

ATTACHMENT 1

COMMITTEE BIOSKETCHES

S. Michael Hudson, *Chair*, retired as vice chairman of Rolls-Royce North America. After Allison Engine Company was acquired by Rolls-Royce, Mr. Hudson served as president, chief executive officer, chief operating officer and a member of the board of directors of Allison Engine Company, Inc. Previously, during his tenure at Allison, he served as executive vice president for engineering, chief engineer for advanced technology engines, chief engineer for small production engines, supervisor of the design for Model 250 engines, and chief of preliminary design and chief project engineer in vehicular gas turbines. In late 2005, Mr. Hudson acquired a controlling interest in and serves as chief executive officer of I Power Energy Systems, LLC, a company that manufactures electric generator units. Mr. Hudson brings insight into propulsion engineering issues, related business issues, and the European perspective on aviation issues. He has also served on a number of National Research Council (NRC) committees including the Vehicle Systems Panel for the NRC's review of NASA's Revolutionize Aviation Program.

Viola Acoff received her B.S. (1989), M.S. (1991), and Ph.D. (1994) degrees in materials engineering from the University of Alabama at Birmingham (UAB). After graduation from UAB, she joined the University of Alabama in Tuscaloosa as assistant professor of metallurgical and materials engineering. In 2004, Dr. Acoff was promoted to the rank of professor. She teaches undergraduate and graduate courses in welding metallurgy, physical metallurgy, and scanning electron microscopy and has an active research group with research projects including the weldability and computer modeling of advanced materials, with particular emphasis on interfacial structures, indentation behavior of materials, processing of alloys by cold roll bonding, and the development of nanocomposite lead-free solders. Dr. Acoff has received numerous national and international awards and recognitions, including the Adams Memorial Membership Award presented by the American Welding Society for outstanding teaching activities (2000); Best Paper Award for the Minerals, Metals and Materials Society (TMS) Symposium on Gamma Titanium Aluminides (1999); TMS Young Leader Intern (1998); National Science Foundation CAREER Award (1997); Warren F. Savage Memorial Award presented by the American Welding Society for best paper (1996); International Business Machines (IBM) Award for Excellence (1992); and First Place Award for Best Physical Sciences Paper (1991) from the Microscopy Society of America. She was also elected to Sigma Xi scientific research society and Tau Beta Pi. She is a member of several professional societies, including the American Welding Society (AWS), TMS, and the American Society for Materials (ASM) International; she holds various positions of leadership and service on the local, national and international levels for the ASM International.

Marshal Greenblatt received his undergraduate education at Columbia University (B.A. 1961, B.S. in flight sciences 1962), a diploma from the von Karman Institute (1963), and a Ph.D. from Princeton University in aerospace and mechanical sciences. After seven years of research in high-temperature fluid dynamics and plasma physics at NASA Langley and the Naval Research Laboratory, in 1973 he cofounded Fusion Systems Corporation, the inventor of microwave-powered ultraviolet radiation sources used to polymerize liquid inks and coatings for the metals,

paper, wood, and optical fiber industries. Fusion Systems subsequently went public and ultimately was purchased by Eaton Corporation of Cleveland, Ohio. Dr. Greenblatt cofounded and was president of a metals-testing company, Materials Engineering Associates (MEA), which tested steel, aluminum, and other metals for structural integrity. Later, he established a subsidiary of MEA, Buffalo Materials Research, Inc. (BMR), which managed the 2 megawatt research nuclear reactor for the State University of New York at Buffalo. He was president of BMR as well. In 1993, he sold both companies and began a consultancy in management. He has served on two public companies that he helped to sell (C3, Inc., NYSE, a computer systems integrator; and Data Measurement Corporation, NASDAQ, a gauge manufacturer for the steel and aluminum industries). Dr. Greenblatt is on the board of directors of Solar Outdoor Lighting of Florida and Marlin Steel Wire Products of Baltimore. He founded a fund to recognize excellent teachers, in the name of his late wife. One of the honorees was named National Teacher of the Year in April 2006. He is also president and cofounder of the Montgomery County Students Information Technology Foundation, which trains at-risk students to repair computers and to prepare for the workforce. He is a cofounder of Next-Stage Development Group, an angel fund in Rockville, Maryland.

Donald L. Johnson, NAE, retired as vice president for product and process technology, Grain Processing Corporation (GPC), in July 2000. GPC is a major corn refiner producing grain alcohol, food and industrial starch products, and conversion syrups. He was responsible for finding, analyzing, developing, and implementing new carbohydrate products and process technologies. Dr. Johnson has 35 years of broad-based business, management, and research experience in the commercial application of carbohydrate chemistry, biotechnology, food science, water-soluble polymers, adhesives, and surface-active materials. Prior to joining GPC in 1987, he directed the research department at the A.E. Staley Manufacturing Company, which included developing products and designing and implementing strategies to support a major new chemicals-from-carbohydrate business. Dr. Johnson has authored or coauthored 13 patents as well as numerous technical publications and presentations regarding the production of foods and chemicals from renewable resources. He was elected to the National Academy of Engineering in 1993 and has served on numerous NRC boards and committees. He received the doctor of science degree in chemical engineering from Washington University, St. Louis, in 1966.

Chandrika Kamath is a computer scientist at the Center for Applied Scientific Computing at the Lawrence Livermore National Laboratory (LLNL), where she has led the Sapphire project in large-scale scientific data mining since 1998. Her research focuses on the analysis of data from observations, experiments, and simulations, using techniques from image and video processing, data mining, pattern recognition, and statistics. The Sapphire project was awarded the 2006 R&D 100 award for its scientific data-mining software. Prior to joining LLNL in 1997, Dr. Kamath was a consulting software engineer at Digital Equipment Corporation (DEC), developing high-performance mathematical software for the Digital Extended Math Library (DXML). Dr. Kamath earned her Ph.D. in 1986 and her M.S. in 1984, both in computer science from the University of Illinois at Urbana-Champaign. She holds five patents in data mining, with two patents pending. She is active in organizing data-mining conferences and workshops and co-edited the book *Data Mining for Scientific and Engineering Applications*, published in 2001.

Thomas R. Kurfess received his S.B., S.M., and Ph.D. degrees in mechanical engineering from the Massachusetts Institute of Technology (M.I.T.) in 1986, 1987 and 1989, respectively. He also received an S.M. degree from M.I.T. in electrical engineering and computer science in 1988. Following graduation, he joined Carnegie Mellon University where he rose to the rank of associate professor. In 1994 he moved to the Georgia Institute of Technology where he rose to the rank of professor in the George W. Woodruff School of Mechanical Engineering. In 2005 he was named Professor and BMW Chair of Manufacturing in the Department of Mechanical Engineering at Clemson University. He is also the director of the Campbell Graduate Engineering Center at Clemson University's International Center for Automotive Research. He currently serves as a participating guest at the Lawrence Livermore National Laboratory in LLNL's Precision Engineering Program. He has served as a special consultant of the United Nations to the Government of Malaysia in the area of applied mechatronics and manufacturing. His research work focuses on the design and development of high-precision manufacturing and metrology systems. He has received numerous awards, including a National Science Foundation (NSF) Young Investigator Award, an NSF Presidential Faculty Fellowship Award, the American Society of Mechanical Engineers' (ASME) Pi Tau Sigma Award, the Society of Manufacturing Engineers' (SME) Young Manufacturing Engineer of the Year Award, the ASME Blackall Machine Tool and Gage Award, and the ASME Gustus L. Larson Award. He is a fellow of the ASME and has been elected a fellow of the SME.

Ronald G. Larson, NAE, became a professor of chemical engineering at the University of Michigan in 1996, after working for 16 years at Bell Laboratories in Murray Hill, New Jersey. He received a B.S in 1975, an M.S. in 1977, and a Ph.D. in 1980, all in chemical engineering from the University of Minnesota. Dr. Larson's research interests include the structure and transport properties of polymers, colloids, surfactant-containing fluids, liquid crystals, and biological macromolecules such as DNA, proteins, and lipids. He has written numerous scientific papers and two books on these subjects, including a 1998 textbook, *The Structure and Rheology of Complex Fluids*. Dr. Larson was the president of the Society of Rheology (SOR) from 1997 to 1999 and served on the executive committee of that society during the period 1991 to 2001. He is a fellow of the American Physical Society (APS), and is a member of the SOR, the APS, the American Chemical Society, the American Association for the Advancement of Science, the National Academy of Engineering, and the American Institute for Chemical Engineers, where he currently serves on the Fluid Mechanics Programming Committee. In 1996, Dr. Larson was named the Prudential Distinguished Visiting Fellow at the Isaac Newton Institute in Cambridge, England; in 2000 he became the G.G. Brown Professor of Chemical Engineering at the University of Michigan; and in 2002 he received the Bingham Medal from the Society of Rheology. He is currently chairman of the chemical engineering department at the University of Michigan.

John McGowan is president of OnSight Energy, LLC, a wholly owned subsidiary of Chesapeake Utilities Corporation. Mr. McGowan founded OnSight Energy in 2004. Before joining Chesapeake, he had, since 1987, been with ABB, a Zurich, Switzerland-based global engineering company serving the worldwide power, industrial, and oil and gas markets. While at ABB, he was director of business development at ABB Equity Ventures, Inc., in Princeton, New Jersey, where he led and financed several domestic and international independent power transactions. Prior to that, he was vice president-controller for ABB's Worldwide Power

Generation business in Zurich. Mr. McGowan began his career as a nuclear engineer with Atomic Energy of Canada in Chalk River, Ontario. He earned his bachelor's degree in chemical engineering at Clarkson University in Potsdam, New York, and his M.B.A. in finance and accounting from the Stern School of Business at New York University, New York City.

James F. Miller has been the director of the Electrochemical Technology Program at the Argonne National Laboratory since 1999. He has extensive experience in energy conversion and storage research, developing advanced batteries and fuel cells for application in both transportation and stationary power generation and storage. From 2000 to 2005, he was also associate director of Argonne's Chemical Engineering Division, with responsibility for electrochemical technology and science programs in high-temperature superconductivity, heterogeneous and homogeneous catalysis, and physical organometallic chemistry. His past research activities have included work on superconducting materials, hydrogen technologies, advanced batteries for electric and hybrid vehicles, polymer-electrolyte and solid-oxide fuel cells, and fuel processing for fuel cells. Much of his current effort is directed at supporting the U.S. Department of Energy's FreedomCAR Partnership and Hydrogen Fuel Initiative. He holds a B.S. degree in physics from the University of Missouri-Columbia, and M.S. and Ph.D. degrees in physics from the University of Illinois at Urbana-Champaign, and an M.B.A. from the University of Chicago's Graduate School of Business.

Kent Misegades was named president of Computational Engineering International (CEI), a leading provider of computer aided engineering (CAE) pre- and postprocessing tools, in 1998. Prior to that, he was vice president for sales and marketing at CEI. From 1991 to 1995, he was managing director for Fluid Dynamics International GmbH in Bensheim, Germany. Mr. Misegades was manager of CFD Applications at Cray Research in Minneapolis from 1984 to 1991, and from 1980 to 1984 he was an aerodynamicist for Dornier GmbH in Germany. He has a diploma in applied aerodynamics from the von Karman Institute in Belgium and a B.Sc. in mechanical engineering from Auburn University. Mr. Misegades is Vice Chairman of NC 100, a North Carolina business advocacy group, and is a member of the American Institute for Aeronautics and Astronautics. He has been a private pilot since age 15.

Judy Nagengast is the CEO of Continental Design and Engineering, Inc. Established in Anderson, Indiana, in 1985, Continental Design and Engineering now employs 350 management and technical specialists experienced in all aspects of design and engineering services, contract technical staffing, executive staffing, and lean manufacturing implementation—including computer-aided design (CAD) and service on all major CAD platforms and recruiting of qualified contract engineers. Some of the awards received by Ms. Nagengast include the following: 1998 U.S. Small Business Administration, Small Business Person of the year for the State of Indiana; 1997 Ernst and Young, Indiana Heartland Entrepreneur of the Year Award—category of Woman Owned Businesses; Indiana University, Kelley School of Business, The Johnson Center for Entrepreneurship and Innovation, Growth 100 Awards 1997, 1998 and 1999 (for being one of the fastest-growing 100 companies in Indiana); 2000 Madison County Business Hall of Fame Laureate; 1999 Richard Lugar Achievement Award for Support of Education.

Andrew Razeghi is a writer, educator, and adviser to organizations on growth strategy and innovation. As founder of the Andrew Razeghi Companies, LLC, he works with organizations

seeking growth through the creation and introduction of new ideas. His work spans many industries. Moreover, he speaks to thousands of people each year at trade association and organization events. Mr. Razeghi is also an adjunct associate professor at the Kellogg School of Management at Northwestern University, a Thought Leader with Knowledge Dialogue, and an advisory board member of Americans for Informed Democracy (AID), a non-partisan 501(c)(3) organization working to raise global awareness on more than 500 university campuses and in more than 10 countries. Mr. Razeghi earned his master's degree in financial derivatives from Loyola University, Chicago, where he graduated with honors. He earned his undergraduate degree in international business from Bradley University.

Kenneth L. Reifsnider, NAE, has served as director of the Connecticut Global Fuel Cell Center since 2004 and has held the Pratt & Whitney Chair for Reliability and Design at the University of Connecticut since 2002. Prior to joining the University of Connecticut, he had been on the faculty of Virginia Polytechnic Institute and State University since 1968; there he held the Alexander Giacco Chair of Engineering Science and Mechanics from 1989 to 2002 and was the associate provost for interdisciplinary programs from 1995 to 2001. He conceived and developed a philosophy for predicting life in composite systems based on mechanistic multiphysics concepts. This achievement was cited in his appointment to the National Academy of Engineering and resulted in an instructional text on the subject with Scott Case as a coauthor. Dr. Reifsnider was appointed editor in chief of the *International Journal of Fatigue* in 2000; is the founder of the *International Journal of Fuel Cell Science and Technology*, published by ASME; and has served several terms on the National Materials Advisory Board of the NRC. He has given more than 100 invited lectures on composite material systems, including functional composites as used in fuel cells in more than 20 countries. Dr. Reifsnider received a B.A. degree in mathematics from Western Maryland College and B.E.S., M.S.E. and Ph.D. degrees from the Johns Hopkins University, the latter in metallurgy and solid mechanics in 1968.

Lloyd M. Robeson, NAE, has been a principal research associate in corporate research at Air Products and Chemicals, Inc., since 1986. He received a B.S. in chemical engineering in 1964 at Purdue University and Ph.D. in chemical engineering from the University of Maryland in 1967 and spent almost 20 years in polymer research at Union Carbide Corporation. Dr. Robeson's research areas include polymer blends, structure/property relationships, reactive extrusion compatibilization, engineering polymers, composites, biomedical polymers, dynamic mechanical analysis, emulsion polymer characterization, adhesion, polymer permeability, membrane separation, polymer utility in electrical/electronic/optoelectronic applications, and water-soluble polymers. He has published 92 technical papers, holds 93 U.S. patents and coauthored a reference book entitled *Polymer-Polymer Miscibility*. He became a member of the National Academy of Engineering in 2001. Recent awards that Dr. Robeson has received include the following: Distinguished Chemical Engineering Alumnus 2001, University of Maryland; Distinguished Engineering Alumnus 2002, University of Maryland; Industrial Polymer Science Award, Polymer Division of the American Chemical Society (ACS), 2002; Applied Polymer Science Award of the ACS, 2003; University of Maryland College of Engineering Innovators Hall of Fame 2003; Distinguished Chemical Engineering Alumnus 2004, Purdue University; and Distinguished Engineering Alumnus 2004, Purdue University. Dr. Robeson's present responsibilities include the initiation of long-range polymer science research projects in

emerging technologies in the Corporate Science and Technology Center of Air Products and Chemicals, Inc.

Norman H. Schutzberger is the NASA Office of the Administrator's Technical Assistant for Program Management overseeing the technical, programmatic and fiscal viability of planetary, deep-space and Earth observation satellites. Prior to holding this position he was the Aerospace Corporation's chief systems engineer in charge of a team of engineers, scientists, and analysts supporting Earth sensing and interplanetary projects' concept, design, cost, schedule, production, test, and operations. Mr. Schutzberger earned his B.Sc. degree in mechanical engineering from the Pratt Institute and an Executive M.B.A. from the Peter F. Drucker Graduate Management Center, Claremont Graduate University. He formulated and advised the start-up of innovative small businesses including Astrotech, which now conducts the vast majority of commercial satellite payload processing in the United States prior to launch. Mr. Schutzberger began his career at NASA's Goddard Space Flight Center evaluating advanced spacecraft design, cost, and mission analysis. His subsequent positions included NASA's resident mechanical systems manager for the Delta Launch Vehicle and Space Shuttle Upper Stages, where he supported technical analysis and contract negotiations on major NASA contracts. He managed on-site field offices for the Gamma Ray Observatory and LandSat Thematic Mapper Instrument. Prior to joining the Aerospace Corporation, he served as director of the Fluid, Mechanical and Propulsion Division of TRW Components International. Mr. Schutzberger has been involved in the direction, integration, and launch of more than 85 international, commercial, and U.S. government satellites. He has been an internal consultant to NASA flight programs, NASA's representative on commercial satellite failure review boards, member of the NRC Committee on Space Launch Range Safety, and an invited consultant to Lloyd's of London for assessing satellite launch risks.

