CMAP staff have conducted multiple interviews with university administrators and faculty members, leaders at traditional manufacturing as well as non-traditional green-oriented businesses, municipal officials, and entrepreneurs. These interviews have provided corroboration for many of the approaches CMAP has been following and have helped generate ideas about additional subjects to research. In addition, these interviews have helped CMAP develop practical, implementable recommendations that may be achievable in the short-term to spur innovation and help create a local "culture of innovation," where trial and experiment are rewarded and remunerated.

Recommended Direction for GO TO 2040

The goal of the innovation recommendations are to improve government policies, dismantle barriers to innovation, and improve services that can enhance innovation and support our regional industry specializations. Progress toward these goals will increase economic prosperity and provide more jobs in the region. The plan also recommends that local governments find areas where the private sector is not providing the roles and institutions necessary to support innovation – and to fill those gaps. The recommendations address state and federal government policies and funding sources, but are primarily designed from a regional perspective to provide workable ideas for the region in case state and local funding is not forthcoming. At the same time, investing in regional innovation is gaining importance in federal policy as a way to support economic growth. Emerging funding opportunities will require regions to be highly organized to be competitive. These recommendations can help position the region to be more competitive for public and private funding that will lead to job growth.

From the vision's inception, innovation has been identified as a priority for the region to actively take steps to achieve. There are three central themes to each of the plan's innovation recommendations: research, collaboration, and policy implementation. The research theme should clearly present a formulation of what needs to be known and how to find that out, and it should be linked to the steps in collaboration and implementation. The research component includes both basic (to provide scientific breakthroughs, new products, etc.) and applied research (to meet specific needs). The collaboration theme emphasizes recommendations designed to generate a culture of collaboration throughout the region that will encourage new thinking about current issues across existing organizations and institutions. The collaboration theme will also support innovation by bringing entities with shared goals together to close the gaps that may slow progress. The policy implementation theme stresses specific policy recommendations that should be addressed in the immediate future in order to better enable innovation in the region.

The Chicago region's economy is diverse but also specialized in many key sectors. These regional specializations, and emerging opportunities related to them, should be leveraged and supported. Since each industry faces unique challenges, opportunities for innovation will vary by sector. Using a sector or cluster-based approach to innovation will help identify shared research, collaboration, and implementation needs. An implementation strategy that focuses on specific strategic industries will help build our regional specializations and support long term job growth and regional prosperity. The first part of these recommendations describes different parts of the innovation recommendation that can be applied to all sectors. The second section provides specific examples of how these recommendations could be implemented by focusing on the energy (renewable and retrofit) industry and the freight industry. These industries were chosen to illustrate specific examples, but additional sectors should also be targeted to identify specific actions for implementation. Each recommendation component is applicable to the freight industry and energy industry, to the rest of the regional industry clusters, and to other sectors in the region as well.

Proposed Recommendations:

Improve the Labor Market

- **RESEARCH** Research is needed to identify opportunities to increase the number of jobs in existing and new industries. Innovation can both create new jobs by generating new opportunities to produce and sell goods and services, and by increasing regional prosperity, which will then lead to further economic activity and job growth. Research should address the potential to encourage innovation within existing medium and larger sized companies ("gazelles") and expand production in businesses that are able to readily expand their labor forces. Current and potential shortages in job-skill combination should be identified.
- **COLLABORATION** Leaders in the private and public sectors, education, and workforce development system should coordinate efforts to build an integrated economic development system that works to promote identified industries. Representatives from industry and educators should collaborate to better align worker training opportunities with the labor needs of targeted industries; The spatial mismatch between the location of some job needs relative to where job seekers live may be solved by including state or regional transportation officials in discussion with industry officials and economic development organizations. This collaboration can also inform infrastructure investments choices that can support industry and labor connections.
- **IMPLEMENTATION** The Business Innovation program at the Illinois Institute of Technology strongly advocates the teaching of innovative thinking to job seekers. Some exposure to innovative and creative thinking / problem solving can improve success in the job market, and in long-term career development. Existing regional innovation centers and programs should be encouraged to engage the region's unemployed population in innovative thinking exercises; this will help people become more entrepreneurial and better job seekers. Educational programs at the community college level should be developed and expanded to meet current and forecast training needs; existing programs must be expanded to both meet current hiring needs as well as to show businesses both within and outside of the region that Chicago has a high quality pool of labor ready to help the region grow.

