MEMORANDUM

Date: July 14, 2003

To: Wisconsin Technology Council

From: Carl Gulbrandsen, Chair, Technology Development Committee
Wisconsin Technology Council

Subject: TECHNOLOGY DEVELOPMENT COMMITTEE AGENDA (REVISED)
- Statement of the Technology Development Issue
- A Proposed Technology Development Policy Agenda

Statement of the Technology Development Issue.

There are many barometers by which to measure the success of technological development, but none more poignant than the ultimate effect that technology has upon the lives of our citizens. That effect can be measured in per capita income. To give Wisconsin's economy the competitive edge that is necessary to increase its per capita income above the national average, a situation which we have not enjoyed for some time, new discoveries and technologies must be used to feed innovation in products and services. Businesses and existing institutions will incrementally cause this to happen on their own, but we can help them accelerate the process. Wisconsin is rich in technology and there are a number of regional technology development opportunities occurring. For example:

- The University of Wisconsin-Madison (UW-Madison) is recognized as a world-class research university. It ranks number two among public universities in terms of overall funding of research. In terms of quality of faculty, post-doctoral researchers and graduate students and in terms of the quality and quantity of work product produced by the university it ranks in the top tier of institutions world-wide. The technology transfer arm of the UW-Madison, the Wisconsin Alumni Research Foundation (WARF) is one of the oldest and most respected organizations of its kind in the country. The partnership between WARF and UW-Madison has resulted in significant benefit to the public and significant financial return to the university. In recent years, the partnership between WARF and UW-Madison has resulted in a significant number of high quality faculty start-up companies that have enhanced the economic growth of the State and particularly Dane County.

- Several years ago, at the urging of the President of the University of Wisconsin-system, WARF formed WiSys Technology Foundation (WiSys) to provide technology transfer assistance to the other four year campuses of the university system. While the efforts of WiSys promise positive results for the state's economic growth, it is still in its infancy.

- The Medical College of Wisconsin is recognized as one of the top research-based academic medical centers in the United States, particularly in the areas of medical imaging and cardiovascular research. The Medical College's physiology department receives more funding from the National Institutes of Health than any other physiology department in the country. Overall, the Medical College receives well in excess of $100 million of research funding annually. In recent years, this research engine has resulted in a number of high quality biomedical start-up companies that have enhanced the State's economy and particularly the economy of Milwaukee.

- Two years ago, with the help of a grant from the Wisconsin Department of Commerce, TechStar was formed to help facilitate the formation of start-up companies based on technology from the Medical College, University of Wisconsin-Milwaukee, Marquette University, Milwaukee School of Engineering, and UW-Parkside. The Metropolitan Milwaukee Association of Commerce is also a collaborator. TechStar's mission is to convert innovation into business ventures, create high quality entrepreneurial jobs, build successful companies and provide returns to investors. TechStar and WiSys have a collaboration agreement that has resulted in the first license agreement with technology from UW-Milwaukee. The agreement is with a start-up company NovaScan Systems based upon technology developed by its founder and president, William Gregory, Dean of the UW-Milwaukee School of Engineering and Applied Sciences.

- The Marshfield Clinic in Marshfield and the Rice Clinic in Stevens Point have a strong research capability. Marshfield Clinic Research Foundation is a division of Marshfield Clinic. It is one of the 10 largest private research clinics in the nation. Many of the Foundation's 600 research and educational projects are conducted by the Clinic's physicians in collaboration with the Research Foundation's 31 scientists. Areas of focus within the Research Foundation include: clinical research, rural health and safety, epidemiology, human genetics, personalized medicine and health services research. More than 750 active research protocols/projects are underway.

- The Chippewa Valley includes the University of Wisconsin-Eau Claire, University of Wisconsin-Stout and the University of Wisconsin–River Falls. This region has a tradition in the manufacturing of computers and components, materials (rubber and plastics), wood products and food products and has now become focused on state of the art industries with signs of real success. These industries include telecommunications, utilities services, information technologies, automation robotics, precision machining, medical devices, instrumentation and health-care applications. Software companies and integrated circuit design firms have developed here because of the past influence of the Cray Corporation. UW-Eau Claire provides research experience through the Center for Excellence for Faculty and Undergraduate Student Research Collaboration. The Center distributes research results to the area at an annual conference. UW-Stout has a well-

organized manufacturing and industry-relations office in the Stout Technology Transfer Office. The school also provides services to assist companies in modernization of equipment, re-engineering its operations, and applying proven technologies and best practices.