James Trolinger is an optical physicist who has devoted his entire career to the pioneering development and fielding of laser-based, state-of-the-art, optical diagnostic methods. During the past 30 years he cofounded two successful, high-technology optical companies-Spectron Development Laboratories, Inc., which was acquired by the Titan Corporation in 1986, and MetroLaser, Inc., where he has worked since 1988. He and his science teams pioneered many applications of lasers in particle and flow diagnostics and aero optics beginning with the first application of holographic particle image velocimetry (published in 1968), followed by more than 100 publications of optical diagnostic methods. He has given more than 40 invited lectures to audiences in 12 countries. He serves on the editorial advisory board for three professional journals. Dr. Trolinger was the principal investigator for the space-flight program "SHIVA" (Spaceflight Holography Investigation in a Virtual Apparatus). He was awarded the George W. Goddard Award by the International Society for Optical Engineering and the Aerodynamics Measurement Technique Award by the American Institute of Aeronautics and Astronautics for outstanding contributions in aerodynamics and aero optics. Dr. Trolinger received his bachelor's degree in engineering physics from the University of Tennessee, his master's degree in physics from the Louisiana State University, and his Ph.D. in physics from the University of Tennessee.

Vern W. Weekman, Jr., NAE, received an M.S. degree in chemical engineering from the University of Michigan and B.S and Ph.D. degrees from Purdue University, also in chemical engineering. During a long career at Mobil Oil, he held a variety of leadership positions,

including manager of process research and development (R&D) from 1977 to 1980 where he was responsible for all of Mobil Oil's process R&D; president of Mobil Solar Energy Corporation from 1980 to 1985; and director of Mobil Oil's Central Research Laboratory from 1985 to 1996 where he was responsible for all of Mobil's basic and exploratory research in both the upstream and downstream areas. Dr. Weekman served the American Institute of Chemical Engineers (AIChE) as director (1989-1992) and president (1998). He was director of the Chemical Heritage Foundation from 1999 to 2003. Dr. Weekman's major awards include the following: AIChE Institute Lecturer for 1978; Distinguished Engineering Alumnus Award, Purdue, 1980; AIChE Wilhelm Award in Reaction Engineering, 1982; Amundson Award in Reaction Engineering, 2005; and he was elected to the National Academy of Engineering in 1985. He has served on chemical engineering advisory boards at 10 universities, has presented invited lectures at more than 30 universities, and is currently a member of the chemical engineering faculty at Princeton University.

J.W. (Jim) Wheeler has a diverse background in business consulting, research, strategy and planning, economic analysis, public policy, and technology programs. He joined Thomas P. Miller and Associates (TPMA) in July 2005 to head up Economic Competitiveness, Policy and Research. His primary focus has been to serve as the policy lead in the development of the Strategic Economic Development Plan for Indiana. Prior to joining TPMA, he was director of Electricore's Midwest operations, where he was charged with developing corporate-university partnerships in advanced technology development. As executive vice president for TechPoint-a merger between Indiana Technology Partnership (ITP) and Indiana Information Technology Association (INITA)-and president of ITP, Dr. Wheeler served as a leader for the statewide technology community's public policy and economic development initiatives (2002 to 2004), as well as managed special programs for information technology. In January 1997, he joined the Indianapolis office of Arthur Andersen as a senior manager to launch the Indiana Strategy, Finance and Economics Consulting practice. Accepted into the partnership in 1999, he took on the newly formed position of Central Region lead for government services. Prior to joining Arthur Andersen, Dr. Wheeler spent 19 years with the Hudson Institute, ultimately directing both international programs and defense industry research. He completed his undergraduate studies at the University of Missouri and his master's and doctoral studies at Rutgers University, all in economics. He has an extensive list of publications, is deeply involved on professional and community boards and committees, and serves as a frequent public speaker on economic, business, and public policy issues.

F. Gordon Willis is a consultant in systems engineering and design automation. From 1999 to 2004, Mr. Willis was president and CEO of VulcanWorks, a company that provided software and services for systems engineering, dramatically reducing the time and cost of product development. The company was sold to Trilogy Software in 2004. Mr. Willis retired from Ford Motor Company in 1999 after 23 years of service, during which he held a variety of positions both in computer systems and product engineering. From 1992 to 1999, these included chief engineer for automatic transmission engineering, chief engineer for vehicle engineering (Europe), and chief engineer for chassis. From 1989 to 1992, he was director of product and manufacturing systems, and prior to that held a variety of positions in powertrain control development and computer-based simulation of vehicle performance. Mr. Willis has B.S.M.E.

and M.S.M.E. degrees from MIT and an M.B.A. in operations research from the University of Michigan.

Michael Zyda is the director of the University of Southern California's (USC's) Viterbi School of Engineering's GamePipe Laboratory, a professor of engineering practice in the USC Department of Computer Science, and a staff member of USC's Information Sciences Institute, located in Marina del Ray, California. From fall 2000 to fall 2004, he was the Founding Director of the MOVES Institute, located at the Naval Postgraduate School (NPS), Monterey, California, and a professor in the Department of Computer Science at NPS as well. From 1986 until the founding of the MOVES Institute, he was the director of the NPSNET Research Group. Professor Zyda's research interests include computer graphics; large-scale, networked three-dimensional virtual environments; agent-based simulation; modeling human and organizational behavior, interactive computer-generated story, modeling, and simulation; and interactive games. He is a pioneer in the fields of computer graphics, networked virtual environments, modeling and simulation, and serious games. He holds a lifetime appointment as a National Associate of the National Academies, awarded in 2003 in recognition of "extraordinary service" to the National Academies. He is a member of the Academy of Interactive Arts and Sciences. He served as the principal investigator and development director of the "America's Army" PC game funded by the Assistant Secretary of the Army for Manpower and Reserve Affairs. He took "America's Army" from conception to more than 3 million plus registered players and thereby transformed Army recruiting. Professor Zyda received a B.A. in bioengineering from the University of California, San Diego, in La Jolla in 1976, an M.S. in computer science from the University of Massachusetts, Amherst, in 1978, and a D.Sc. in computer science from Washington University, St. Louis, Missouri, in 1984.

ATTACHMENT 2

EVALUATION CRITERIA FOR THE WCI AND RCP PROGRAMS

Evaluation Criteria for WCI Proposals (quoted from the Request for Proposals [RFP])

Only the most meritorious proposals are sought for funding. Proposals passing the administrative review will be evaluated based on the responsiveness to all the requirements of this RFP and to the evaluation criteria described in the following sections. External reviewers qualified to assess both the technical and commercialization aspects will evaluate the proposals.

Commercialization Potential

Factors to be evaluated within this area include the following.

- The proposed capital acquisition, research and associated projects have a high probability of successfully developing materials, components, systems and products within 3 years and with further commercialization potential beyond that time period
- The proposal must deal with technology based products that have existing proof of concept
- The products expected from the proposed projects will have a beneficial impact on jobs, income, and business formation or support in Ohio
- The technologies and products from the proposed projects have or will have a competitive advantage over existing and alternative technologies that can meet market needs
- The proposal clearly describes the strategies and approaches to developing and commercializing the products resulting from the research and commercialization projects
 - The proposal indicates that the Lead Applicant understands the commercialization process, resource requirements for commercialization, and resource providers
 - The proposed team has experienced personnel who will handle regulatory and approval processes that will enhance the potential for commercial benefits
 - The proposed team has a strong intellectual property management plan that provides assurance that commercialization will benefit Ohio
 - The collaborations between institutions are clear and reasonable with respect to future commercial authorities, responsibilities, and roles
 - The proposed project will lead to enabling technologies and further discoveries
 - The Lead Applicant and its collaborators must have the financial capacity to finance the commercialization of the technologies or have a plan to raise necessary capital.

Scientific Merit

Factors to be evaluated within this area include the following.

- The proposal team represents an existing, well-established program with national prominence
- The research projects represent scientific excellence to the degree of being internationally competitive and will advance scientific knowledge
- The conceptual framework, design, methods, and analyses are adequately developed, well integrated, and appropriate to the aims of the project

- The Lead Applicant acknowledges areas of potential problems and has identified alternative tactics to resolve the problems
- The proposed projects employ novel concepts, approaches or methods and describe aims that are original and innovative
- The investigators are appropriately trained and well suited to carry out this work, as are the other researchers on the project
- The collaborative effort will likely produce a synergistic effect to further enhance the outcomes of the project
- There is good evidence of strong institutional support and access to necessary resources
- The proposal provides strong evidence that the Lead Applicant can successfully recruit or otherwise involve the highest quality research and technical talent available in the defined technology focus areas of the Center.

Evaluation Criteria for RCP Proposals (quoted from the RFP)

Only the most meritorious proposals are sought for funding. Proposals passing the administrative review will be evaluated based on the responsiveness to all the requirements of this RFP and to the evaluation criteria described in the following sections. External reviewers qualified to assess both the technical and commercialization aspects will evaluate the proposals.

Commercialization Potential

The following factors will be used to evaluate the commercialization potential.

- The proposed project has a high probability of successfully developing products with commercial potential within 3 years
- The proposed projects have already achieved at least proof of principle
- The products expected from the proposed project will have a beneficial impact on jobs, income, and business formation or support in Ohio
 - The technologies and products proposed have or will have a competitive advantage over existing and alternative technologies that can meet market needs
- The proposal team has experienced personnel with commercial product development expertise
- The proposal clearly describes the strategies and approaches to commercializing the products resulting from the project
- The applicant understands the commercialization process, resource requirements for commercialization, and resource providers
- The proposed team has experienced personnel who will handle any regulatory approval processes that will enhance the potential for commercial benefits
- The proposed team has a strong intellectual property management plan that provides assurance that commercialization will benefit Ohio
- The collaborations between organizations are clear and reasonable with respect to future commercial authorities, responsibilities, and roles
- The proposed project will lead to additional enabling technologies and further discoveries
- The Lead Applicant and its collaborators have the financial capacity to finance the commercialization of the technologies or have a plan to raise necessary capital

Scientific Merit

The following factors will be used to evaluate the scientific merit.

- The proposed team already has established a prominent reputation in the fields of science involved with the proposed project
- The research project represents scientific excellence to the degree of being internationally competitive and will advance scientific knowledge
- The conceptual framework, design, methods, and analyses are adequately developed, well integrated, and appropriate to the aims of the project
- The Lead Applicant acknowledges areas of potential problems and has identified alternative tactics to resolve the problems
- The proposed project employs novel concepts, approaches or methods and describes aims that are original and innovative
- The investigators are appropriately trained and well suited to carry out this work, as are the other researchers on the project
- The collaborative effort will likely produce a synergistic effect to further enhance the outcomes of the project
- There is good evidence of strong institutional support and access to necessary resources.

ATTACHMENT 3

ASSESSMENTS OF WCI PROPOSALS OF MERIT-INTERIM

This attachment contains reviews of those Wright Centers of Innovation (WCI) proposals deemed to have the greatest merit when judged by the committee at the first meeting according to the criteria outlined in the State of Ohio's FY 2007 request for proposals (RFP). While not as strong as the top WCI proposals in the past, they were considered to be fundable and worthy of examination at the management review meeting. The proposals were sufficiently similar in overall merit so as not to justify a ranking; they are listed solely in order of their identification number.

WCI 07-003

The Wright Center for Sensor Systems Engineering: Using Innovations in Instruments, Controls, and Electronics to Enhance a Sensor's Utility

The establishment of a center is proposed to encourage and assist the commercialization of sensor technology that exists in Ohio. Six technologies have already been selected for commercialization. Four of these are considered to be ready for demonstration, while two are considered to be in the incubation stage. The center is intended ultimately to take on a very wide range of products, from smart sensors to electronics and supporting software and include a wide spectrum of applications in the fields of process control, power generation, oil and gas, food and beverages, and automotive and aerospace.

Commercialization Potential

Strengths

- The project is likely to lead to a commercial product within 3 years.
- Some of the proposed products have already met proof of principle.
- Products can have a competitive advantage and can meet market needs.
- A large number of different products could ultimately be commercialized by the center.
- The project can lead to enabling technologies and further discoveries.

Weaknesses

- The six projects are not related, and little collaboration will occur between members working on these product areas.
- Projects five and six are not well defined and do not have clear goals. Competing methods are not well addressed.
- Intellectual property is addressed only in general terms. How such intellectual property will benefit Ohio is not made clear.

Scientific Merit

Strengths

- Four of the selected products will advance scientific knowledge.
- The conceptual framework of the four demonstration projects is clear.
- Novel concepts are employed.
- The proposed investigators are well qualified to perform the work.
- A large number of university and commercial teams are brought together under a single framework.

Weaknesses

- Because a major part of the project involves specific separate products already selected, collaboration between team members will not be encouraged, which is seen as a significant disadvantage. As a result, less capability will be applied to finding and exploiting new technologies.
- Projects five and six are not well defined.

WCI 07-010

Center for Photovoltaic Innovation and Commercialization

The proposal seeks to create a science and technology platform supported by major universities, the Battelle Institute and industrial partners that will develop and commercialize second- and third-generation photovoltaic (PV) materials tailored primarily for applications in clean electricity generation. The center will expand existing research facilities in nanomaterials and thin films, attract top talent and high-growth companies to the state, incubate high-technology businesses developing advanced PV products, and assist existing Ohio PV industries in addressing customer needs.

Commercialization Potential

Strengths

- The proposal aims at scaling up a number of thin-film PV technologies. It is highly likely that some of these will be commercialized in the next 10 to 20 years.
- While it is difficult to assess the potential of Ohio's being a winner in the global competition existing in this field, this proposal will make Ohio a serious player.
- The broad approach involving universities, not-for-profits and industrial partners, if properly managed, is key to developing a strong consortium.

Scientific Merit

Strengths

- While the proposal aims at scale-up of various thin-film technologies, there is a reasonable chance that some improved technology may evolve because of the good interaction between Ohio universities.
- There is a real potential for educating students in these areas.

Weaknesses

- The method by which various projects proposed within the center will be selected for funding was not clear.
- With approximately 40 principal investigators (PIs), coordination of their activities will be vital, but the mechanism by which this will be accomplished was not explained.
- Since many universities and other state and federal laboratories are working on thin-film technologies, the proposal should have explained how the partners plan to interact with these non-Ohio activities so they do not duplicate past or present work and stay on the leading edge of current developments.

WCI 07-012

Institute for the Development and Commercialization of Advanced Sensor Technology

This proposal brings together a large number of sensor-related research projects under the umbrella organization Institute for the Development and Commercialization of Advanced Sensor Technology (IDCAST). Some six universities and several companies are participating in the proposal, creating a broad base of activities and interests in the area of sensor technology, with strong projected growth potential. The motivation for the proposal is strong and well articulated.

Commercialization Potential

Strengths

- Considerable effort has been made to create an administrative structure that encourages commercialization, including funding incentives.
- Good commercial potential in areas of remote sensing, including terahertz spectroscopy, focal plane array infrared (IR) cameras, laser detection and ranging (LADAR), wide-angle radar imaging, infrared sensing, and related software development for managing large arrays of data and automated decision-making. For example, Ohio State University already has the world's largest wireless sensor network, developed under funding from the Defense Advance Research Projects Agency.
- Activities are already underway for development of cameras that pan, tilt, and zoom, to capture high-activity areas.
- The large-format IR plane array camera is already projected to be commercialized by L3 Cincinnati Electronics.
- In the area of remote sensing, the proposal builds on an established pipeline of commercial activities; prospects for commercial success are good to excellent.

- The area of chemical and biological sensing has the potential for rapid growth, especially with the threat of terrorism through biological or chemical agents.

Weaknesses

- In chemical and biological sensing, there is not as yet a strong track record of commercialization, and there is doubt that significant commercialization can be achieved in a 3-year, or even 8-year time frame in many of the projects, or at least the case for near-term commercialization was not made in the proposal.
- While the proposal recognizes that “key metrics include sensitivity, selectivity, and stability,” there is little in the proposal to indicate that the projects have been screened for their potential, even in best-case performance, to meet minimal requirements for these metrics if commercial success is to be achieved.
- There has been little effort to assess what the requirements are for these key metrics to enter the market.
- At most, only a few of the 34 projects in chemical and biological sensing really represent strong prospects for commercialization on the short-to-medium time scale (3 to 8 years). However, the capital budget appears to be already allocated to each institution, so there does not seem to be a mechanism to filter out unpromising technologies
- The weakness of the proposal in the biological and chemical sensing area is also apparent in the small commitments made by companies working in this area, most of which are at the level of \$10,000 to \$20,000, or “in-kind.”

Scientific Merit

Strengths

- The PIs generally have strong track records of publication and some have numerous patents.
- There is significant potential scientific merit in many of the proposed projects.
- Research is proposed, including work with nanotubes, aptamers, and other materials, with significant scientific interest and potential for use in sensors.

Weaknesses

- There are too many projects in the chemical and biological sensing area that are described in very sketchy fashion, making it difficult for the committee to assess in detail their scientific merit.
- The projects appear disjointed, and while each is likely to deliver by itself, the proposed institute could realize additional gains by actively exploiting synergies among projects. For example, the proposal mentions the benefits of combining multiple modalities, but it was not clear how this would be done.

ATTACHMENT 4

ASSESSMENTS OF RCP PROPOSALS OF MERIT-INTERIM

This attachment contains reviews of those Research Commercialization Program (RCP) proposals deemed to have the greatest merit when judged at the first committee meeting according to the criteria outlined in the State of Ohio's FY 2007 request for proposals (RFP). The proposals are ranked in order of decreasing merit except where a tie is noted.

RCP 07-015

Commercialization of Functional Polyimide Films and Nanocomposites

This proposal brings together a consortium of key companies and universities across Ohio focused on the commercialization of functional polyimide films and nanocomposites. The team is led by the Center for Multifunctional Polymer Nanomaterials and Devices (CMPND) at the University of Akron, and each of the five thrust areas is led by a key private company. This is a technology area with great growth potential, and it leverages both academic and industry resources in Ohio. The five thrust areas focus on quite different application areas and are at somewhat different stages of maturity, but all rely on enabling technologies developed at the University of Dayton Research Institute (nanofiber dispersion technology) and the University of Akron (film casting system). These breakthroughs offer the potential to create an Ohio-based polyimide technology platform supporting a high-growth, high-value academic-industry cluster.