Enhance technology transfer and commercialization.

- **RESEARCH** Research is needed to learn how to improve upon current practices of measuring technology transfer program productivity. Some measures base rewards on the number of patents; such incentive schemes cause innovators to spread a single innovation across several years, delaying innovation and commercialization. Research is needed to establish better measures of program success. Research should also examine existing tech transfer models and policies implemented in other regions that drive innovation. Research must be done to identify best practices for collaboration toward commercialization of new ideas in order to provide a smoother template to what is otherwise often a tumultuous process. Ultimately, private sector industries must be more closely linked with the region's world-class researchers to be able to draw ideas from them for implementation; this implementation can improve the region's economy as well as providing a testing ground for the research ideas.
- **COLLABORATION** Regional organizations should facilitate dialogue and information exchange between different industrial sectors within the regional specializations and industry clusters, parts of the same sectors, universities and other research institutions, entrepreneurial programs, and producers and consumers. These efforts should build on meetings like the Business Innovation Conference or the Innovation Summit. These industry-oriented organizations should also consider how to best involve universities in the vision of growth throughout the region. Build on the Midwest Research University Network (see website). A key part of collaboration between government and universities/research institutions should be to involve business in the collaborative process; facilitating connections in this area is essential.
- **IMPLEMENTATION** Institutions should coordinate technology transfer departments and staffs at different universities to improve performance and monitor progress (based on improved metrics) in meaningful ways. "Innovation Zones" should be established to spur technology transfer between universities and R&D clusters, and to spur commercialization. The region's green industries can be improved by providing grants to establish "green engineering" and similar programs at regional universities (among other actions). The ITECH technology collaborative effort, where universities donated faculty time to review technology commercialization plans for start-up firms (and potentially award a $25,000 stipend) should be reinstated, with possible changes driven by evaluation of the program. *[Suggest Technology Challenge Grant Program?? must talk to Lori Clark]* Such a program is a low-cost way of getting new firms to develop commercialization plans and learn to be entrepreneurial.

Increase funding opportunities

- **RESEARCH** In order to address capital funding and pursue opportunities to better serve the capital needs of our businesses, targeted research should explore the existing conditions and strategies to increase investment. Research should aim to reveal what types of financial resources and institutions are the most efficient at creating successful start-ups; focusing this research on specific industries will be most helpful.
- **COLLABORATION** Policy-makers should collaborate with technical assistance providers and industry experts to make sure that both incentive programs and financial resources are well understood and accessible. Strategic partnerships should be formed to make private capital available for small and new businesses as they move from incubator programs into the business world. State, county, and municipal officials should be part of a collaborative discussion about how best to support emerging innovative businesses. Regional collaboration should consider

federal funding opportunities and the partnerships that will make the region more competitive such as the Regional Innovation Clusters program.

- **IMPLEMENTATION** Incentives should be provided for multi-firm collaborations to submit proposals for technical assistance, training, capital, and ongoing regional collaboration from governmental and non-governmental funding sources. Several actions should be taken in the near term, including the creation of a new Chicago region clean tech venture capital fund, evaluation of and re-instatement of the Illinois Small Business Innovations Research funding, and re-instatement of the Technology Challenge Grant Program (must talk to Lori Clark). The ITEC program (which provided assistance and guidance to emerging technology businesses through collaboration between university faculties) should be reinstated; this program offered important benefits at very low costs.