- The Fox River Valley stretches from Green Bay to Fond du Lac. The area is a solid industrial corridor for Wisconsin with an emphasis in the paper and packaging industries and is one of the fastest growing areas in Wisconsin. It is also the retail center for many rural areas that surround the valley. UW-Green Bay has established a Research Council which provides grants for teaching and research. UW-Green Bay has post-graduate programs in environmental science and agriculture including its biodiversity program.

- Rock County is a main entry point into the state and a one-day truck route to about 25 percent of our nation's population. As such, Rock County businesses manufacture and distribute a variety of products. Janesville is the home of a General Motors manufacturing facility, and has a strong tradition in metal fabrication, plastics and machine automation. It is the adoption of cutting-edge technology by the plants and processes of these "old tech" businesses by highly-trained employees that allows them to increase their national and international competitiveness.

What is described above are many, but certainly not all, of the numerous public and private partnerships occurring through out the state that are resulting in high technology, high growth start-up companies. Collectively, these efforts will enhance Wisconsin's economy. What is lacking, however, is a coordination of these various efforts and a vision of how to apply limited state resources to maximize the economic result for Wisconsin and its citizens.

Coordination of effort can result in a synergism that amplifies the economic return. Strategic planning of how to use limited state resources in this effort reduces waste and can result in applying state resources to technology areas or projects that will produce a high and sustained level of economic growth for Wisconsin. The following proposed institutions are designed to provide the strategic planning and accomplish the goal of coordination of local, regional, and statewide efforts to maximize the use high technology for economic growth. This approach will set Wisconsin ahead of its peers in technological development. And it is technological development that will raise Wisconsin's per capita income back above the national average.

Institute for Interdisciplinary Research (IIR)

The IIR will initially be a virtual "think tank" focused on best practices in using technology as an economic engine for the economy of the state. It would include thought leaders from around the state familiar with technological evolution (futurists), entrepreneurism, business organizations and operations, government, finance, law and economics. The IIR would focus on identifying the state's intellectual capital, including areas of research excellence arising from academic and industrial laboratories in Wisconsin, and determining how the state can build on this developing technology against the backdrop of global technological demand

and evolution. It would use an interdisciplinary viewpoint and personnel to foster and promote Wisconsin's technological revolution. This institute would advise the Tech Council on technology policy and application of limited state resources. It would also serve as a resource for the Centers of Research Excellence and the regional and statewide technology clusters.

Centers of Research Excellence (CRE)

CREs may be regional or virtual, but need not be confined to a geographic locale. CREs would be the functioning arms and hands of the IIR. Each CRE would be organized around large-scale opportunities to build high-technology Wisconsin businesses via intellectual capital in specific fields that yield a competitive advantage to Wisconsin. Some examples of such fields may include genetics, bioinformatics, and information management. One goal is to target disruptive technologies that force changes in the competitive landscape providing an advantage to Wisconsin's leading industries. The CRE focus is applied research that transfers those new, disruptive technologies from the public sector to the private sector to solve unique problems of a particular industry. The CRE thereby combines public and private sector resources to amplify the competitive advantage of intellectual capital being developed in Wisconsin.

Regional and Statewide Technology Clusters (TC)

A TC occurs when related technology-based businesses develop via the applied research fostered by a CRE. The technology cluster would include companies engaged in commercialization of the technology spun of from the CRE. The cluster would also include supply chain companies that provide the infrastructure needed for the technology cluster to efficiently and quickly commercialize the particular technology. Clusters may be regional, and like CREs can be statewide. Various technology clusters already exist in Wisconsin. Examples include the computer software and hardware industry in the Eau Claire area and the printing industry in the southeastern part of the state. Where such clusters already exist, it may merit the establishment in the region of the cluster of a CRE to help feed and further develop the growth of the cluster.

Structure and Operation of Technology Institutions.