Commercialization Potential

Strengths

- A clear case for why Ohio is presented: a strong academic base and an extensive small and large private-company base.
- The economic impacts on Ohio from investing in this project are clearly analyzed.
- Strong private-company participation is evident in the leadership roles and matching contributions as well as the defined responsibilities in areas that specifically leverage each firm's competitive advantage and the role it plays in the cluster supply chain.
- Thrust areas have clear short- and long-term commercialization objectives with well-defined plans to proceed once funded.
- Each thrust area identifies and often includes as collaborators customers for near-term products.
- A good case is presented for this becoming a platform technology, upon which multiple technologies and products will be developed over time.
- The approach to manage intellectual property is well articulated.

Weaknesses

- The project is very complex
- The management plan is outlined but needs more clarity and definition for managing the inevitable tensions and conflicts that will emerge as these initiatives move into commercialization.
- The proposal notes but does not clearly address the array of issues involved in the formation of new companies as part of the commercialization plans.

Scientific Merit

Strengths

- A strong team has been assembled which leverages both academic and industry expertise.
- The proposal is focused on solving key technical issues, leveraging breakthrough advances developed by Ohio institutions.
- Each thrust area has a clear, well articulated plan to address the key technical issues required to move both current and next-generation polyimide materials toward commercialization, in the context of emerging material and process technologies.

Weaknesses

- The degree of seriousness of key scientific risks is not well articulated.
- More clarity is needed in the management of the process of discovery as responsibility moves among responsible parties in each thrust area.

RCP 07-109

New Roll Technologies to Commercialize High-Quality, Low-Cost Steel

The steel production industry, both integrated plants and the more recently introduced mini mills, constitute a major employer in the State of Ohio. This is an industry in steep decline mainly due to outside forces, an uneven playing field created by Asian government-supported plants and their lack of environmental requirements coupled with a reluctance of indigenous producers to employ modern production techniques. Mittal Steel, the owner/operator of an integrated steel mill in Cleveland, Ohio, in collaboration with Wright State University, The Ohio State University, and Deformation Control Technology, Inc., proposes to develop a software and monitoring system to optimize the incorporation of High Speed Steel (HSS) rolls and Continuously Poured Clad (CPC) rolls now employed in modern Asian plants into U.S. plants. The utilization of these improved hot roll devices is critical to meeting the high-quality steel properties demanded by the automotive industry, which has a large presence in Ohio. The optimization afforded by the proposed efforts should result in reduced unplanned outages, thus greatly improving plant efficiency. This improvement in efficiency is critical in creating a competitive advantage for U.S. and Ohio sheet steel producers that will

staunch the flow of imported steel and result in state job retention while paving the way toward potential significant employment increases.

Commercialization Potential

Strengths

- The commercialization potential for this product is high and focused. There is a well-defined target market and a clearly defined need within that market.
- The product will provide further incentive for Ohio steel producers to invest in the latest hot roll production technologies, giving them a market competitive advantage which should result in stemming the loss of steel industry jobs in the state and holds the potential to reverse the tide.
- An excellent collaborative team is proposed, including significant industry participation and investment. University participation and independent-company support will ensure distribution of the product to all relevant Ohio steel producers.

Scientific Merit

Strengths

- This clearly focused project relies on a combination of proven finite element analysis, statistical probabilities, metallurgy and experimental in-process data.
- It is expected that product optimization will continue beyond the initial release as production data become available.
- The results of this work are fully expected to improve the efficiency of hot rolled sheet steel production and product quality using modern techniques and equipment.

Weakness

- A concern exists for maintenance of proprietary rights within the State of Ohio and the United States.

Comment: Attention should be paid to the U.S. government's International Traffic in Arms Regulations (ITAR) with respect to software export abroad, as Mittal is headquartered in The Netherlands.

RCP 07-081

Commercialization of Low-Temperature Carburization

This project, led by the Swagelok Company, discusses a low-temperature technique for carburizing metals. The process is called low-temperature colossal supersaturation (LTCSS) and was originally developed by Swagelok for manufacturing pipe fittings. It has been used successfully for 6 years, and now they want to

commercialize the process and expand it for use on other metals such as Ni-based and Ti-based alloys. Most of the capital cost requested is for scale-up of manufacturing to meet market demand. The partner institution is Case Western Reserve University's Department of Materials Science and Engineering. Collaboration between Swagelok and Case has existed for more than 6 years in work related to the proposed project.

Commercialization Potential

Strengths

- The approach for commercialization is well planned, with Swagelok proposing to set up a separate business within Swagelok to run the commercialization of LTCSS.
- Based on the background of the personnel involved, there appears to be a good mix of both technical and business expertise for commercialization.
- The potential applications and markets range from bearings and heat exchangers to aircraft engines and medical implants, which is promising for commercialization. The principal investigators (PIs) say that they have been contacted by companies in each of these industries for the use of LTCSS.

Weaknesses

- It is not clear who will own the intellectual property. Swagelok currently owns the patent for the LTCSS process; however, there is no plan of ownership provided for any new discoveries that may develop.
- The competitor analysis provided is very weak.
- It is not clear how the market-capture estimates were calculated.

Scientific Merit

Strengths

- The LTCSS process can improve the corrosion resistance and wear resistance of metal components currently used in applications in which corrosion resistance and/or wear resistance is critical to the integrity of the component.
- One of the major advantages of the LTCSS process is that it can provide both improved corrosion resistance and wear resistance in a single application, whereas it usually takes at least one process (e.g., coating or plating) to obtain improved corrosion resistance and a different process (e.g., shot-peening) for improving surface or wear resistance.

Weakness

- The PIs acknowledge that they are aware of a process called "Kolsterizing", which provides similar benefits to those of LTCSS. The PIs state that their

process, LTCSS, is superior to the Kolsterizing process, but they provide no supporting scientific evidence.

RCP 07-039

Development and Commercialization of Graphite Nanocomposites for the Next Generation of Electronic Devices

The objective of this proposed program is to create and commercialize the next generation of thermal management solutions of the consumer electronics industry. The focus of the proposed effort is the barrier of thermal conductivity. Current graphite-based materials are limited to about 500 W/mK, but conductivities >1000 W/mK at comparable weight and cost are needed. The approach is to create bulk materials using nanoparticles such as single-wall nanotubes (which may have conductivities as high as 6,000 W/mK) to formulate and manufacture composite materials that have the desired bulk properties.

Commercialization Potential

Strengths

- Target markets have been well identified and characterized.
- The primary company, GrafTech, has a well-established global leadership position in the technical field and a well-established market position in graphite materials. It is well positioned to bring the proposed products to the market place in the United States and abroad.
- The products proposed, if successful in development, will have a clear edge in the projected market.
- Risk has been identified, and management of that risk has been addressed.
- Projected payoff to the State of Ohio has been clearly identified.
- A significant investment of \$30 million in the program has been promised by GrafTech.

Weaknesses

- Project management and communication strategies are not well defined. There is a large group of investigators, which will present challenges for management and project selection.
- Monthly conference calls and the use of e-mail are good mechanisms to enhance communication with a large group of persons at various locations; process and metrics need more definition for effective management.
- Scale-up, as a plan for commercialization, was not clearly defined.

Scientific Merit

Strengths

- The project proposes a real solution to an important problem involving thermal management in future electronic systems. The company is an established leader in state-of-the-art technology for this purpose and has a strong science base to bring to this program.
- A clear statement of technical needs has been made, and a reasonable plan has been constructed to overcome barriers.
- Partners with suitable expertise have been assembled to address the tasks defined by the needs and barriers of the project. Deliverables have been identified for each of the partners.

Weaknesses

- While a clear plan for the technical approach has been outlined, there is a lack of hard evidence that the approach will in fact solve the technical problems at a competitive level.
- While a good discussion of the characterization and measurement methods for the proposed materials was presented, there are some uncertainties in important methods such as the measurement of the thermal conductivity of films.

RCP 07-016

Commercialization of High-Performance Nanotailored Structural Composites for Energy and Survivability Applications

This proposal from the Center for Multifunctional Polymer Nanomaterials and Devices (CMPND)-the project brings together Ohio State University and the University of Dayton Research Institute, with collaborative efforts with both small and large companies-is directed at nanotailored structural composites. A litany of projects is proposed, directed at the incorporation of new composite materials systems into emerging energy and survivability applications. This proposal is well written and addresses the information requested by the RFP. The proposal effectively describes the relevance of the composite technology to the State of Ohio and presents a strong case for the commercial and scientific benefits to the Ohio. It should be noted that this center has already been funded by the State of Ohio.

Commercial Potential

Strengths

- The technology base is relevant to Ohio, the industry base exists in Ohio, and the technology is in a growth area with considerable strength in Ohio as well as in the United States.
- This proposal involves a strong collaborative effort of Ohio-based academic institutions and small and large companies, with the theme of nanotailored composites.

- The proposal weaves new products and concepts from the partners into potentially synergistic commercial offerings.
- The commercial merit of nanofiber reinforced matrices of advanced composites is (although not a new idea) a concept that has not been properly evaluated; it offers the potential for a significant improvement in advanced composites with commercial implications. The subject of advanced composite materials continues to be viewed as an emerging technology area with good growth potential after several decades of commercial activity.
- The survivability applications are largely military-directed and funding from the military branches of the federal government would be suggested to support at least part of this effort.

Weakness

- While the carbon nanofiber investigation is realistic, the economics were not discussed in detail and may not be viable on some of the more cost-sensitive applications (e.g., transportation markets).

Scientific Merit

Strengths

- This proposal makes use of the technology base existing in Ohio and the industries that can benefit from advanced composite development.
- The concept of nanofiber reinforcement of advanced composite matrices is not new, but it has not been properly addressed. This proposal offers the possibility of developing advanced composites based on this concept and should offer a new route to further increasing the cost/performance benefit of composite systems.
- The application to larger blades for wind power systems is worthy of new materials and systems investigations. The high-strength fiberglass approach is worthy of support but should also include carbon fiber systems at least in hybrid combinations, as it is questionable how far fiberglass systems can be extended in this application.

Weakness

- The proposal is highly “nano”-technology based. There are specific situations in which nanoscale dimension reinforcement is useful. However, the proposal has not properly defined the “nano”-effect benefits expected over classical continuum mechanics.

RCP 07-086

Technologies for the Next Generation Military and Commercial Propulsion, the Reliable Intelligent/Variable Cycle Engine

The Ohio Center for Advanced Propulsion and Power proposes to address the evolving requirements of both military and civil aviation propulsion systems. The Center is led by Ohio State University and includes seven other Ohio universities and six industrial partners comprising GE Aviation and five Ohio-based component companies. Specifically the program addresses technologies to produce reduced fuel burned, increased speed, more time on station, increased electric power, reduced environmental impact and improved engine reliability. The program addresses not only the generation of propulsion technology but also targets the creation of a highly skilled workforce for Ohio, technology transfer to local industry, and spin-offs to other industries.

Commercialization Potential

Strengths

- The committee believes that individual pieces of the component will reach a sufficient level of maturity to permit them to be transitioned to product within 3 years and to provide the desired effect of creating jobs in Ohio.
- The team has the requisite skills and talents to transition technologies rapidly to the marketplace through the component manufacturers involved in the program.
- The commercialization plan submitted is expansive and provides a realistic view of the transition to propulsion products.
- The goals of the program provide significant competitive advantage over existing products in the marketplace and, as shown in the proposal's charts, have the potential of creating new jobs.
- The technology produced in the proposed program has significant potential to be used in other industries such as the energy business and in other precision products.

Weakness

- The committee questioned whether the entirety of the technologies targeted in this proposal will reach a sufficient level of maturity to permit them to be transitioned to product within the 3 years specified in the RFP.

Scientific Merit

Strengths

- The committee recognized that the team assembled by Ohio State University has an excellent reputation as industry or subject-matter experts and leaders. They have demonstrated this capability both in the competitive marketplace and in their performance of previous R&D programs, including WCI grant programs.
- The reputation of the propulsion activities at Ohio State University and the close working relationship with GE Aviation and the other industry partners

have created a framework for the recruitment and retention of the highest-quality research and technical talent in the propulsion industry.

- The proposed program appears to be well laid out and includes both methods development and proof-of-concept demonstrations that will accelerate the introduction of the technologies into service. This approach of analytical and experimental work addresses the issues of understanding the challenges that are currently envisioned and those that will arise during the technology-development stages.
- The ability of the team to reach out to the academic strength within the combined universities and industry partners and to build on the technologies and capabilities generated in prior WCI programs was considered a strength of the proposal. The prior experience of the team in implementing similar technologies was due to their prior performance on WCI grants.

Weaknesses

- The technical approach to transition the technology into existing products through proof-of-concept or demonstration testing is not clearly defined.

RCP 07-040

Judged To Be of Equal Merit with RCP 07-098

Commercialization of High-Performance Multifunctional Composite Structures Using Ohio's Advanced Polymer and Nanotechnology

The objectives of this proposal are to accelerate the time-to-market of high-performance, application-specific composite structures derived from carbon foam and to establish an Ohio-based supply chain to support a carbon foam platform from the manufacture of foam raw material to the assembly of finished composite panels.

Commercialization Potential

Strengths

- The proposed project has a high probability of successfully developing products with commercial potential within 3 years, as the partners and collaborators are well positioned in the marketplace.
- The proposed projects have already achieved at least proof of principle.
- The products expected from the proposed project will have a beneficial impact on jobs, income, and business formation in Ohio.
- The technologies and products proposed have or will have a competitive advantage over existing and alternative technologies that can meet market needs.
- The proposal team has experienced personnel with commercial product-development expertise.
- The proposal clearly describes the strategies and approaches to commercializing the products resulting from the project.

- The applicant understands the commercialization process, resource requirements for commercialization, and resource providers.
- The proposed team has experienced personnel at the Center for Multifunctional Polymer Nanomaterials and Devices who should be able to handle any regulatory approval processes and who enhance the potential for commercial benefits.
- The collaborations between organizations are clear and reasonable with respect to future commercial authorities, responsibilities, and roles.
- The proposed project will lead to additional enabling technologies and further discoveries.
- The lead applicant and its collaborators have the financial capacity to finance the commercialization of the technologies or have a plan to raise necessary capital.

Weaknesses

- Carbon foam has been explored for possible applications for many years. It is not entirely clear what breakthroughs might have taken place recently to make this material much more attractive than it has been in the past. This clouds somewhat the otherwise good case made for the utility of carbon foams in a variety of applications.
- The proposal does not discuss intellectual property matters such as whether or not the process has U.S. patent protection.
- With the large number of partners, monthly coordination conference calls seem insufficient.

Scientific Merit

Strengths

- The proposed team already has established a prominent reputation in the fields of science involved with the proposed project.
- The research project represents scientific excellence to the degree of being internationally competitive and will advance scientific knowledge.
- The conceptual framework, design, methods, and analyses are adequately developed, well integrated, and appropriate to the aims of the project.
- The lead applicant acknowledges areas of potential problems and has identified alternative tactics to resolve the problems.
- The investigators are appropriately trained and well suited to carry out this work, as are the other researchers on the project.
- The collaborative effort will likely produce a synergistic effect to further enhance the outcomes of the project.
- There is good evidence of strong institutional support and access to necessary resources.

Weaknesses

- It is not clear that the proposed project employs novel concepts, approaches, or methods and describes aims that are original and innovative.
- The proposal did not explain whether or not the brittleness of carbon foam will be a limiting factor in the commercialization; for example, would the battery application be affected by brittleness?
- The proposal did not discuss if extreme temperatures will be a challenge for the carbon foam in any applications.

RCP 07-098

Judged To Be of Equal Merit with RCP 07-040

Multifunctional Carbon Materials for Energy and Thermal Management Applications

This project addresses the scaling up of carbon-based materials developed by the University of Dayton to be used in energy and thermal management applications. The project foresees synergistic opportunities for multifunctional materials, since common equipment and procedures can be used for a wide variety of carbon material forms. The thermal management applications will be for ultrahigh performance heat sinks and high-temperature conductive polymers. These products would be used in military applications, electronics, medical devices, and high-output energy devices. The energy applications will focus on fuel cell electrodes, “ultra” super-capacitors, electromagnetic interference shielding and material for Direct Carbon Fuel Cells. The market for these products would include fuel cell manufacturers, battery applications, and electronics and telecom industries.

Commercialization Potential

Strengths

- The primary strength is a combination of carbon-based materials offering promise for emerging energy-related markets.
- Out of a litany of emerging applications in which advanced carbon materials could be utilized, the nanofluid coolant and heat-sink systems appear most promising for support.
- The proposal is well written and describes the technology clearly.
- A cross-functional team involving the University of Dayton, the Air Force Research Laboratory (AFRL), the Edison Institute and the University of Miami and a collection of small start-up companies has been established.

Weaknesses

- Many of the markets suggested for carbon nanotube utility are cost sensitive and cannot tolerate the expense of these materials.

- The main carbon player in Ohio is Graftech, which has considerable experience in commercializing carbon products; a linkage with Graftech would strengthen this proposal.
- The proposal does not have a well-developed path to market.

Scientific Merit

Strengths

- The choice of carbon-based topics is relevant for emerging technologies and worthy of scientific investigation.
- The proposal introduces novel concepts for advanced carbon materials that may lead to new technological innovations and intellectual property.
- The University of Dayton's fundamental expertise in carbon-based materials will provide the research base for the many applications proposed. This expertise will be augmented by the inclusion of the AFRL, the University of Miami, and the Edison Institute.

Weaknesses

- So many topics are proposed that the proposal lacks a certain focus; this lack of focus could dilute the applicant's ability to solve the technology challenges properly.
- Applications noted are emerging high-technology, high-risk carbon-based approaches.

RCP 07-048

Flexible Liquid Crystals Film Manufacturing Alliance

This proposal brings together an alliance among four manufacturers and suppliers and two research universities as the core of a permanent Ohio-based cluster focused on flexible liquid crystal films. Flexible liquid-crystal film has potentially disruptive impacts on products and markets. The potential size of this marketplace is enormous, and a strong case was made that with targeted investment, Ohio firms and universities can maintain and extend current technical leadership and capture a high-value commercial niche in the marketplace. The proposal intends to leverage the early technical and market lead of Ohio-based firms (first in the world to produce and sell liquid-crystal displays (LCDs) and visors on flexible substrates), to refine manufacturing processes and build an Ohio-based industry cluster that can capture this emerging explosive market. The core strategy is based on developing the production technologies and processes that will permit efficient and high-quality printing of displays at high volumes on flexible substrates using roll-to-roll manufacturing techniques.