Support Green Innovation

- **RESEARCH** Measurements should be established for tracking growth in the region's green economy. Changes in the industry should be tracked continuously. Information (lists or directories) of existing and potential green businesses in the region by sector should be compiled and updated as necessary. Federal, state, local and private/market-based Incentive structures to generate green innovations and encourage their use by existing businesses should be researched; comparisons of the Chicago region to other areas may be useful. Research should address ways in which state, county, and local governments can support sustainability through public policies, regulation, financial investment, or purchasing decisions as well as potentially removing policy/regulatory barriers to green economic development. Outreach and survey tools to confirming if businesses meet green standards should be developed.
- **COLLABORATION** Collaboration between innovators, government, and industry associations in affected sectors can open dialogue and ease the implementation of green innovations. Create networks and support centers. A new regional green energy agency specifically tasked with addressing short and long term needs for renewable energy use across sectors can speed adoption of green energy and generate innovations to make that possible. Education for businesses and economic development communities about economic incentives for emerging green business and greening of existing businesses should be improved.
- **IMPLEMENTATION:** Define standards for green business or parts of green business for each industry sector. These standards must recognize that most businesses or jobs may never be wholly green, but are likely to have substantial and important green elements. Enact policies and practices that create demand for renewable energy production and green building products. Create new or improve existing incentives, policies, regulations, and standards. Improve industry standards and certifications for trained workers and safe work practices for emerging green industries that currently lack clear standards. (Example: lack of clear standards for deconstruction workers.) Establish and communicate clear goals and concrete actions for local officials to implement.

Remove Obstacles to Innovation

- **RESEARCH** Policy and regulatory barriers should be examined to assess whether they can be re-designed to encourage innovation. Goal-based regulation has the potential to incent

people and businesses to find new solutions for problems previously solved through regulatory control. Potential opportunities for regulatory reform should be addressed. Challenges faced by small businesses should be researched along with new models to support entrepreneurship. For example, micro-loan programs, social entrepreneurship programs, and certain tax incentives should be enhanced. Business growth should be assessed in relation to regulations that may affect business development. Regional governments should determine specific infrastructure, workforce, and other needs of targeted industries. It will be important to identify opportunities, gaps, and redundancies in existing state and local programs that seek to assist these sectors.

- **COLLABORATION** Representatives from industry, labor, and government should convene to identify the public policies that provide the most substantial barriers to small business growth and commercialization of new innovations. This process should consider alternative regulatory ideas that could generate new ways of doing business and meeting regulatory goals. Collaboration with stakeholders in areas where goals-based regulation has spurred economic innovation should be undertaken.
- **POLICY IMPLEMENTATION** Removing obstacles and redesigning regulations should be performed across all sectors, on a case by case basis. Public policies at the county and municipal levels that were based on dated technological standards should be reviewed and potentially discarded or modernized. For example, the region should address the expansion of broadband in the region in light of recent federal and state actions. Another example is that the state should create a new administration of telecommunications to modernize regulations and thereby improve high-speed telecommunications and provide the basis for innovations in that area. A third example is for the region to take a leadership role in healthcare information technology; this will be especially salient for continued health care debate at the federal level.

Develop a Culture of Innovation

- **RESEARCH** Leading stakeholders in the region attest that there is a lack a culture of innovation in the region. Research should address how to change long-term attitudes in the region to support experimentation and creativity necessary to produce commercial innovations. The culture of sectors that have produced innovations within the region (such as the finance industry) should be explored to see if any lessons can be applied in other, more traditional, risk-averse sectors. Research should assess whether there is a link between the locally perceived lack of venture capital and the lack of a culture of innovation.
- **COLLABORATION** Educators, investors, leaders in venture capital, and entrepreneurs should be brought together to think about this problem. Some innovators in the region have been successful despite initial setbacks; these people should be consulted to learn what barriers they faced and how they overcame them.
- **IMPLEMENTATION** Existing innovation competitions should be continued and expanded to encourage budding entrepreneurs to experiment. Programs within colleges and high schools should be made more widespread to show that often mistakes are valuable learning experiences. The stories of successful Chicago innovators (many of whom had experienced previous false starts) should be recorded and publicized to help educate the region about the value of experimentation and resiliency following mistakes.