IIR. Ultimately, the IIR will be a bona fide research institute funded from a variety of sources including government grants, gifts from industry, and benefactors interested in using high technology to stimulate economic development. The institute would have endowed positions and staff sufficient to support a variety of research efforts targeted at maximizing high technology growth in Wisconsin. Once established, the IIR may also support post-doctoral fellows and graduate students and perhaps even offer advanced degrees in technology policy. As stated above, the IIR would be the research arm of the Tech Council. It would also provide needed advice and guidance to the CREs and TCs. The institute would also act as a resource for Wisconsin public and private sector participants interested in technology policy, such as WARF, WiSys, Medical College of Wisconsin Foundation, the Marshfield Clinic Foundation, TechStar, the licensing offices of Wisconsin high technology businesses.

Until adequate funds are obtained, it is necessary that the IIR operate as a virtual center. There are Wisconsin people and businesses in the private sector that are skilled and interested in technology policy. There are also academic researchers in Wisconsin universities and colleges who are already researching issues that complement the goals of IIR. At UW-Madison for example, there is a multidisciplinary organization called Initiative for Studies in Technology Entrepreneurship (INSITE). This program was started by individuals from the sciences, law, economics, business, finance and entrepreneurism. We propose to start off the IIR by inviting INSITE and other interested public and private sector persons to assist in further refining the goals, priorities and action steps for the IIR. Associated with these planning exercises, early activities would include a lecture series of nationally prominent futurists and thought leaders on the topic of technology development.

One early priority of the IIR is to inventory the technology strengths of Wisconsin. The creation of a Wisconsin technology database would be very helpful to the WTC and other policy makers in government. Another priority would be to use the database in identifying technology for use with SBIR and STTR grants with the goal of increasing the proportion of such grants awarded to Wisconsin companies.

CRE. CREs will be located around the state, but will not be confined to any specific geographic locals. Each CRE will focus on a significant opportunity to foster and create high technology Wisconsin businesses through the application of public sector science and technology. Transfer of public sector technology to the private sector will give private sector actors the tools and motivation to solve problems unique to those industries around which a CRE is organized. The intellectual property rights to be transferred from CRE research would be determined up front and managed jointly by industry and the technology transfer arms of the participating institutions. WARF has significant experience in developing and implementing technology transfer programs that benefit all of participants in the collaborative effort.

Examples of this already exist at the University of Wisconsin-Madison and the Medical College of Wisconsin in the medical imaging area. Both institutions have broad joint research programs with GE Medical Systems targeted at developing the next generation imaging technology. As these programs progress, some of the technology discovered may be more suitable to further development in a start-up company than in a large on-going corporation like GE Medical Systems. It is worth exploring with GE Medical Systems and similar companies, the incentives for sponsoring start-up companies that may either license developed technology to GE or be an acquisition target. Recently, GE Medical Systems has been approached regarding the establishment of a CRE targeting IT/Mass Data Storage/Communications Systems. This CRE would involve collaborations between the Medical College of Wisconsin, the University of Wisconsin-Milwaukee and the University of Wisconsin-Madison. A third CRE involves the Biotech/Genetics/Proteomics/Stem Cell fields. Strengths in these areas exist at Marshfield, Medical College of Wisconsin, University of Wisconsin-Madison and a number of small to mid- size biotechnology companies in Wisconsin.

All of Wisconsin will benefit from the work of the CREs by furthering its economic development goals and transforming its economy into a knowledge-based, technology-driven engine for increasing wages and the standard of living. CREs would be funded jointly by the

private sector business participants and the collaborative efforts of state and local government. The investments in CREs will be returned many times over to private industry, the CRE itself, and local and state economies. CREs will benefit the State by: being economic development engines for local economies; attracting and retaining world-class researchers to serve companies and CREs; attracting federal research funds; producing quality employees for local companies; and increasing incentives for companies to retain current and develop new facilities.

By leveraging the knowledge already within our state to develop synergies under the guidance of the IIR, CREs will help drive our State's technology-based economy by applying that knowledge in a concerted, strategic manner.

TCs. New TCs are the ultimate beneficiaries of the activities of the IIR and CRE. TCs are the commercial enterprises that will create the knowledge-based jobs that provide a high standard of living to Wisconsin citizens. As stated earlier, some TCs already exist. With respect to each of these TCs, we should consider establishing an affiliated CRE. The CRE will aid its affiliated TC by performing the applied research that brings technology into the commercial realm. This symbiosis will create an environment for rapid prototyping of new ideas, rapid build up of resources and rapid roll out of new products. This accelerated development and commercialization cycle will enable companies within the TC to enjoy an early-mover advantage over competitors and capture a greater share of the market.