Commercialization Potential

Strengths

- This is a good case for why Ohio—a strong academic base and a core of private companies with a current competitive edge.
- This is a large potential market, if production and technical issues can be resolved. If the flexible liquid-crystal film technology cannot be developed, the LCD approach taken here could become a competitive system.
- The firms involved have good existing relationships with early-product customers, i.e., those ready to buy if requirements are met.
- The proposal provides a good, if too general, discussion of the economic impacts on Ohio from investing in this project.
- Strong private-company leadership is present, and clear responsibilities are cited in areas that specifically leverage each firm’s competitive advantage
- Clear near-term commercialization objectives with well-defined plans to proceed once funded are noted
- There is a good case for becoming a strong base upon which multiple products will be developed over time.

Weaknesses

- This is a very competitive marketplace; however, the proposal has a weak competitor analysis.
- The proposal presents an uneven discussion of business risks. In particular, it did not address how the firms were going to deal with the large foreign companies that dominate this marketplace. To be successful, this team must have, or have a strategy to develop, a pipeline to these companies (e.g., Sony, Samsung, Philips, and so on.).
- The management plan is outlined, but it needs more clarity and definition for managing the inevitable tensions and conflicts that will emerge as these initiatives move into commercialization in two very different product and customer bases.
- The only possible significant weakness relates to intellectual property plans, which are not well developed.
- It is important to address how a significant share of the value potential of the technical advances in Ohio can be captured by Ohio firms and citizens. A discussion of an economic development strategy to build an Ohio industry cluster is provided, but no clear plans or strategies to accomplish to accomplish it are offered.

Scientific Merit

Strengths

- A strong team, leveraging both academic and industry expertise, is evident.
- Researchers at Kent State have an excellent record of accomplishment for developing technology on LCDs and creating new technology.
- The proposal is focused on solving key technical issues.

- A clear, well-articulated identification of technical risks, and plans to address those risks, are made.
- A compelling case is presented for investing in flexible displays and their potential to put Ohio and the United States back in the liquid crystal game, now Asian-dominated, is made.

Weaknesses

- The degree of seriousness of key technical risks needs more clarity and some responses are vague (e.g. (p. 20 of the proposal) risk: poor bonds to fabricated displays–mitigation: attraction of ACF (anisotropic conductive film) manufacturers to region)
- The proposal did not address certain technical concerns of the committee:
 - The problem of dealing with compressive stress (e.g., squeeze-out of liquid crystal that might occur when a flexible LCD is bent).
 - PEDOT (poly[3,4-ethylenedioxythiophene]) proposed for the transparent electrode is not conductive enough.

RCP 07-018

High-Speed Advanced Pultrusion of Hollow, Thin-Walled Close Tolerance Composite Profiles

The proposal seeks to refine the manufacturing of fiberglass reinforced plastic (FRP) products for the fenestration industry (windows, doors, sunrooms) utilizing a pultrusion process. Comfort Line, Ltd., has done extensive R&D to improve the current state of the art in pultrusion of hollow, thin-walled, close-tolerance FRP profiles for window, door and sunroom frames. Comfort Line needs more R&D on these products and processes to further develop the product, process, and coatings for the purpose of taking costs out of the product, which will increase market share and thus production.

Commercialization Potential

Strengths

- As this company is currently producing this type of product and is collaborating with a major manufacturer of windows (Owens Corning), there is a high degree of commercialization potential. The volume of product produced is greatly dependent on the elimination of costs, which is the primary purpose of this proposal.
- The strengths of the commercialization potential are that the company is already in this space and has customers willing to purchase and market the end product. There is a well-identified market need for FRP fenestration materials, which was clearly explained in the proposal.
- The company is already producing FRP fenestration materials and has a proof of concept. The team has experienced personnel.

- One of the main strengths of this proposal is the high degree of collaboration with university and research partners and end users. It was apparent that the synergies would lead to further discoveries.

Weakness

- The weakness depends on the ability of the company to improve the product and processes enough to reduce the costs so that the product is more in line with other fenestration products (aluminum and vinyl). The company delineated many product and process shortcomings, and it is unclear if the program will be able to resolve these difficulties. While progress should be made toward Comfort Line's goal, the question is, will it be enough?

Scientific Merit

Strengths

- The strength of this proposal is that the company has established a reputation in the fields of science involved with the proposed project.
- The applicant has identified many problems with the product, process, and coatings that must be overcome and it has a plan to tackle them. It has confidence that the use of finite-element analysis, fluid-flow dynamics and other advanced product development and manufacturing tools will enable the company to achieve its very ambitious goals.
- The collaborative effort will likely produce a synergistic effect to further enhance the outcomes of this project and the technology for the State of Ohio.

Weaknesses

- The weaknesses of this proposal are also some of its strengths. However, with the current state of the product and process, it is unclear that the company will be able to achieve its ambitious goals. Yet with the application of the tools and methods outlined, there should be significant improvements in the product and process.
- It is not clear what the impact on market penetration, jobs, and economic development would be if the applicant is only able to achieve 50 percent of its goals.

RCP 07-088

Advanced Materials Technology Platform for Sustainable Lawn and Garden Products

This project is primarily aimed at accelerating the development of organic and naturally derived lawn and garden materials to support Scotts' conversion of its products from the present petroleum base to 50 percent natural-based. Two-high volume proprietary products are in the pipeline for introduction in 2008/2009. Scotts have

assembled a team of technology and ingredient suppliers, commercial manufacturing partners, and academic and not-for-profit organizations to accelerate its entry, and, more importantly, to develop an advanced materials platform and enabling technologies for sustainable lawn and garden products.

Commercialization Potential

Strengths

- Scotts is committed to achieving 50 percent of its product line based upon organic/natural ingredients as a long term goal. Thus, efficacious products developed within this project would be readily commercialized.
- The needed resources are defined and available.
- The products and concepts presented in this proposal are appealing and could have a favorable environmental and economic impact, including job growth.

Weaknesses

- The committee noted that the lead organization (Scotts) would control the technology and intellectual property developed, and while potentially growing this Ohio-based company with an attendant increase in jobs, this project may not necessarily result in large benefits to the State of Ohio.
- A large share of the project may be viewed as technical support to the lead organization's marketing.
- The longer-term products alluded to, though meritorious, would benefit primarily the lead organization.
- The discussion on the pace at which the market for environmentally "green" products will grow is vague.

Scientific Merit

Strengths

- The committee agrees that the research proposed is meritorious and has long - term impact potential in an important area.
- The planned approach is laudable, a general plan is proposed and a diverse collaboration with appropriate scientific and technical resources to move the technology to commercialization by the lead organization is shown.
- Some outstanding scientific advisers have been retained.

Weakness

- The plan contains little detail regarding what will be done, and over what time period, apart from a listing of "key building blocks" needed for product development.

ATTACHMENT 5

ASSESSMENTS OF REMAINING WCI AND RCP PROPOSALS CONSIDERED - INTERIM

The following Wright Centers of Innovation (WCI) and Research Commercialization Program (RCP) proposals were deemed by the committee to have less merit than those reviewed in Attachments 3 and 4. These proposals are ordered according to the State of Ohio's proposal identification number. Thus, no significance should be attached to the order in which they appear below.

WCI 07-001 AVETeC Center for Condition-Based Maintenance

Advanced Virtual Engine Test Cell, Inc. (AVETeC) proposes to develop methodology and software tools to improve engine health maintenance for aircraft turbine engines and reduce operating costs for the U.S. military and for civil airlines. The proposal addressed information management for improved maintenance decision making, improved maintenance predictability and productivity, and mission availability. The approach included design tool and feedback mechanisms that would provide corrective action from lessons learned in the maintenance process. The center plans that the methodology and software tools developed would be commercialized by companies such as GE Aviation.

Commercialization Potential

Strengths

- The committee finds that the proposal addresses a critical need and that the field and concept being addressed represent a commercially viable and active area to pursue.
- The center as proposed has a reasonable probability of producing products with commercial potential within 3 years.
- The team that AVETeC proposes to conduct the program has adequate technical experience and background.
- The committee recognized that the project has the ability to generate additional enabling technologies that could lead to additional commercial opportunities.

Weaknesses

- It was not clear whether the proposed tools and the linkages of the tools into a comprehensive suite of tools were sufficiently innovative to be competitive in this active market.

- Job creation as outlined and quantified in the proposal appeared to be modest compared to the size of the investment. It was noted that these jobs were highly skilled and well paying and represented a significant payroll level.
- There were few details on the needed resources to perform a comprehensive commercialization activity to develop the desired job creation.
- The committee did not find a comprehensive intellectual property management plan that would protect the investment for the State of Ohio. While the investment in computing systems may ensure that the initial work will be carried out in Ohio, it was thought that the majority of job creation would be at the traditional centers of engine maintenance.

Scientific Merit

Strengths:

- The team assembled by AVETeC appears to be experienced and capable of performing the technical tasks proposed.
- The State of Ohio has a rich heritage of research and educational universities, and the inclusion of the University of Dayton Research Institute in the program was considered to be a positive aspect.

Weaknesses

- The committee found the lack of participation of other potential contributors in the field from other universities to be a weakness. Other WCIs in the area of data management were not mentioned.
- It was not clear how involved some of the outside collaborators would be in the performance of the tasks, nor how these would be managed.
- It was not clear that the proposed program contained a high level of innovation. It recognized the large scale of the task of linking and integrating the data systems but could not identify specific innovative techniques that would provide differentiation of the proposed system in the market place.
- The committee questioned the requirement for the level of computing requested, since the size of the data to be handled was never quantified. The proposal contained block diagrams of the process, but these were at a very fundamental level and not consistent with the degree of difficulty described for the overall task.

RCP-07-001

Class “A” Structural Thermoplastic Composite Parts

The subject proposal is directed at expanding the commercial utility of two new film products (ClarixTM and InvisionTM) into the automotive and related application areas. The proposal is seeking support for scale-up of this technology for larger parts with an expansion underway at Findlay, Ohio. The collaborative effort involves the North Central Campus for Emerging Technology (NCC-ET) for long fiber thermoplastic

composites systems. The key technology noted is the ability to achieve Class “A” surfaces on thermoplastic parts with economic and/or environmental advantages over the state-of-the-art paint processes.

Commercialization Potential

Strengths

- The applicant, A. Schulman, Inc., is well known in the polymer industry. This company, involved with polymer compounding, polymer blends, and polymer formulation for decades, has continually upgraded its technology, leading to products in more-demanding polymer applications.
- The weaknesses of existing painting techniques present a clear case in favor of the proposed process.
- The commercial potential is high.

Weaknesses

- The product is available and is already in test-marketing and developmental and commercial activity with the potential customer base. The scale-up of the Invision™ sheet does not meet the RFP criteria as well as other proposals reviewed, because the main focus appears to be beyond what the State of Ohio defines as the “Demonstrating Stage”.
- There is no evidence that the proposed project will lead to additional enabling technologies and further discoveries.

Comment: The commercial success will be highly dependant on the quality of the marketing effort.

Scientific Merit

Weakness

- The scientific (technological) merit of the proposal is less well defined. The firm has developed a commercially viable technology and is requesting funds for the development of adhesive systems and higher-temperature thermoplastic sheets for automotive panels and nonautomotive applications requiring class “A” surfaces. The proposal did not properly define the scientific studies needing to be conducted to address these issues successfully.

RCP 07-21

Field Programmable Devices for Network Traffic Management

The proposal submitted by the Wright Center of Innovation for Advanced Data Management and Analysis (daytaOhio) is to establish an engineering facility in Ohio to produce computer hardware and software for network traffic management, including

traffic generation, reporting, filtering, and shaping. A detailed engineering plan and staffing list accompany the proposal.

Commercialization Potential

Strengths

- Deep scanning of network packet traffic is of great commercial interest. With such a capability for example, quality of service can be provided by differentiating packet streams and prioritizing those streams in real time.
- Inappropriate network traffic can be detected and eliminated in real time with such hardware. Current software-only solutions cannot perform such operations in time scales of any operational interest.

Weakness

- The downside of this work is that it has great intelligence potential, and hence great potential for misuse. The authors of this proposal need to address the ethical uses of what they propose as part of their work plan. If one discounts such ethical issues, then there is great commercial potential.

Scientific Merit

Strength

- The engineering plan to carry out the work in the proposal looks like a straightforward commercialization of intellectual property created by Washington University, St. Louis.

Weaknesses

- Scientists at Washington University, on whose work this proposal is constructed, are not part of this effort so there is a worry about whether there is the possibility of sustained and continued work in this area without the developing brain trust. These Washington University scientists need to be integrated into this effort, or the State of Ohio needs to generate such a networking research group at one of its top universities.
- It appears that the product features will be driven by market research (which has not yet been done). If the technical team that developed the original technology is not part of this proposal, it is not clear how daytaOhio will deliver on the product features.
- Because there is little background information on the technical experts who will be involved, the committee could not determine if they have the talent to provide a solution to all the technical problems listed in the proposal- specifically the intrusion detection.

RCP 07-045
High Impact Resistance Technology

The objective of this proposed program is to build a strong foundation of impact resistance technology, to develop armor for Army tactical vehicles, to develop multi-purpose sports helmets, and to build a unified approach to impact-resistance engineering.

Commercialization Potential

Strengths

- Two clear technology gaps were clearly identified and characterized. The market need for products that address those technology gaps was clearly defined.
- An existing client (U.S. Army) was clearly identified as a driver for the armor commercialization plan and for the supporting technology effort. The team understands the government procurement processes and is currently working with key customers.
- Potential clients for the multipurpose sports helmet were identified.
- Product readiness was addressed for both proposed product types.
- Steps to market were clearly identified with team members and resources.
- Team members have a presence in the markets identified and a record of success.

Weaknesses

- The analysis of potential competitors was weak.
- The market penetration strategy for new helmet types is questionable.
- The intellectual property strategy seems poorly defined.
- The impact of this project on the State of Ohio was somewhat nebulous.
- The proposed commonality of the science and technology as a driver (and glue) for the general commercialization plan is not soundly founded.

Scientific Merit

Strengths

- Technical needs were clearly identified for both armor and helmets.
- The technical approach was specifically based on projected product functional needs. This is especially effective for the case of the low-impact-attenuation-device task.
- The experience of the team members in the technology involved is sound.

Weaknesses

- The diversity of the products proposed is actually small compared with the diversity of the science and engineering needed to address the issues they involve. While there are some examples of the statement that “the principles for designing a helmet and armor share several features,” the differences are overwhelming. Even material behavior under ballistic loading can be much different from behavior at blast rates of loading, and dramatically different from loading rates associated with sports impacts. These are technical apples, oranges, and grapes, or worse.
- The authors speak of using modeling tools such as ANSYS and Autodyne to “allow rapid convergence to a preferred design.” But the origin of the constitutive relationships needed in any such analysis (as a function of strain rate and temperature) was not cited. It may be adequate for ballistic armor to see if the projectile produces a hole, but for blast effects the structural response must be considered. And for helmets, a rather precise knowledge of material’s behavior is needed to get the correct accelerations of the wearer, which defines the damage to the subject. These issues were not addressed.
- What will the “foundation of impact technology” consist of? Will there be codes that are shared by the team members that enable future products to be designed? Will all of the analysis be done with commercial codes? Will nonlinear (geometric and material) behavior be considered? These questions were not answered, and the committee deemed them to be very important.

RCP 07-051

Nano-Enabled Energy Storage Materials and Components

The objective of this proposal is to commercialize nanoscale materials for applications in batteries and ultracapacitors. The proposal is focused on commercialization of existing technologies and on developing new technologies. Three products are expected to be in the commercial marketplace by the end of the 3-year project. A new manufacturing company would be formed in central Ohio in 2007 to manufacture nanomaterials under this project.

Commercialization Potential

Strengths

- The proposal offers a technology that has a high probability of at least some commercial potential in the next 3 years.
- The proposal offers a platform technology, and the project could lead to future additional enabling materials.
- Investment capital of \$4 million has been pledged through investors in NanoDynamics, the parent organization of the applicant, and access to additional capital may be possible.
- The applicant has a good intellectual property position and a reasonable plan for managing its intellectual property.

Weaknesses

- The technology faces strong competition in the marketplace, as many other companies are pursuing similar approaches and applications. While some degree of market penetration can be expected, it is not clear that there will be sufficient penetration to justify a manufacturing plant of the scale proposed.
- The proposal provides only very limited information on the capability and demonstrated corporate experience of the lead applicant in commercializing new technologies.

Scientific Merit

Strengths

- The proposal provides a good team of technical researchers who are well suited for the proposed activities. The technical team is based on good collaboration with three universities (Ohio, Ohio State, Dayton) and with energy storage companies (Ultralife, Cymbet).
- The applicant has performed well under a previous Ohio Department of Development grant.

Weaknesses

- The project aims are neither innovative nor original, as there are many other companies and research institutions pursuing the same or similar development.
- The proposal could have been strengthened with the addition of the strong electrochemical materials capability at Case Western Reserve University.

RCP 07-057

Nanostructured Supercapacitor Energy Storage

The objective of this project is to develop and commercialize an electrochemical capacitor technology (PowerCap) using nanostructured materials and a nonsymmetrical electrode design approach. Key design goals are to double the energy stored per weight and to significantly reduce the manufacturing costs.

Commercialization Potential

Strength

- There is a high probability of having a commercially ready product at the end of the proposed 3-year project.