Part two: Sector Specific Examples

This part of the recommendation describes how the innovation strategies may be implemented in two sectors: energy and freight. These sectors have been chosen as examples due to work on other parts of *GO TO 2040* and because CMAP staff expertise are much more closely aligned with these sectors than others. This is not meant to discourage alternate efforts by other organizations to address these or other sectors.

I. Renewable Energy and the Retrofit Industry

The renewable energy and energy efficiency industries are quickly emerging and numerous global, national, and local policies and priorities provide an opportunity to be a leader in this industry long after it emerges. As the country strives to become energy dependent and create jobs that support long term prosperity, the region should promote policies and investments that support private sector growth. In addition, to reach our climate change goals, we need to be consuming less energy; our buildings account for 63% of all green house gasses and to address this we need to make our buildings more energy efficient through retrofit strategies.

Initial research has identified the following actions and implementation strategies to support innovation, within the five recommendations for the Retrofit Industry and the Energy Industry.

A. <u>Retrofit Industry</u>

1. **Improve the Labor Market**
   Training needs must be anticipated and taught to a large section of the labor force in multiple areas of the region. Since retrofits are likely to take place throughout the region, training should train and draw from local labor forces to effect change throughout the region; this effort will employ more people in different markets and will also train labor forces in multiple locations that will make further retrofit and efficiency programs easier to carry out and more attractive for localized businesses and governments to carry out. Significant resources are already dedicated towards understanding the labor needs to support this industry; regional collaboration and coordination of efforts is needed to ensure greater efficiency.
2. **Improve technology transfer and commercialization**
   Retrofit standards must be reviewed in order to ensure that innovative techniques for improving energy efficiency can easily be incorporated into existing certification standards. The new federal inter-agency Regional Innovation Clusters pilot is designed to support the energy efficient building systems cluster; this opportunity provides direction for regional collaboration and outlines the roles of the entities and institutions required within this collaboration to increase technology transfer and commercialization within this sector.
3. **Increase funding opportunities**
   Banks need to feel comfortable making loans for retrofit costs and building owners need to feel comfortable spending money on retrofit activities. This is not an access issue; it is more of a market development issue. Some innovative financial tools with successful track records are available; these tools, and examples that show cost-effectiveness of energy retrofits should be publicized and further developed. Public private partnership between financial institutions and

government (such as the proposed Chicago Retrofit Ramp-up Program) should work to share risk to support market development and make more financial tools available.

4. **Support green innovation**
   By investing in and producing retrofits in different locations, the retrofit programs will have the effect of training local workforces to work in green ways, and provide both skills and awareness to local business and labor communities. This awareness should be capitalized upon to encourage community and external funding for other green initiatives in each area that will improve both local environmental quality and economic performance.
5. **Remove obstacles to innovation**
   Retrofit standards should be continuously reviewed and updated in order to ensure that regulations to address dated technology does not hinder the application of state-of-the-art technology. Innovation will stall if certifications, such as LEED, become static and do not allow for new types of materials or practices that may reduce costs or increase efficiency to be incorporated into work plans.
6. **Develop a culture of innovation**
   Increasing awareness of innovation through the application of locally innovative programs, especially if such programs recognize and encourage local initiative should foster innovative thinking. Job training in innovative areas should also help provide a pool of innovation-ready resources. All of these factors can combine to create a more fertile ground for creativity and experimentation.