The composition, size, and structure of each TC will vary by industry. The establishment and development of TCs will be driven by the demands of each industry. Those demands are, in part, logistical. Consequently, TCs may be local, regional, or statewide, and may include international participants. Technology and people will move from CREs to TCs as research becomes commercialized and the private sector enterprises need help implementing the new technology. This flow of human and intellectual capital will attract knowledge workers who seek opportunities and career advancement possibilities. Thus, the cycle of growth, innovation, and development will sustain itself and fuel growth of the high-tech economy of the future.

What is the state of Wisconsin's role?

Establishing the Institutions

The State of Wisconsin has a critical role in helping start the IIR and CREs. It is beyond doubt that market-driven, coordinated research of the type described above will accelerate the cycle of technology innovation and application and product development. Private sector institutions often fund narrow research. But those efforts will not bring together the critical mass of resources necessary to start institutions like IIR that will identify and solve technological problems to create new opportunities across industries. Narrow research efforts also will not seek coordinated applied research opportunities like those fostered in CREs. Consequently, the state has a role as an angel investor in creating these institutions.

R&D Tax Credits

And like any good investor, the state must require exceptional return on its investments. Those returns will be realized by investment in research and development. Public support of research and development is justified by its ultimate effect on living standards. Research and development investment of the type suggested within IIR and CREs is the major factor contributing to long-term productivity growth, which in turn enables growth of real wages. The ancillary benefits of research and development to the economy as a whole greatly exceed privately appropriable returns, leading to private underinvestment in a publicly beneficial activity.

Despite the presence of one of the most well funded research institutions in the country, Wisconsin still ranks in the middle of the pack on per capita research and development expenditures. From the period of 1997–2000, Wisconsin's per capita R&D spending ranked 26–29 nationally. State Science and Technology Institute, citing, National Science Foundation, *Research and Development in Industry, 2000*. This means that the level of per capita research outside of UW-Madison is substantially below the national average.

Wisconsin's existing research expenditures tax credit and research facilities tax credit are both modest. Maine, for example, has substantially increased research and development incentives by implementing a Super R&D Tax Credit giving a 50 percent tax credit for expenditures that exceed 150 percent of the prior years expenditures. A state investment in the creation of IIR and CREs coupled with an ambitious increase in research and development tax credits would bring substantial momentum to the development of coordinated, applied research and greater weight to the furtherance of TCs.

Tax Credit for Industry Support for IIR

Industry support for both IIR and CREs will be critical to their long-term success. IIR will eventually become funded through government grants, gifts from industry, and benefactors interested in using high technology. To incent private sector institutions to support and make direct gifts to IIR, the State should authorize an IIR Tax Credit. The credit could have a sunset provision to reflect that IIR will eventually have a more balanced source of funding via federal grants and gifts from industry and other private benefactors.

Increase Funding for Innovation and Economic Development Grant Program

This program, funded by the State and administered by the University of Wisconsin-System, provides seed grants to enterprises seeking to perform applied research on technologies that have the potential to improve state's economy. Grants have typically been between $35,000 to $40,000. The program has been well used and it has served to leverage private funds many time greater than the initial grant. Many promising technologies do not get funded due to the programs limited resources. Increasing funding from $1 million to $2 million would provide significant opportunities for proponents of promising technologies to seek leverage from other sources and continue their commercialization process.

Homeland security funding

Because of the strength of key technology clusters, Wisconsin could be attracting more "homeland security" research and development funds. However, that has thus far failed to happen to any large degree, in part because of restrictions on classified research at the UW-Madison. The state should examine strategies by which Wisconsin could leverage some of its core technology competencies in zoonotics, mass data storage, computer security and engineering to attract more federal R&D dollars.

CONCLUSION

Wisconsin has technology assets and a "tech transfer" process to rival virtually any state. However, it needs more tech-savvy leaders in private industry and government to point the way to greater commercialization of that technology to help create high-wage jobs and a better quality of life for Wisconsin. The creation of technology clusters, Centers of Research Excellence and an Institute for Interdisciplinary Research will help pull together all of Wisconsin's technology assets in a way that benefits the entire state.