Weaknesses

- The proposal is led by a nonprofit organization, the National Aeronautics and Space Administration (NASA). While NASA has a strong technology-transfer experience, it nonetheless does not have the same incentives for commercialization as a for-profit organization; the proposal would be strengthened with a for-profit lead. Furthermore, the lead applicant, while based in Ohio, has headquarters in Washington, D.C.
- The source of follow-on investment to carry technology improvements to market is not adequately identified.
- The proposal indicates that a manufacturing facility will be built at a yet-to-be-determined site, but there is no convincing evidence that it would be built in Ohio. Two Ohio battery facilities are reported to have expressed some interest, but there is no letter of support from either. One of these already has available existing facilities located out of state.
- There is considerable uncertainty regarding intellectual property issues and potential patent infringement; additional due diligence should be performed to confirm that there would be no potential legal liabilities.

Scientific Merit

Strengths

- The lead technical consultant for the project (JME, Inc.) provides a world-class expertise for supercapacitor research and development.
- The proposal identifies the potential problem areas and technical barriers to commercialization. It lays out a well-structured plan to address these issues.

Weakness

- While the proposed project manager has good technical management experience, the proposal would have been strengthened by providing supporting evidence of his direct experience in ultracapacitor research and development.

RCP 07-059

Advanced Electrical Starter/Generator Systems for Turbine Engines

The applicant, Smiths Aerospace Electrical Power in Dayton, proposes to develop two new classes of advanced electric starter/generators (AES/G) for aerospace applications. RCP funding will aid the development of key technologies in the area of materials for lower friction and lower weight, and solid-state power switches related to brushless motors and generators. Other organizations involved in this proposal include the Ohio Aerospace Institute (OAI), PC Krause, Ohio State University, the Air Force Research Laboratory (AFRL), and Lockheed Martin (Fort. Worth, Texas).

Commercialization Potential

Strengths

- There is a high probability that new jobs generated will be in Ohio.
- The potential for market success is high, as MEA (More Electric Airplane) needs in next-generation commercial and military aircraft are well understood.

Weaknesses

- Competition in this domain is strong.
- IP rights remain with the applicant, owned by a major industrial group based in the United Kingdom.
- The backing purported by the applicant to be coming from Lockheed Martin and AFRL is not consistent with letters accompanying the proposal from these two organizations.
- The OAI involvement is seen as a negative, given the questionable history of OAI's success. The OAI budget appears large for a poorly described contribution.
- Insufficient details are provided on the support of AES/G and Brushless Starter Generator (BSG) efforts from airframe manufacturers. The relatively high interest in AES/G versus BSG, given the current boom in light jets and emerging small engines, is not explained.

Scientific Merit

Strengths

- The applicant has demonstrated unique and innovative technology in brushless systems and required solid-state electronic switching.
- A good involvement is noted of Ohio universities and the AFRL.
- The qualifications of collaborators in Ohio universities and other organizations are good, with the exception of OAI.

Weakness

- The AES/G product line, the more lucrative of the two proposed, is now in the demonstration phase at potential customer sites; therefore the need for further funding and involvement of the Ohio academic research community is unclear.

RCP 07-063

Technology Development to Accelerate Commercialization of Bio-Products from an Integrated Supply Chain of Renewable Advanced Materials

The objectives of this proposal are to create innovative technologies, new products, and strong partnerships in collaboration with a diverse group in the Ohio

industry, research and academic communities. These activities are aimed at creating bio-based products from agricultural raw materials indigenous to Ohio, primarily from corn and soya monomers and polymers.

Commercialization Potential

Strengths

- The PLA blown film technology, patented by Plastic Industries, Inc., is close to being, if not already, commercialized. Extensions of this technology by the project team can create expanded markets.
- A few of the products are past proof-of-concept stage, but require additional development. Conceived technologies presented have the potential for competitive advantage and might spawn new industries and jobs.
- Since the collaboration includes commercial entities, market entry should be readily facilitated for the defined products.

Weakness

- Many of the concepts are embryonic, and insufficient information is presented to allow more than speculating on markets and entry.

Scientific Merit

Strengths

- Team members have established positions in bio-based technologies and have the needed expertise and wherewithal to achieve technical success.
- The patented blown film technology is important, and the proposed work to extend the technology may improve competitiveness. The technology and methodologies to do this appear adequate.

Weaknesses

- Besides the blown film technology, many of the approaches to the other products and concepts are familiar to the industries and have not succeeded in the past. It is not made clear in the proposal how the chance of technical success will be improved, or how the proposers approach can overcome previously unsurmounted hurdles. Although it may be worthwhile to re-examine the suggested materials, a discussion on how to overcome the previous limitations was missing.
- Few data are presented to support the concepts presented.

RCP 07-068

Center of Excellence in Highly Efficient Systems Commercialization

Parker Hannifin is the world's leading diversified manufacturer of motion and control technologies and systems, employing over 50,000 people worldwide, with its headquarters in Cleveland. Parker proposes to create a Center of Excellence in Highly Efficient Hybrid Systems Commercialization. The center will conduct activities that will significantly accelerate the Highly Efficient Hybrid Hydraulic platform technology and make Ohio the world leader in Highly Efficient Hybrid Hydraulic Drivetrain (HEHHD) systems commercialization. Specifically, Parker intends to commercialize HEHHD systems that will increase the energy efficiency and reduce the emissions of on-road parcel delivery vehicles and off-road mini construction vehicle platforms.

Commercialization Potential

Strengths

- This product has a high degree of commercialization potential, based on the fact that Parker Hannifin has developed the RunWise® drive system.
- Parker has a clear path to product development with its Winovation Gates system and has the experience and financial resources to develop products and bring them successfully to market.
- This product will have a beneficial impact on jobs and the economy in Ohio if developed and manufactured in Ohio.
- Parker presents a strong intellectual property management plan.

Weaknesses

- There is an inherent noise problem with hydraulics. How Parker plans to handle mechanical noise is not addressed.
- There is no discussion of competitors in Hydraulic Drive Systems or of how Parker's product will have a clear competitive advantage over similar technologies (though there is a discussion on how it is superior to other types of hybrid technologies).
- There is not enough discussion on the innovative and original aspects of the proposal.
- It is unclear if this project will lead to enabling technologies and further discoveries, except in Parker products.

Scientific Merit

Strengths

- Parker is a world leader in motion and control technologies and systems, with a great deal of technical knowledge in the field.
- Conceptual framework, design, methods, and analyses are adequately developed and integrated.
- There is access to needed resources through the development of the Center of Excellence in Highly Efficient Hybrid Systems Commercialization.

Weaknesses

- The committee's primary concern was that the proposal did not exhibit significant collaboration that would produce a synergistic effect to further enhance the outcomes of the project and move Ohio toward a position of national and international leadership in the selected focus area. The only beneficiary of this technology is Parker and the end users, which are international companies. No sustainable partnerships between organizations that can develop and commercialize new products were being developed.
- The project has no method to advance scientific knowledge except within Parker.
- There is no significant university collaboration.

RCP 07-071

Project Vision - A New Paradigm in MEMS Fabrication and Packaging

The proposed project targets the micro electro mechanical systems (MEMS) area, and in particular packaging issues related to MEMS devices. The proposed technology employs several polymer layers for packaging the MEMS device. The first layer is sacrificial. The second layer is the actual sealing layer, but is gas-permeable. The MEMS device, with the two layers sealing it, is then heated to "bake out" the sacrificial layer. Gases generated when the sacrificial layer is baked out escape through the permeable second layer. This leaves a gap between the sealing layer and the actual MEMS device, resulting in an operational but sealed device. A third layer may be added on top of the second layer to hermetically seal the device after the sacrificial layer has been removed. Both the materials used in this process and the process procedure itself are quite new and innovative.

Commercialization Potential

Strengths

- Packaging remains one of the most difficult aspects of MEMS production. The ability to effectively, easily, and inexpensively package MEMS devices has tremendous commercial potential.
- The intellectual property (IP) management plan presented in the proposed project is reasonable. Certainly, the IP protection that is currently available via patents is relatively strong.

Weaknesses

- The IP plan does not address how the IP will be shared among all partners. Furthermore, the major competition for this approach will be located in the Silicon Valley area. If the project is successful, will the process be licensed

off to other companies that might be outside of Ohio? Licensing issues were not adequately addressed.

- There was a limited discussion on applications of the proposed process, the primary application being a Braille display employing microvalves. The identification of several more potential applications and the time to market for these applications was missing from the proposal.

Scientific Merit

Strength

- The scientific merit of this proposal is reasonable. The development of new technology is not targeted in the project; rather, its validation is addressed.

Weaknesses

- A key concern for the proposed work is that the initial results are still vague. For example, residue from the sacrificial layer is viewed as a potentially major concern. The proposal indicates that this problem will be addressed, but insufficient technical detail related to this task prevented the committee from achieving a better understanding of the process that will be followed.
- Another concern with the proposed process is the third layer that may be used to hermetically seal the device after the sacrificial layer has been removed. In most cases, a hermetic seal is desired. Thus, any demonstrations, data, or analyses that make this approach more convincing would have been useful.

RCP 07-073

The National Center for Healthcare Knowledge Services

The Applicant, Qbase LLC, proposes to establish a center for health care “knowledge services” to provide access to medical data to health professionals, scientists, and administrators. The center would create a large, centralized database of medical information, host this in a new computer center, and create a series of software tools to aid in the retrieval and interpretation of the data. The five areas of focus planned are: (1) the administration of uninsured patients, (2) a means to track and anticipate events related to patient safety, (3) archiving medical images related to neurological disorders, (4) processing and detection of patterns of fraud and abuse, and (5) aid to hospitals in ensuring compliance with accreditation standards.

Commercialization Potential

Strength

- There is a high probability that new jobs generated will be in Ohio.

Weaknesses

- Competition from a company based in Cincinnati is strong; profitability of this market is questionable.
- The applicant has no experience selling commercial software in the health care industry, and the applicant's staff has no experience in the health care industry.

Scientific Merit

Strength

- The applicant has substantial experience building and running data centers, developing data archives, and providing fee-based services to access archives.

Weaknesses

- In three of the four commercial areas addressed in this proposal (all but the neuroscience database), there is no evidence that the applicant or collaborators bring any innovation to the market through this effort. The focus is on creating a large database and providing a means to retrieve information from it.
- The proposal involves the acquisition of major computer resources; however, for development of the proposed software tools, the need is not justified in the proposal.
- Nearly all funding goes to the applicant and very little to the other members. Very little involvement is noted of other academic or health care industry organizations.

Comment: The proposer is encouraged to perform a better review of existing products, in particular an effort sponsored by Cincinnati-area hospitals and to compare and contrast this proposal with the Cincinnati effort.

RCP 07-076

Field Testing and Evaluation of One-Megawatt Scale Solid Oxide Fuel Cell Systems during the Alpha, Beta and Pre-Commercialization Design and Development

Rolls-Royce is developing a first-of-a-kind solid-oxide fuel cell in the 1-megawatt range for stationary power generation. This fuel cell should have twice the power density of existing fuel cells and be more efficient than those technologies, as well as reciprocating and gas turbine engines. Rolls Royce has reached the test and evaluation phase of the development program, which is what this proposal addresses. The objective of the proposal is to install, commission, operate, test, and evaluate the fuel cell to generate technical proof of the product.

Commercialization Potential

Strengths

- Rolls-Royce, the lead applicant, has a well-documented history of developing and proving technological advancements in the power industry.
- The product being developed addresses the growing need to add stability and diversity to the electricity generation and delivery infrastructure.
- A customer, American Electric Power (AEP), is included as a launch partner.
- A good analysis of existing and future markets is provided.

Weaknesses

- The applicant states that significant cost reductions will be achieved through factory assembly rather than field assembly and compares that cost with existing technology costs. The applicant should assume that competitors will also focus on cost reductions and should recast its own competitive profile.
- The proposal is unclear about the true long-term benefit (e.g., value chain impacts) to the State of Ohio. This benefit should be further delineated.
- The level of involvement of partners was not made clear.

Scientific Merit

Strengths

- The work plan is well defined.
- Inclusion of AEP's facilities Walnut Test Facility is a plus
- A strong base of technology development will be available in support of the goals.

Weaknesses

- A major claim is that power density would be doubled, but no data are presented to substantiate the claim.
- Performance monitoring and data recovery are not defined.
- The metrics for success are not well defined.

RCP 07-077 Atmospheric Solar Cell Products

Solar Fields LLC has developed an atmospheric pressure thin-film deposition process for the rapid production of large-area photovoltaic (PV) devices on glass at high-volume manufacturing rates. The University of Toledo and Pilkington Glass will collaborate. The aim is to begin production of solar modules by the end of the project.

Commercialization Potential

Strengths

- There is a high probability of a marketable product in less than 3 years.
- Good partnership in complementary areas will be attained with Pilkington.

Weaknesses

- Although there is a stated intent to set up a manufacturing facility in Ohio, there is no commitment to do so. The source of the resources (\$100 million) required for the manufacturing facility has not been identified, and the eventual investors may choose to set up the manufacturing elsewhere.
- The applicant has already licensed some of the technology to a foreign group.
- There is significant business risk, owing to the very competitive nature of the photovoltaic business, with greater than 80 percent of PV production currently done overseas.
- The applicant company has no corporate commercialization experience, although many of the key individuals have commercialization experience from previous organizations.
- There is a large global effort to scale up CdS/CdTe thin films. It is unclear if Solar Fields will be a strong enough competitor to be a winner in this effort.

Scientific Merit

Strengths

- The key personnel have strong expertise in the field, with many years of R&D experience and many patents registered.
- A well-developed work plan is presented.

Weaknesses

- The use of transparent electrically conductive glass is used by a number of competitors, and it is not clear if any new scientific insights will come from the Solar Fields effort. The scale-up process can reveal technical problem areas that must be overcome, but this may not lead to any new scientific knowledge or intellectual property.
- Solar Fields appears to make only limited use of the capabilities and expertise at the University of Toledo, which will be involved only in characterization and testing and not in the development of intellectual property. A greater involvement and better integration with the university would have strengthened the proposal.

RCP 07-085

Digital Manufacturing and Maintenance for Smart Machines

This is a proposal to develop an enhancement for existing software from UGS. The add-on software is proposed to comprise two essentially unrelated modules or

capabilities: (1) Digital Engineering Manufacturing Consultant for Designers (DEMCD) and (2) Manufacturing Health Prognostics and Throughput Optimization Module (MHP). DEMCD will allow a designer to move directly from a computer-aided design (CAD) program to a manufacturing program that optimizes the manufacturing process, while MHP provides for health monitoring and prognostics of the item after it is in use. What makes DEMCD different from other such programs is its reuse of processes and storage of knowledge during actual process work and an experience base that continues to improve with program use.

Commercialization Potential

Strengths

- The project is likely to lead to a product within 3 years.
- The proposing team has a clear understanding of the market and is in a position to market the resulting product.

Weaknesses

- The cost estimate for add-on to the UGS software seems high as compared with the projected return.
- The resulting product will directly benefit UGS's business; however, as a software product there is no particular benefit for Ohio that is not also available to anyone who purchases the software.
- The products do not have a clear significant beneficial impact on jobs, income, and business formation in Ohio that differs from any other location.
- The principal investigator does not have experience in marketing software.
- Collaborators include only one university.
- Competitive products are not identified and compared with this product.
- The two different modules effectively constitute unrelated products.

Scientific Merit

Strengths

- The DEMCD module employs a unique tool for manufacturing that is based on a novel concept.
- The investigators are qualified to conduct the research and development.

Weaknesses

- The MHP module presumes that some collection of measurements will provide what is necessary for prognostics without actually identifying what these are and how they will be used.
- Proof of principle has not been demonstrated for the two modules.
- The MHP module is based on technology that is not novel.

- The committee concludes that it is doubtful that the resulting product will lead to additional enabling technologies and further discoveries.

RCP 07-092
MFC (Micro Fuel Cell) Commercialization Project

The objective of this project is to commercialize a 25-watt fuel cell operating on reformed methanol fuel. The work plan calls for cost and reliability improvements and the implementation of high-volume manufacturing processes.

Commercialization Potential

Strengths

- The applicant has garnered an impressive array of venture capital investment and appears to have adequate resources and the requisite skill sets for commercializing advanced technology.
- The applicant has a strong intellectual property (IP) position and a reasonable plan for managing its IP.

Weaknesses

- The proposal provides a discussion of competing technologies and identifies some competing companies, but it fails to mention its foremost competitor in the field of portable fuel cells, namely, MTI Micro Fuel Cells, which has widely published the status of its fuel cell development. MTI Micro demonstrated a hand-held, methanol-fueled fuel cell incorporated into a radio-frequency identification device (RFID) in 2004 and has since made significant progress toward market entry. Thus, the proposal does not clearly establish whether its technology and products will have a competitive advantage.
- Because this proposal is focused on the commercialization of a specific product as opposed to a platform technology, the long-term benefits to the State of Ohio are more limited.
- The lead organization has no demonstrated corporate experience of having previously commercialized a new technology.

Scientific Merit

Strengths

- The applicant has demonstrated proof of feasibility in a functionally operating prototype system.
- The proposal clearly identifies cost and durability issues and other key technical issues and barriers to commercialization.

Weakness

- The proposal identifies key objectives but fails to adequately describe a plan for achieving those objectives. For example, one objective is a 50 percent reduction in catalyst cost, but no specific technical approach or convincing work plan is presented as to how this will be accomplished in the required time frame. Given the huge amount of time and effort (tens of millions of dollars over the last 30 years) that has been directed at reducing fuel cell catalyst costs, achieving a further 50 percent catalyst cost reduction in this 3-year project with the limited resources allocated is not likely.

RCP 07-094

Low Cost High Performance Metal Matrix Composite Production Using Infrared Processing

This project seeks to develop a processing technique for metal matrix composites (MMCs) using infrared processing. The project has the potential to reduce costs associated with manufacturing MMCs by 15 to 30 percent. The principal investigators also state that this process is more feasible for scale-up for mass market production compared with existing processing methods for MMCs. The lead institution on this project is the University of Cincinnati which is teamed with the following five Ohio companies: Sherbrooke Metals, Powdermet, Adamus Research, Applied Sciences, and TechSolve. The project has two major focus applications: (1) electrical composite applications and (2) jewelry composite applications. Future applications include industrial wear components, armor, and aerospace structures.