B. <u>Energy Industry</u>

1. **Improve the Labor Market**
   Currently, wind farm technicians and managers are primarily trained in the Iowa and Ohio community college systems. Given the increasing development of wind farms in Illinois and the preponderance of wind energy companies in the Chicago Metropolitan Area, local educational curricula should be directed toward producing local residents to be employed in the renewable energy industry. To ensure adopted curriculums are preparing our workforce for the renewable energy industry, linkages between education systems, workforce development systems, and economic development systems should be strengthened regionally.
2. **Improve technology transfer and commercialization**
   Opportunities to enable sharing of ideas between researchers at our area's universities and research institutes and local wind energy companies should be encouraged. Government funding restrictions that restrict technology transfer should be revisited and reformed to encourage the support of local wind industries. The state or region should adopt a targeted SBIR program that is designed specifically for renewable energy.
3. **Increase funding opportunities**
   The primary limitation for the wind energy industry is a constrained transmission system. Public Private Partnerships should be encouraged to find ways to finance and provide for expansion of capacity to take advantage of possibilities for renewable energy. Commercialization funding for

emerging renewable energy generation, such as solar and geothermal should be addressed through SBIR or Technology Challenge Grants (?)

4. **Support green innovation**
   Technological development to make wind turbines more effective and less noticeable will expand the possibilities for locating turbines closer to densely populated areas, thus enabling these communities to use a greater share of renewable energy. To encourage this, both municipal codes and municipal officials must keep abreast with developments in this area; if attitudes and laws become dated, innovation and its commercialization will be more difficult.
5. **Remove obstacles to innovation**
   Both regulatory barriers from local government zoning and land use ordinances, and the high variation and uncertainty concerning such regulations and restrictions are preventing the growth of the small, onsite turbine industry. In addition, large scale wind farms are also restricted due to land use regulations. Rationalizing, updating, and standardizing county and municipal codes toward goals-based regulations will allow and encourage the development of the Chicago as the emerging wind industry capital of the nation.
6. **Develop a culture of innovation**
   Conferences such as Clean-Tech should be expanded upon, and should draw in community development organizations and planning officials to help everyone generate innovative ways to develop renewable energy facilities locally.

II. Freight

The region's economy has long been supported by our extensive freight infrastructure, due largely to the ripple effect on the regional economy. The projected needed capacity of our freight system requires innovation and supporting innovation in the historic freight industry will help to ensure our region remains the nation's transportation hub.

1. **Improve the Labor Market**
   Training needs should be oriented to prepare for economic recovery, especially since recovery in different parts of the nation will generate freight needs that may draw upon Chicago, even if the Chicago economy itself is lagging. More training should be made available in preparation for the reemergence of labor shortages that existed before the recession; training programs for drivers should be expanded. Training should also prepare laborers to work in modern intermodal yards, which have complex needs not fully addressed in most current curriculums.
2. **Improve technology transfer and commercialization**
   Technical innovations in the transportation industry are usually conveyed through automotive industry channels, or through departments of transportation. Potential linkages between fuels, engine, and transportation research ongoing in the Chicago regions' universities and research institutes should be connected to the needs and operations of the freight industry, particularly for trucking and intermodal yard operations. Recent advances within the transportation industry should also be shared with the technical research centers in the region; development of regional freight technology centers would help generate further research and innovation.
3. **Increase funding opportunities**

Innovative funding solutions must be developed to enable the construction of infrastructure necessary to help smooth freight operations in the region. (this area needs work).

4. **Support green innovation**
   There is a substantial amount of attention to environmental improvements in the freight and logistics industry. Global 4, one of the region's most advanced intermodal yards, is a world leader in environmental performance; this model should be researched and expanded on.
5. **Remove obstacles to innovation**
   Programs such as CMAQ offer partial funding and encouragement to reduce transportation fleet emissions; a very cost-effective CMAQ tool is partially funding diesel retrofits for Switching Locomotives. Other such tools should be encouraged rather than reliance on prescriptive technical solutions, as have been implemented in California.
6. **Develop a culture of innovation**
   Increasing awareness of innovation through the application of locally innovative programs, especially if such programs recognize and encourage local initiative should foster innovative thinking. (This area needs work)