Commercialization Potential

Strength

- The team does a good job in addressing the ownership of intellectual property; it will belong to the institution of discovery and will be owned jointly when two or more collaborators jointly discover the invention.

Weaknesses

- The rationale for commercialization of MMCs for jewelry applications before aerospace structures is lacking in detail. Since the State of Ohio is well known for its aerospace industry, the team should have explained why it selected jewelry as a focus application instead of aerospace.
- The team does not provide a compelling argument to justify how the MMCs for jewelry applications will benefit Ohio, whereas the benefit of developing low-cost MMCs for aerospace structures is more obvious.
- Insufficient information was provided concerning how much of the expected market penetration depends on the success of application of wetting control coatings to low-cost material substitutes for tungsten.

Scientific Merit

Strength

- The role of each collaborator is clearly defined. The infrared (IR) processing technique will be developed by the University of Cincinnati and will be based on a U.S. patent that is owned by the University of Cincinnati. The roles of the five companies include market access to the focused applications, development of particle reinforcements, and machining testing.

Weaknesses

- The University of Cincinnati's expertise in the proposed IR processing technique is well documented; however, the expertise of some of the companies is not as well documented.
- The team has not adequately demonstrated that it has established a prominent reputation in the proposed area.
- The team does an adequate job of addressing the intellectual competitiveness of the MMCs for electrical applications; however, the impact of advancement of scientific knowledge is lacking. Both of these issues are inadequately addressed for the MMCs for jewelry applications.

RCP 07-100

Commercial Manufacturing of Microchannel Reactors

The objective of this proposal is to develop low-cost, high-precision manufacturing techniques and establish the infrastructure to commercialize microchannel technology.

Commercialization Potential

Strengths

- The commercialization potential for the proposal is good if the manufacturing problems can be solved.
- The product has achieved proof of principle as evidenced by the fact that a small-scale prototype has been developed in the laboratory.
- The product expected from the proposal could have a beneficial impact on jobs and the economy of Ohio.
- The lead applicant, Velocys, has very qualified and experienced personnel with strong intellectual property (IP) management systems in place, as evidenced by the patents already obtained.
- The collaborations between the organizations were clear and reasonable, which should lead to additional enabling technologies.

- The greatest strength lies in the commitment of the partners, Hexion, Total, Dow, and Battelle, to the success of the project, as evidenced by their prior financial support and IP contribution.

Weaknesses

- There was no discussion as to other entities that may have competing technologies in the microchannel processing arena.
- The competitive advantage of this technology over similar products already offered by other companies was not clearly explained.
- The company has not yet commercialized the technologies that it has developed.
- Manufacturing problems have not been resolved.
- There was concern as to the company's ability to bring this product to market since it has no prior success in product commercialization.
- There is insufficient fall-out to other entities in the State of Ohio.

Scientific Merit

Strengths

- Velocys has established a prominent reputation in this field.
- The conceptual framework, design, methods, and analyses are adequately developed, well integrated, and appropriate to the aims of the project.
- The project employs concepts novel to chemical processing, that have been validated in the laboratory.

Weakness

- There is no academic institutional support to place the project in a broader setting; thus, no synergies will be developed from the collaboration of diverse partners.

RCP 07–102

Automation for Agile Manufacturing and Mass Customization

The proposal targets the enhancement of advanced manufacturing along the lines of agile manufacturing and mass customization. Mass customization is a critical area that is becoming increasingly important in a variety of manufacturing sectors, including commercial electronics (e.g., computers, cellular telephones, and so on) and automotive. The proposed center addresses research and development issues in software, hardware, procedures, and training. All of these are necessary to maintain the competitive nature of manufacturing in Ohio (and the United States). The major goals of the proposed project include the development of advance factory automation and control systems that will provide flexibility and agility enabling mass customization. To evaluate the project, an extensive cost-benefit analysis will be undertaken.

Much of the project focuses on the development of software that will enable data management, systems interaction, and training for advanced manufacturing systems. In particular, middleware software (IQware) is proposed for development that enables data interchange between a variety of software packages operating across “vertical markets.” This capability permits the multitude of software used in the manufacturing sector to exchange data and enables interoperability. The other major software development project is in the mass customization software (AM2C). This development targets software agents that are capable of a variety of services such as reporting, safety, diagnostics, and so on. A major effort in the AM2C is the development of the ability to allow these agents to operate across a variety of platforms, including machinery and controls that are IEC-61499 compatible (e.g., legacy systems).

Commercialization Potential

Strength

- The potential market for the proposed work is significant.

Weakness

- The proposal presents a market value “in the \$50 billion range.” However, there is very little additional discussion as to details of the potential market.
- While there is some discussion of competition, the proposal does not identify several major competitors such as GE Fanuc, Siemens, and Bosch. These companies have a majority of the automation work in the global manufacturing arena, yet they are not mentioned at all in the report.
- While the market plan is reasonable, it lacks enough details to allow an accurate assessment of the project’s potential.
- The intellectual property (IP) section is weak; a much more detailed explanation of how the IP will be addressed is necessary. Basically, the proposal states that a law firm will be retained to work on the IP issues.
- The proposal is also fairly weak in developing a management structure related to how the various partners will interact and how the overall organization will be managed.

Scientific Merit

Weaknesses

- The proposal does not make a good argument for the work in the controller and integration areas. From a technology perspective, it appears that software will be written to implement a number of ideas for controlling large-scale production systems. However, it is not clear that there are many technical hurdles that must be overcome.

- The proposed effort appears to be more one of coding algorithms and systems that have already been developed. The integration of these different algorithms and systems is the most difficult task, and little is presented, from a technical perspective, as to how these issues will be addressed.
- Communication with legacy controls is a critical issue, but p. 17 of the proposal indicates that protocol development will be left to others.
- Standardization is historically difficult to achieve. The proposal does not explain how much of the benefit of this work is dependent on manufacturers' adopting the Modular Process Units Design Toolkit (MPUDT).

RCP 07-105

HIEx™ a Shared Electronic Community Health Record

The Wright State University Center for Healthy Communities submitted a proposal whose goal is to build a standards-based, interoperable suite of electronic record-keeping tools for health care and social service ambulatory care providers for the Ohio region. A detailed engineering plan for carrying out that software development effort is included in the proposal.

Commercial Potential

Weaknesses

- There are many commercial solutions, which can be purchased today, that provide this type of record keeping.
- There is very little chance that the proposed software will replace other software already in daily-use systems. Hence, the commercial potential that HIEx™ will replace those systems, not being the first mover, is near zero.

Scientific Merit

Strength

- The proposed engineering work plan is sound for a commercial firm building this type of software.

Weaknesses

- The proposal contains few technical details on the product and what it will do
- There is no real new “scientific effort” involved in such an information technology development; hence the scientific merit of the proposed work is low.

ATTACHMENT 6

FINAL RANKINGS AND ASSESSMENTS OF WCI PROPOSALS

This attachment contains reviews of those Wright Centers of Innovation (WCI) proposals deemed to have the greatest merit when judged following the second of the two committee meetings according to the criteria outlined in the State of Ohio's FY 2007 request for proposals (RFP). The proposals are ranked in order of decreasing merit.

WCI 07-012

Institute for the Development and Commercialization of Advanced Sensor Technology

This proposal brings together a large number of sensor-related research projects under the umbrella organization Institute for the Development and Commercialization of Advanced Sensor Technology (IDCAST). The objective is to capitalize on complementary activities between these research groups to bring those with the greatest prospect for commercial success quicker to the market than would be possible otherwise. If funded, a collaborative sensor technology facility in Dayton, Ohio, will be established; it will have sensor laboratories from IDCAST universities, the Air Force Research Laboratory (AFRL) Sensors Directorate, and industry all under one roof.

This program exhibits excellent opportunities for collaboration between the defense research establishment, academic research, and local industry in the State of Ohio. Topics of sensor research are categorized in the areas of biological/chemical (BC) and remote sensing (RS). Industrial participants include the Ohio companies Woolpert, L-3 Cincinnati Electronics, and YSI. All have proven track records of success in bringing advanced sensor systems to market, work closely with leading academic and defense research organizations in Ohio, and have committed substantial resources to ensure the success of IDCAST. Already the collaboration required to submit the application for this Wright Center of Innovation has led to closer ties among the participants, a positive indication of the center's potential for success.

Research topics in the biological and chemical sensing area are related to both defense (battlefield and homeland security) and nondefense markets-for instance sensors for monitoring air and water quality. Demand for products with improved sensitivity, selectability, and stability is great in both areas, and the IDCAST has a clear roadmap for addressing this need. In the area of remote sensing, past successes in Ohio in the commercialization of high-resolution infrared and optical cameras as well as high-slant-angle cameras will be further supported by the work of IDCAST, including their use on airborne platforms provided by one of the participants

Some six Ohio universities, several Ohio industrial companies, and one major bank are participating in the proposal, creating a broad base of activities and interests in the area of sensor technology with strong projected growth potential. The motivation for the proposal is strong and well articulated. Considerable effort has been made to create an administrative structure that encourages commercialization. IDCAST will establish two organizations to enable rapid commercialization of ideas: Ohio Sensor Company Assisted Research (OSCAR) directly addresses market-pull research and can be used by Ohio

companies to cover 33 percent of industry-sponsored research with IDCAST universities, provided the research leads to commercialization opportunities in Ohio within 8 years. The remaining operating funds will be used for the Mobilization of Ohio Sensor Technology (MOST) program to mobilize intellectual property (IP) through the commercialization framework.

Responses to the committee's questions from the initial review were well prepared and delivered. While the initial proposal included a large number of potential research areas with no clear indication of those that could be commercialized within 3 years, the applicants were able to describe six in the biological/chemical area and two in the remote sensing area that are already at an advanced stage of development. Another six projects in the biological/chemical area were identified as being strong candidates for commercialization. All such projects contained a very strong probability for job creation in Ohio and close involvement with universities, including substantial funding for additional graduate students.

The overall objectives of the proposal are fully consistent with the intent of the Wright Centers of Innovation, and the prospect for new and sustainable job creation in the State of Ohio is high. While the number of sensor research topics, in particular in the biological/chemical area, is great, the proposal calls for an organizational structure that should be able to ensure adequate oversight so that the most promising of these is brought quickly to market. In addition, while the large number of participating groups poses the potential for conflicts over the allocation of resources, it appears from details provided in the application as well as from the committee's discussion with the applicant that these issues have been resolved and that an organization has been devised to prevent such conflicts in the future.

If the State of Ohio chooses to fund this proposal, the committee recommends that it address the following key issues with the management team during award negotiations:

- Select a center director with strong experience in the commercialization of highly technical products and processes, preferably from the sensor area.
- Demand commitment from the groups claiming their projects to be near commercialization to take these to market in substantially less than 3 years.
- Demand commitment from the groups claiming their projects to have strong commercialization potential to have near-market-ready products within 3 years.
- Closely monitor the acquisition of capital equipment to ensure minimal duplication of resources.
- Encourage the inclusion of other research groups and industry involved in sensor technology in the State of Ohio that were not members of the IDCAST proposal, even if these are outside the fields of chemical/biological sensors and remote sensing.

WCI 07-010

Center for Photovoltaics Innovation and Commercialization (PVIC)

The Center for Photovoltaics Innovation and Commercialization (PVIC) proposes a world-class science and technology platform in the State of Ohio employing second and third generation photovoltaic (PV) materials for clean electricity generation. The

proposed center brings together three universities (University of Toledo, The Ohio State University, and Bowling Green State University), numerous industry participants, and the Battelle Memorial Institute. The proposal requests \$11 million in capital funds, which will allow the universities to expand and enhance their capabilities for fabrication and characterization of photovoltaic thin-film materials. The proposal also requests \$7.6 million in operating funds, which would build upon Ohio's current leadership position in the photovoltaic field by attracting top talent, incubating high-technology businesses developing advanced photovoltaic products, and assisting existing Ohio photovoltaic industries in addressing customer needs.

The proposal has strong technical merit. The broad approach involving universities, not-for-profits, and industrial partners provides the synergies of a strong consortium, and keeps the State of Ohio at the forefront of PV research and development. The Center for PVIC will build on and leverage the State of Ohio's prior investment in the Center for Photovoltaic Hydrogen and Electricity, whose facilities will be available to complement the center proposed here. There is a strong educational benefit from the proposal, with real potential for attracting world-class researchers and training graduate students. Specific plans for recruiting and hiring have been developed by the universities.

The proposal has strong commercialization potential, and the proposal establishes that there is a clear case for why Ohio is a good location for leadership in thin-film PV technology. The proposal aims at developing and scaling up a number of thin-film PV technologies, and it is highly likely that many of these will be commercialized in the next 3 to 8 years. The intellectual property (IP) plan is well developed, based on Battelle's long history in bringing technology to the marketplace. In particular, the pooling of IP at the early stage of research will avoid duplication of effort and will also greatly enhance the marketability of the IP as a package.

The committee recognizes the value of this endeavor and is pleased that the proposed center has the support of the not-for-profit groups Green Energy Ohio and Northwest Ohio Partnership for Alternative Energy Technologies. These groups can provide critical linkages to distribute innovations to commercial entities and to educate the public on benefits of the technology.

Commercialization potential is greatly enhanced by strong industry participation. Fourteen companies, including Pilkington and Owens-Corning, have committed cash and in-kind cost share. The proposal could have been strengthened with the active support of the electric utility industry, but there was no evidence of such support either in the written proposal or in the management review presentation.

The applicant's responses to the committee's questions from the initial review were appreciated, providing clarification on the need for the capital equipment requested. The composition of the Scientific Advisory Board with its strong technical experts is impressive, and the Executive Industry Advisory Board is structured to ensure high-level input from a diverse representation of industry stakeholders.

In summary, this is a very good proposal that addresses all of the RFP evaluation criteria and builds a platform technology in an important and growing commercial field. If the State of Ohio chooses to fund this proposal, the committee recommends that it address the following issues with the management team during award negotiations:

- Greater involvement of the electric utility industry should be encouraged, with its participation either as an active partner in the center or as representation on the Executive Industry Advisory Board.
- Given the large request for capital funding, continued careful consideration should be given to coordinating equipment needs and potentially combining some features into single instruments with multiple capabilities, rather than requiring a new instrument for each capability needed.
- In light of the management challenges of coordinating such a wide array of partners, requiring a written agreement about reporting progress on a regular basis to the state should be considered.

WCI 07-003

The Wright Center for Sensor Systems Engineering

The Wright Center for Sensor Systems Engineering proposes to innovate and commercialize products in the areas of instruments, controls, and electronics to enhance the capabilities and value of sensors. A key element of this proposal is the systems engineering approach that addresses the utility of the devices in their intended environments and applications. The proposal identifies a series of large growth industries with strong market pull for this technology, including food processing, automotive, dairy production, consumer electronics, test and measurement services, and military equipment manufacturers. The strong presence in Ohio of industrial concerns and universities operating in this general product area was presented.

Six specific technologies have already been selected for commercialization. Four of these are considered to be ready for demonstration, while two are considered to be more in the incubation stage. Beyond these immediate programs, the center is projected to take on a very wide variety of product areas ranging from smart sensors to electronics suites and the supporting software and to include a spectrum of applications in the fields of process control, power generation, oil and gas management, food and beverage processing, and automotive and aerospace monitoring and control.

The program contains good statewide participation and involves industry, university, and government agency contributors. Based on the four near-term technologies proposed, the project is likely to lead to commercial products within 3 years since some of these have already met proof of principle. These products are projected to have a competitive advantage and to meet market needs according to the material provided in the proposal. A large number of different products were shown as potential candidates for inclusion in future center activities, and they could ultimately be commercialized by the center participants. The proposal demonstrated how the availability of test facilities and cooperation between participants can lead to enabling technologies and further discoveries.

The committee recognizes the strong presence of the industrial base for the proposed technology in the State of Ohio and assessed the proposed projects as being capable of advancing the scientific knowledge based on the qualifications of the individual investigators. The committee has concerns that the grouping of such diverse sensor types and applications will promote and achieve the synergistic effects noted. The committee questions whether the management framework as described might require

such a high level of effort to integrate effectively and to realize synergistic advantage on such a large scale that it may distract from the desired pursuit of scientific knowledge and transition of technology to product. Specifically, the four near-term projects are not related, and little collaboration among members working on these product areas was indicated other than through the common system-engineering approach.

Responses to the committee's questions served to effectively clarify some of the concerns resulting from the evaluations of the basic proposals. The committee's assessment was that projects five and six did not appear well defined, nor have clear goals based on the material in the original proposal. This and the area of intellectual property that was also questioned were addressed in the oral briefings and were better understood and considered to be satisfactorily resolved.

Should the State of Ohio choose to fund this proposal, the committee recommends that it consider the following issues with the management team during award negotiations:

- Consider separating the program into multiple awards in which the technical efforts are grouped by application or market types or by sensor technology. The important systems engineering and integration functions should be considered part of one of these new groupings and made available on a service agreement basis to the other groupings or structured as a stand-alone entity.
- Consider melding these new groupings with other sensor-oriented activities within the state that have common technologies or application in order to create more critical mass in areas of strategic focus.
- Consider a management structure capable of implementing a true portfolio management approach that will focus technical and marketing efforts on areas of highest opportunity in the context of the WCI goals.

ATTACHMENT 7

FINAL RANKINGS AND ASSESSMENTS OF RCP PROPOSALS

This attachment contains reviews of those Research Commercialization Program (RCP) proposals deemed to have the greatest merit when judged at the second of the two committee meetings according to the criteria outlined in the State of Ohio's FY 2007 request for proposals (RFP). The proposals are ranked in descending order based on the numerical scores developed by the committee. However, within the accuracy of the grading system, the proposals more correctly should be listed in groups. Following this approach, it is noted that proposals RCP 07-015 and RCP 07-081 were tied for the top ranking, followed by RCP 07-039 in third place. RCP 07-016 and RCP 07-048 were tied for fourth. The next five proposals (RCP 07-018, RCP 07-086, RCP 07-040, , RCP 07-088, and RCP 07-098) were judged to be essentially equal in sixth place and RCP 07-109 was ranked 11th. At the request of the Ohio Department of Development, proposal RCP 07-092 was further evaluated by the committee subgroup at the management review meeting in the same manner as that employed for all of the other RCP proposals reviewed at this meeting. The evaluation did not lead to a change in the committee's initial judgment, as recorded in the last assessment of Attachment 7.

RCP 07-015

Commercialization of Functional Polyimide Films and Nanocomposites

This proposal brings together a consortium of key companies and universities across Ohio focused on the commercialization of functional polyimide films and nanocomposites. The team is led by the Center for Multifunctional Polymer Nanomaterials and Devices (CMPND) at the University of Akron, and each of the five thrust areas is led by a key private company. This is a technology area with great growth potential, and it leverages both academic and industry resources in Ohio. The five thrust areas focus on quite different application areas and are at somewhat different stages of maturity, but all rely on enabling technologies developed at the University of Dayton Research Institute (nanofiber dispersion technology) and the University of Akron (film casting system). These breakthroughs offer the potential to create an Ohio-based polyimide technology platform supporting a high-growth, high- value academic-industry cluster.

There is a clear case for why Ohio is a good location for potential leadership in polyimide technology. A strong academic base supports an extensive population of small and large private companies across the state. The proposal team provided a clear discussion of the range of economic impacts on Ohio from investing in this project.

The project assembles a strong team, leveraging both academic and industry expertise. The research plan is focused on solving key technical issues, leveraging breakthrough advances developed by Ohio institutions. Each of the proposed thrust areas has a clear, well-articulated plan to address the key technical issues required to move both current and next-generation polyimide (PI) materials toward commercialization, in the context of emerging material and process technologies. The project team makes a

good case for functional polyimide films and nanocomposites becoming a platform technology on which multiple technologies and products will be developed over time.

The commercialization potential was enhanced by strong private company participation. Key private partners hold leadership roles and have provided significant matching contributions. Moreover, the project plan identifies clear responsibilities for each leading participant in those areas that specifically leverage each participant's competitive advantage and the role it plays in the cluster supply chain. Each of the five thrust areas presents a well-defined project roadmap with clear short- and long-term commercialization objectives. Each thrust area identifies, and often includes as collaborators, key initial customers for early product launches. An intellectual property (IP) management approach that recognized the complexity of the undertaking was clearly articulated.

The committee was concerned about the complexity of the proposal and how the team planned to manage the inevitable tensions and conflicts that will emerge as these initiatives move towards commercialization. In response to questions, the team articulated a well-structured management plan and process to stage-gate projects in order to allocate resources efficiently. Some concern remains because the actual implementation will be complex; therefore, an agreed-on reporting process and metrics will be important.

The committee also was concerned that the degree of seriousness of a number of identified key scientific and business risks in the proposal were not well identified. During the follow-up briefing, the team provided a ranked summary of scientific risks and a well-articulated summary of mitigation plans for each risk area. Also, in response to committee inquiry, the team provided an assessment of the competitive position of the proposed effort that suggests a clear market leadership opportunity for Ohio.

This is an outstanding proposal that addresses and ranks high against all of the RFP evaluation criteria. If the State of Ohio chooses to fund this proposal, the committee recommends that it address the following issues with the management team during award negotiation:

- In light of the complexity of the project, the committee recommends that a regular reporting system be established with the state, based on the metrics and milestones provided, to ensure that the plan is executed as proposed.
- The committee further recommends that the Ohio Department of Development establish a regular meeting schedule with the thrust leaders designed to identify potential targets of opportunity in the supply-to-customer chain for business-attraction opportunities.

RCP 07-081 Commercialization of Low-Temperature Carburization

This project, led by the Swagelok Company, proposes to commercialize a novel, low-temperature technique for carburizing metals. The process is called low-temperature colossal supersaturation (LTCSS) and was originally developed by Swagelok for manufacturing pipe fittings. It has been used successfully for 6 years on 300 series

stainless, and now the company wants to commercialize the process and to expand it for use on other metals such as Ni-based and Ti-based alloys. Most of the capital cost requested is for scale-up of manufacturing to meet market demand. The partner institution is Case Western Reserve University's Department of Materials Science and Engineering. Collaborations between Swagelok and Case have existed for more than 6 years in work related to the proposed project.

The approach for commercialization is well planned, with Swagelok proposing to set up a separate business within Swagelok to run the commercialization of LTCSS. Based on the background of the personnel involved, there appears to be a good mix of both technical and business expertise for commercialization in 3 years. Swagelok has applied its carburization process to a variety of customer applications that fit its existing equipment and process parameters with considerable success. The potential applications and markets range from bearings and heat exchangers to aircraft engines and medical implants, which is promising for commercialization. The principal investigators (PIs) mention that they have been contacted by companies in each of these industries for the use of LTCSS.

The LTCSS process can improve corrosion resistance and wear resistance of metal components currently used in applications in which corrosion resistance and/or wear resistance is critical to the integrity of the component. Key commercial values are the abilities to substitute treated, lower-cost alloys in place of far-more-expensive alloys and to significantly extend the useful life of alloy parts. One of the major advantages of the LTCSS process is that it can provide both improved corrosion resistance and wear resistance in a single application, whereas it usually takes at least one process (e.g. coating or plating) to obtain improved corrosion resistance and a different process (e.g. shot-peening) for improving surface or wear resistance. A vast array of analysis and characterization is required to develop a full understanding of the treated materials' behavior under various conditions and applications, and to extend this to a range of new alloys. This offers a significant range of possibilities for scientific discovery for faculty and graduate student research projects.

The response to the committee's questions was sufficient and clarified several issues that were raised during the initial panel review. In particular, the committee appreciates the detailed response regarding the question addressing competitor analysis. The project PIs provided a compelling response to support the statement that there are currently no direct competing technologies that offer all of the benefits of LTCSS. This project is well organized, and the PIs provide a sound plan for all aspects of the project.

If the State of Ohio chooses to fund this proposal, the committee recommends that it address the following issues with the management team during award negotiation:

- The need for strong oversight of the progress of the program, with particular attention to the process extension to new alloys, the selection process for targeted alloys, major hurdles, and realistic timing.
- The need for a written agreement with regard to how to address maximizing the value to Ohio. Swagelok will be focused primarily on commercial success, as it should be, so special attention must be given to maximizing the value of this fascinating process for Ohio firms.

RCP 07-039

Development and Commercialization of Graphite Nanocomposites for the Next Generation of Electronic Devices

The objective of this proposed program is to create and commercialize the next generation of thermal management solutions for the consumer electronics industry. The primary focus of the proposed effort is the technical barrier of thermal conductivity. Current graphite-based materials are limited to conductivities of about 500 W/mK, but values >1000 W/mK at comparable weight and cost are needed. The proposed approach is to create bulk products using nanostructured materials such as single-wall nanotubes (which may have conductivities as high as 6,000 W/mK) and composite fabrication to achieve the desired bulk properties.

The proposing team represents an all-Ohio group of industries led by GrafTech, an industry leader in graphite, assisted by the University of Akron and Case Western Reserve University. The proposal is strengthened by the involvement of the Air Force Research Laboratory (AFRL), the Ohio Aerospace Institute(OAI), the NASA Glenn Research Center, and the Center for Multifunctional Polymer Nanomaterials and Devices (a Third Frontier center). The objective of the program is to maintain Ohio's leadership in nanotechnology by strengthening existing partnerships and creating new collaborations by jointly developing new products and technologies. Deliverables have been identified for each of the partners. Target markets have been carefully identified and characterized. A clear technology edge has been established as a basis for immediate return on investment.

GrafTech has a well-established global leadership position in the technical field and a well-established market position in graphite materials. The company is an established leader in state-of-the-art technology for this purpose and has a strong science base to bring to this program. It is well positioned to bring the proposed products to the marketplace in the United States and abroad. The products proposed, if successful in development, will have a clear edge in the projected market. Risk has been identified, and management of that risk has been addressed. Projected payoff to the state of Ohio has been clearly identified. A significant investment of \$30 million in the program has been promised by GrafTech. The committee emphasizes that project management and communication strategies need to be well defined. There is a large group of investigators in the program, which will present challenges for management and project selection. The involvement of stakeholders and participants in that process is essential. Management processes and performance metrics need clear definition as a basis for management and stage-gate decisions, especially for downselecting viable technologies for development. The commitment of a full-time manager for the program is applauded.

The presenting group addressed all concerns voiced by the review committee. The clarification of several aspects of the technology was helpful. The deployment of funds and the formation of task-focused teams were discussed. Six technology approaches were proposed as a means of exploiting technical assets of the Ohio partners, including Bucky paper, multiwalled nanotubes, nanofibers and papers, graphite mats, nanoparticles and platelets, and polyimide films. This robust approach is laudable, but it serves to highlight the need for careful management of the incubation process. A stage-

gate (or comparable) process for narrowing down the field of possibilities to achieve the best solutions is advisable.

Processing and manufacturing will present special challenges in the proposed project. Team members, including OAI, the National Composite Center (NCC), Maverick Corporation, and the University of Akron will assist in this essential element of the work. Careful collaboration in this part of the program will be especially critical, since it is a potential bottleneck in the development process.

GrafTech has a long record of success in the commercialization of products in Ohio. It has been successful in three previous Ohio Third Frontier programs. The PEM LITE Project (ODOD TECH 04-040) was completed on time and on budget. A second Frontier project (ODOD TECH 05-013) on gas diffusion layers for fuel cells is about 60 percent complete. Proof of technology is underway, with commercialization to follow.

The committee regards the proposed program as having outstanding prospects of meeting the stated objectives of the RCP initiative. If the State of Ohio chooses to fund this proposal, the committee recommends that the following issues be addressed with the management team during award negotiations:

- While a management team has been identified, a technology and development management process should be more clearly articulated.
- The strong involvement of partners in the development and deployment of manufacturing technology, especially for composite products involving nanofillers, should be ensured, with specific plans and clear responsibilities, matched by appropriate funding.
- The involvement and enrichment of Ohio's state institutions and state organizations, including the educational community, should be ensured.

RCP 07-016

Commercialization of High-Performance Nano-Tailored Structural Composites for Energy and Survivability Applications

This proposal from the Center for Multifunctional Polymer Nanomaterials and Devices (CMPND)-formed by Ohio State University and the University of Dayton Research Institute, with collaborative efforts with both small and large companies-is directed at nanotailored structural composites. A litany of projects is proposed, directed at the incorporation of new composite materials systems into emerging energy and survivability applications. One quite interesting project involves the design and development of larger-scale wind blades and turbines for the emerging wind energy conversion market. The proposal is well written and addresses the information requested in the RFP. The proposal effectively describes the relevance of the composite technology to the State of Ohio and presents a strong case for the commercial and scientific benefits to Ohio. The composite technology base is relevant to Ohio, the industry base resides in Ohio, and the technology is a growth area with considerable future strength in Ohio as well as nationally and internationally. Nanocomposite technology involving polymers has had a large amount of research effort and even more publicity but to date only limited

commercial success. This proposal defines areas of utility in which nanocomposites can be commercialized, with the success of the technology development effort.

The proposal addresses composites technology directed at three application areas: energy, transportation, and security. It combines materials concepts, new materials developed recently by the partner(s), and new composite fabrication techniques into the specific projects noted in the proposal. These projects are further divided into three time scales [near term (1 to 3 years), mid term (4 to 5 years) and long term (6 to 8 years)].

The proposal has a strong collaborative effort of Ohio-based academic institutions, small and large companies, with the theme of nanotailored composites. It weaves new products, concepts and processes into potentially synergistic commercial offerings. The merit of nanofiber-reinforced matrices of advanced composites (although not a new idea) is a concept that has not been properly evaluated and which offers the potential for a significant improvement in the performance of advanced composites with a multitude of commercial implications.

The advanced composite materials market continues to be viewed as an emerging technology market with significant growth potential existing for at least several decades into the future. Nanoparticle/nanofiber reinforcement of more commodity applications including foams and coatings (while not a new concept) has not been properly evaluated. This proposal combines the appropriate partners to develop and commercialize nanoparticle/nanofiber reinforcements in these application areas. Nanofiller dispersion is recognized as a potential obstacle and NanoSpurse technology should be relevant for the resolution of this problem.

The survivability applications are largely military directed, and further funding and involvement of the military branches of the government would be recommended to enhance this proposal. While the carbon nanofiber investigation is realistic, the economics were not discussed in detail and may preclude consideration from the more-cost-sensitive applications. The development of larger wind blades could have considerable impact on wind energy applications, and the proposed routes to these structures appear viable, including additional suggestions made in the presentation to the review committee.

The presentation and responses to the review committee's questions properly addressed the subject and provided an improved understanding of the technology proposed. The presentation also reinforced the positive view of the review committee relative to the merit of this proposal and its potential importance to the State of Ohio. A large number of projects exist in this proposal, involving a large number of collaborators. The coordination of these projects and the ability to focus on the more successful and commercializable products will be a major task of the RCP implementation team. The team's ability to manage these projects will be the key to the success of the program.

RCP 07-048
Flexible Liquid Crystals Film Manufacturing Alliance

This proposal brings together an alliance among four manufacturers and suppliers and two research universities as the core of a permanent Ohio-based cluster focused on flexible liquid-crystal films. The team intends to leverage the early technical and market

lead of Ohio-based firms (first in the world to produce and sell liquid-crystal displays [LCDs] and visors on flexible substrates), to refine manufacturing processes and build an Ohio-based industry cluster that can capture this emerging, potentially explosive market. The core strategy is based on developing the production technologies and processes that will permit efficient and high-quality printing of displays at high volumes on flexible substrates using roll-to-roll manufacturing techniques.

Flexible liquid-crystal film has potentially disruptive impacts on products and markets. The potential size of this marketplace is enormous, if the technical and production issues can be resolved. A compelling case is made for investing in flexible displays and their potential to put Ohio and the United States back in the liquid-crystal game, now dominated by Asia. The team presented a strong case for how targeted investment would help Ohio firms and universities maintain and significantly extend their current technical leadership while capturing a high-value commercial niche in the marketplace.

A strong team has been assembled, leveraging both academic and industry expertise. The researchers at Kent State have an excellent record of accomplishment for developing technology on LCDs and creating new technology in the area. The team provided a clear plan for solving key technical issues, with a well-articulated discussion of technical risks. The result is a well-defined path to attacking the challenges of production scale-up. The team has established clear near-term commercialization objectives with well-defined plans. It has good existing relationships with initial target customers, and these customers are ready to buy if the defined requirements can be met. The team also presents a good case for this project helping to build a strong technical and manufacturing base upon which multiple products will be developed over time.

The prospects for successful commercialization are enhanced by the strong private-company leadership established in the management plan. Clear responsibilities are assigned in those areas that specifically leverage each firm's competitive advantage.

The committee raised a variety of concerns in the initial review. The liquid crystal market is very competitive, and the proposal provided quite weak competitor analysis, which in turn led to an uneven discussion of business risks. In particular, the committee was concerned about how the team intended to deal with the large foreign companies that dominate this marketplace. In the management review session, the team clearly outlined how it was targeting both applications and markets that were not of high interest to the large, high-volume foreign electronics giants. Rather, they were targeting focused niche markets-large enough to be of great economic value to Ohio, but small enough to fall below the primary interest of the giants. Moreover, the team articulated a strong path to market in these initial niches.

Another committee concern was the management plan. A plan was outlined, but it required more clarity and definition for managing the inevitable tensions and conflicts that will emerge as these initiatives move into commercialization in two very different product and customer bases. However, the team addressed the committee's concerns quite effectively, including clarification of its intellectual property plans, which were not well developed in the proposal. The team also addressed how it expected to ensure that a significant share of the value potential of the technical advances created was going to be captured by Ohio firms and citizens. The initial proposal provided a general discussion of an economic development strategy to build an Ohio-based industry cluster but offered

no clear plans. The team provided a well-thought-out, niche-focused supply-chain development strategy, but the committee recommends that these plans be crisply identified in the final negotiations, should this project be funded.

The committee raised several technical concerns. Although key technical risks were identified, the committee felt that some of the mitigation plans were inadequate. The presentation eased most of these concerns, as well as effectively answering specific technical questions regarding compressive stress and PEDOT (poly[3,4-ethylenedioxythiophene]) conductivity.

This is a very good proposal that addresses all of the RFP evaluation criteria. If the State of Ohio chooses to fund this proposal, the committee recommends that it address the following issues with the management team during award negotiation.

- In light of the complexity of the project, a regular reporting system should be established with the state, based on the metrics and milestones provided, to ensure that the plan is executed as proposed. In particular, the technical risk mitigation efforts should be monitored on a regular basis.
- The niche-based supply-chain plans for leveraging Ohio economic development need to be clearly formulated and agreed by all parties.

RCP 007-018

High Speed Advanced Pultrusion of Hollow, Thin-Walled Close-Tolerance Composite Profiles

Comfort Line Limited (CLL) in conjunction with Owens Corning, Therma Tru Corporation, the University of Akron and the Ohio National Composites Center, proposes to develop leading-edge controls and processes that will result in a three- to fourfold increase in production speed with a concomitant decrease in breakage for the formation by the pultrusion process of complex fiberglass structural elements used in the fenestration industry. Success is posited to bring the superior structural and load-carrying attributes of fiberglass reinforced plastic (FRP) into a cost-competitive posture with existing materials in this domestic \$2 billion market. It is stated by the proposer that, should it be successful in achieving its stated goal, fiberglass fenestration elements so constructed will replace vinyl with the rapidity that vinyl replaced wood and aluminum. Concurrent with the pultrusion advances, the petitioners plan to develop a related surface finish-coating process that is attractive and protects the FRP base from the degrading effects of exposure to ultraviolet radiation.

CLL is a niche composites manufacturer located in Toledo, Ohio, that pioneered hollow, thin-walled plastic material profiles as framing materials within the U.S. fenestration industry using pultrusion forming technology. During the past 2 years, CLL has embarked on an R&D program to improve the process and speed of pultrusion production related specifically to FRP materials. Owens Corning, in conjunction with CLL, has developed a first application product sunroom that will be marketed through the Owens-Corning established distribution channels.

The consortium seeks to refine and improve the production speed while reducing breakage sufficiently to result in a cost-competitive product. In the committee's view, the production-rate and breakage-improvement goals are optimistic but possibly

attainable, based on CLL's past industrial experience with this technique and further bolstered by finite-element modeling to be employed by the University of Akron. The petitioners assert that the production-cost-reduction goals will be met by the achievement of 50 percent of target production goals.

Under committee questioning, CLL noted that most production will occur out of state, though its primary plant in Indiana employs largely Ohio residents. CLL further stated its goal of targeting production in the People's Republic of China to take advantage of that burgeoning market. It remains unclear to what extent these plans will directly benefit Ohio.

The committee recognizes the value of this endeavor to the petitioners, who do have a significant presence in the State of Ohio and it believes that the consortium is well constituted to achieve its highly focused agenda. It remains unclear to what extent this support will directly economically benefit the State of Ohio and how transferable the intellectual rights to this technology will be to other Ohio-based industries.

If the State of Ohio chooses to fund this proposal, the committee recommends that it address the following key issues with the management team during award negotiations:

- A clear understanding of the intellectual property rights ownership for all processes.
- A development timeline with key milestones for progress noted.
- A commitment on benefits to be derived by the State of Ohio in return for funding.

RCP 07-086

Technologies for the Next Generation Military and Commercial Propulsion, the Reliable Intelligent/Variable Cycle Engine

The Ohio Center for Advanced Propulsion and Power (OCAPP) proposes to address the evolving requirements of both military and civil aviation propulsion systems. The center is led by Ohio State University and includes seven other Ohio universities and six industrial partners comprising GE Aviation and five Ohio-based component companies. Specifically the program addressed technologies to reduce fuel consumption, increase speed, provide more time on station, increase electric power, reduce environmental impact, and improve the reliability of future aircraft propulsion systems. The program proposes to generate the propulsion technology noted and also create a highly skilled workforce for Ohio, provide technology transfer to the local propulsion component industry, and spin-offs to other industries.

The ability of the team to reach out to the academic strengths within the combined universities and industry partners and to build on the technologies and capabilities generated in prior WCI programs was considered a strength of the proposal. The proposed implementing plans were similar to OCAPP's successful performance in its prior WCI activities, and the working relationships between members including existing agreements on the handling of intellectual property rights should provide programmatic efficiencies. Individual pieces of the component technology will reach a sufficient level of maturity to permit them to be transitioned to product within 3 years and provide the desired effect of creating jobs in Ohio, even though there may not be new propulsion

launches in that time period. The commercialization plan submitted was considered to represent a realistic view of the transition of propulsion technology to products.

The technical goals of the program provide significant competitive advantage over existing products in the marketplace and have the potential of creating new jobs within the participating companies. In addition, the technology produced in the proposed program has significant potential to be used in other industry products such as power-generation equipment and other precision machinery. This possibility provides other options for commercialization of the technologies targeted in this proposal even when aviation product opportunities may not be readily available.

The committee recognized that the team assembled by Ohio State University has an excellent reputation in the industry and as subject-matter experts and leaders in this field. The team has demonstrated this capability both in the competitive marketplace and in its performance on previous R&D programs, including WCI grant programs. The strengths of the propulsion activities at Ohio State University and its other university teammates and its close working relationship with GE Aviation and the other industry partners have created a framework for the recruitment and retention of the highest-quality research and technical talent in the propulsion industry.

The proposed program is well laid out in most areas and includes both methods development and proof-of-concept demonstrations that will accelerate the introduction of the technologies into service. This approach of analytical and experimental work addresses the issues of understanding the challenges that are currently envisioned and those that will arise during the technology-development stages. The plan would be stronger if the level of detail for the transition of technology to existing products through proof-of-concept or demonstration testing was more clearly defined. The committee also viewed the approach to technology generation and validation to be very traditional in nature and lacked the creativity shown in some other proposals and therefore increased program costs may result.

The responses to the committee's questions from the initial review were comprehensive and resolved several concerns. These responses included discussions of the involvement of the component suppliers in the planning process and in the transition of technology to product and in documentation of the success of past performance on similar WCI programs. The participation of both the university and industrial partners provided valuable insight into the relationship among the teammates.

Should the State of Ohio choose to fund this proposal, the committee recommends that it address the following key issues with the management team during the award negotiations:

- A more detailed plan for the proof-of-concept demonstrations, to provide measurable milestones for program management.
- More details on the transition of component technology from the supplier base into commercialization, to provide measurable milestones.
- Some organized activities to provide communications with other WCI and RCP awardees that may be generating technologies relevant to this program.
- A more creative approach to technology generation and validation to improve program cost-effectiveness.

RCP 07-040

Commercialization of High Performance Multifunctional Composite Structures Using Ohio's Advanced Polymer and Nanotechnology

This proposal, led by GrafTech, is directed at the commercialization of high-performance carbon foams. GrafTech, a leader in carbon-based product technology for decades, has also been a leader in carbon foam development and commercialization for almost 4 decades. A recent improvement in carbon foam production yielding property improvements has allowed for consideration of these products for new applications. This request for funding is made primarily to provide support for accelerating the time-to-market of specific applications for structures based on this product. Commercialization of this technology will have a positive impact on jobs and new business for the State of Ohio. The project goals are succinct, and the management plan is properly directed towards commercialization success.

This project has a high probability of success, as GrafTech is past the developmental stage and is already in the commercial stage. GrafTech has an excellent route to market, has familiarity with the technology, and has the ability to make product improvements as the market develops and expands. The project team is composed of experienced personnel with strong scientific, technological, and commercial expertise. The applications of core materials for panels, tooling and conductive foam are well defined and well along toward commercialization, with properly defined collaborators to achieve these goals. The technology and products will have a competitive advantage over existing carbon foam products. The extension of this technology into additional technologies is less obvious, as the opportunity and product offering are specifically related to improved carbon/graphite foam. Extension into novel applications could be realized and is, of course, the key feature of the proposal. GrafTech has the financial capability to commercialize the technology and the support of the management to provide the appropriate resources for the commercialization. While these comments have a very positive tone, it must be noted that it is not obvious that state funds are necessary to facilitate the success of this commercial venture. Funding could enhance the speed to market and development of next-generation products; however, the progress and developments to date will dictate the commercial success of the project.

The scientific merit in the work already accomplished by GrafTech in the development of these products is strong, but the scientific merit of what it proposes to do with state funds in the next 3 years is less significant. The scientific element of the project is internationally competitive and capable of further advances in the technology. The area that appears deficient in the proposal involves materials science approaches toward further improvements in the properties (strength and/or toughness) of the carbon foam necessary for expanding potential applications. Some of the concepts were discussed briefly in the management review session; however, further delineation of those approaches would be desired if this proposal is accepted.

In summary, the strong positive aspect of the proposal is the high probability of commercial success. The primary applicant (GrafTech) has been and is a leader in carbon technology and has demonstrated the ability to transform new carbon technology into successful commercial products. It is, however, not clear how the requested funds will facilitate this expected commercial success. It appears that the project is farther along the

commercialization pathway than are other also-viable projects examined in this RFP review process. If this consideration is seen as more of a positive than a negative by the State of Ohio, this appears to be a strong proposal. It is recommended that the product- and market-development activities that can benefit the most from state funding be prioritized relative to commercial activities that are already past the developmental stage. Also, further expansion of the proposed research and development concepts for improved carbon foam products (e.g., different precursors, nanocomposite concepts, and so on) should be defined in more detail.

RCP 07-088
Advanced Materials Technology Platform for Sustainable Lawn and Garden Products

The Advanced Materials Technology Platform for Sustainable Lawn and Garden Products proposes to accelerate the development of organic and naturally derived lawn and garden materials to support Scotts' conversion of its products from the present petroleum base to 50 percent natural-based.

Industrial collaboration is exhibited by the commitments with Cognis Corporation; Plant Health Care; Novozymes Biologicals, Inc; OmniViz, Inc; Dysart Corporation and TyraTech, LLC - only two of which are located in Ohio. Scotts has also affiliated with the Ohio State University (OSU), Miami University of Ohio, and Purdue University on this proposed project. The strong combination of Tyratech, Novozyme, and OmniViz assisting Scotts' R&D program to overcome the technical challenges that will be encountered in developing the technology platform bodes well for a successful outcome, as is utilizing the resources of OSU's plant biotechnology strengths and Miami of Ohio's botanical research and testing facilities. Scotts' organization also enjoys a good relationship with the consumer marketing organizations such as Lowe's, Home Depot, Wal-Mart, and others, demonstrating excellent probability of commercial success if the target products are developed. The committee does note that economic benefits accrue primarily to the lead organization, Scotts, and are then passed through to the State of Ohio in increased income and jobs, and to Scotts' collaborators for those applications not directly imbedded in Scotts' product marketing portfolio. It is also noted that this could be an important path toward commercializing technology that may be developed by OSU and/or Miami, for example.

While the committee recognizes the value of developing such a technology platform as proposed, disappointment was expressed that so little emphasis was placed, both in the proposal and the presentation, on the type of products and processes to be developed beyond the two introductory materials, and on how the platform could lead to important new products and economic benefit to the State of Ohio beyond growing the Scotts company. It is perceived by the panel that the collaboration among Tyratech, OSU, Novozymes, and OmniViz is a powerful combination to identify specific pesticidal activity occurring in natural materials and to develop a platform for developing new cost-effective materials utilizing that knowledge. The panel was disappointed that a broader plan on how the platform technology would be used for the economic betterment of the State of Ohio was not emphasized.

The goals of this proposal are consistent with the aims of the RFP and the potential contribution to the growth of Scotts, and thus to the State of Ohio's economy, is good. The organizational structure, commercialization plan, and personnel resources are well geared to succeed for introducing the first two environmentally friendly products. The development of the technology platform proposed could have far-reaching consequences.

If the State of Ohio chooses to fund this proposal, the committee recommends that it address the following key issues with the management team during award negotiations:

- A mechanism should be established for sharing the Advanced Materials Technology Platform results with others in noncompetitive areas in order to create new businesses in Ohio.
- The pace at which the market for environmentally "green" products is grown should be more clearly elucidated.
- Scotts should clarify the relationship between the "key building blocks," the "Advanced Technology Platform", and "Products" that it intends to develop.
- In its estimated economic impact, Scotts should differentiate between the growth in jobs and payroll impact from the Advanced Technology Platform and that expected from normal company growth attributed to expected growth without the platform.

RCP 07-098

Multifunctional Carbon Materials for Energy and Thermal Management Applications

This Multifunctional Carbon Materials for Energy and Thermal Management Applications proposal addresses the scaling up of carbon-based materials developed by the University of Dayton to be used in energy and thermal management applications. The project foresees synergistic opportunities for multifunctional materials, since common equipment and procedures can be used for a wide variety of carbon material forms. The thermal management applications will be for ultrahigh performance heat sinks and high-temperature conductive polymers. These products would be used in military applications, electronics, medical devices, and high-output energy devices. The energy applications will focus on fuel cell electrodes, "ultra" supercapacitors, electromagnetic interference shielding, and material for direct carbon fuel cells. The market for these products would include fuel cell manufacturers, battery applications, and the electronics and telecommunications industries

The proposal is well written and describes the technology clearly. A cross-functional team involving the University of Dayton, the Air Force Research Laboratory (AFRL), the Edison Institute, and the University of Miami and a collection of small start-up companies has been established. The proposal's primary plus is a combination of carbon-based materials offering promise for emerging energy-related markets. However, there is a litany of emerging applications in which advanced carbon materials could be utilized, reflecting a potential lack of focus and prioritization. The committee recognizes that there are certain economies of combining both efforts, yet it feels that with regard to

the total proposal scope, some of the other proposals had a more focused effort, a clearer path to market, and a more likely potential of reaching commercialization within 3 years.

The committee appreciates that the choice of carbon-based topics is relevant for emerging technologies and worthy of scientific investigation. The proposal introduces novel concepts for advanced carbon materials that may lead to new technological innovations and intellectual property. The University of Dayton's fundamental expertise in carbon-based materials will provide the research base for the many applications proposed. This expertise will be augmented by the inclusion of the AFRL, the University of Miami and the Edison Institute. However, as stated above, so many topics are proposed that the proposal lacks focus; this problem could dilute the applicant's ability to properly solve the high technology challenges and high-risk carbon-based approaches.

Responses to the committee's questions from the initial review were appreciated. The discussions on the analysis of the strengths, weaknesses, opportunities, and threats were particularly helpful. The vision of the program is consistent with the goals stated in the RFP, yet for the reasons mentioned above the proposal was deemed by the committee to be less robust than some of the other proposals presented.

If the State of Ohio chooses to fund the proposal, the committee recommends that it address the following key issues with the management team during award negotiations:

- Strong oversight of the progress of the programs, in particular those related to the energy management applications.
- A written agreement about how to address potential disputes or conflicts with regard to the disbursement of funds.
- A staged approach for the disbursement of funds, with quantifiable milestones for disbursements of additional funds.
- A more detailed market analysis for each application showing major hurdles and realistic timing for market entry.

RCP 07-109

New Roll Technologies to Commercialize High-Quality, Low Cost Steel

Mittal Steel, in conjunction with Wright State University, The Ohio State University and Deformation Control Technology, Inc. (DCT), proposes to develop and refine software tools that will enable the efficient incorporation of modern hot roll equipment and technology into existing mills that produce high-quality sheet steel for the automotive industry and similar applications. Specifically, they plan to develop a software analysis program to optimize the incorporation of High Speed Steel (HSS) rolls and Continuously Poured Clad (CPC) rolls initially into the Mittal Cleveland Integrated Steel Plant. The utilization of these improved hot roll devices is critical to meeting the high-quality steel properties demanded by the automotive industry, which has a large presence in Ohio. The optimization afforded by the proposed efforts should result in an improved roll replacement schedule, along with a reduction in unplanned outages, thus improving plant efficiency. This improvement in efficiency is proposed to create a competitive advantage for U.S. and Ohio sheet steel producers that will staunch the flow of imported steel and result in state job retention while paving the way toward potential significant employment increases.

This proposal exhibits good industrial collaboration by pairing a strong industry partner with capable university research departments and an independent consulting firm knowledgeable in the target industry. This partnership structure will ensure that the technology developed will be disseminated to all interested Ohio sheet steel producers. If the proposal is funded, it will complete the efforts started by Mittal Steel, which represent an already-significant investment.

The committee recognizes the value of preserving and advancing the state's steel industry, the second largest in the nation, which by itself employs over 18,000 Ohio residents. Ohio steel production and specifically sheet steel deliveries have declined markedly since 2001, resulting in significant job loss. Ohio plants have been unable to provide the quality sheet steel demanded by its local customers, which now fill nearly all their needs for sheet steel from abroad. Incorporation of HSS and CPC methodology into Ohio mills should bring the mills' product up to world-class standards while their proximity to customers will provide them with a competitive advantage.

Roll-Based Design Optimization (RBDO) technology, if successful, will improve plant efficiency once the new hot roll equipment is installed. In the longer term, it is expected that the systematic methods of RBDO technology will be applied to production processes beyond sheet steel, helping other industries to commercialize better products at lower operating costs.

The partners in this endeavor are well suited for their respective tasks and have demonstrated through both presentations to the committee and their work to date a strong commitment to the success of this effort. One issue centers on the fact that Mittal Steel is a Dutch-based company with multiple plants both in the United States and abroad. A concern exists that the products developed through this effort will benefit other regions at the expense of Ohio. This concern is largely mitigated by the presence of DCT and the Ohio university partners who will ensure dissemination of the developed products within the state as well as reliance on basic market forces governing sheet steel that favor proximity of producers to customers.

The focused plan of this proposal is consistent with the goals expressed in the state's RFP, but its potential contribution to the economic well-being of the state seems limited. The proposal appears solely focused on the software development as an evaluation tool for technology that is already available in the market and in use by other large, international sheet steel producers. For this reason, the committee expects the realization of only marginal overall beneficial effects from its development.

If the State of Ohio chooses to fund this proposal, the committee recommends that the state do the following:

- Address the U.S. government's International Traffic in Arms Regulations (ITAR) with respect to the dissemination of technology software products outside the United States.
- Request a detailed plan to support the dissemination of the developed products to other Ohio mills during award negotiations.

RCP 07-092
MFC (Micro Fuel Cell) Commercialization Project

Although this project was not ranked among the top 11 RCP proposals during the initial evaluation process, at the request of the ODOD the proposal was further evaluated by the committee subgroup at the management review on September 7, 2006.

The objective of this project is to commercialize a 25-watt fuel cell operating on reformed methanol fuel. The work plan calls for cost and reliability improvements and the implementation of high-volume manufacturing processes.

A major concern of the committee was the lack of commercial readiness of the prototype fuel cell and the low probability of having a commercial product within 3 years. While the applicant has developed a functioning prototype, there is much additional development needed to reduce the size and weight of the product and to achieve the cost and reliability required for commercial application. In the committee's view, a plausible pathway for achieving these improvements was not adequately identified, and the oral presentation by the applicant did not provide a convincing case for the likelihood of achieving the necessary improvements during the proposed 3-year project.

The analysis of market competitors was a major weakness in the written proposal, which failed to identify and discuss some key competitors. While the oral presentation provided some additional information on market competitiveness, the lack of a clear competitive advantage over competing companies and products remains a key weakness in the proposal.

In summary, while the concept has appreciable scientific merit and is worthy of continued research, by comparison its commercialization potential is perceived to be not as great as that of the other, more highly-rated group of proposals.