IPC Comments on the
Effectiveness of Federal Agency Participation in Standardization in Select Technology Sectors
(Docket No. 0909100442-0563-02)

Via Electronic Submission: SOS_RFI@nist.gov

IPC – Association Connecting Electronics Industries appreciates the opportunity to comment on NIST's request for information on the *Effectiveness of Federal Agency Participation in Standardization in Select Technology Sectors*.

IPC represents all facets of the electronic interconnection industry, including design, printed board manufacturing and electronics assembly. Printed boards and electronic assemblies are used in all electronic industry market segments including: military, aerospace, communications, computer, automotive, industrial, medical and personal electronics. The impact IPC standards have on the electronics industries effects the entire supply chain from raw materials to finished goods. IPC is a not-for-profit organization made up over 2,700 member companies, 1,700 of which are located in the U.S. IPC has 230 standard development committees with over 10,000 active participants. As a member-driven organization and leading source for industry standards, training, market research and public policy advocacy, IPC supports programs to meet the needs of an estimated $1.7 trillion global electronics industry.

IPC strongly believes that Federal involvement in private sector standards is extremely important. The collaborative standards development activities that include Federal agencies result in better standards. Federal agencies, such as NIST, bring scientific methodology and technology that can be transferred into the standards in a non-proprietary, non-threating manner. NIST participation improves balance of standards development committees and increases the level of openness into the standards development process. The contribution from Federal agencies is embedded in many IPC standards. Federal agencies bring specific expertise and knowledge that may not reside within certain market segments. Over the past twenty years, organizations such as NIST have provided critical knowledge and expertise which has been incorporated into design, assembly and data exchange standards. Our comments provide an overview of how Federal agencies', such as NIST's, involvement in nearly forty different IPC standard development committees has helped the electronics industry.

Standards are Essential for Industry

Standards are essential for industry success. Standards help ensure that products, specifically electronics, are reliable, improve repeatability and reproducibility within manufacturing operations, provide common terminology for communication throughout the supply chain, and lower costs for manufacturers. Standards are reflections of best known practices within an industry. By having standards, a common protocol for communication is established and better understanding within the supply chain is obtained. By identifying product specifications, standards ensure better product performance, longevity, and compliance with regulations. Standards specify desirable characteristics of products that typically relate to a product's quality, reliability, and efficiency. The development and manufacture of products is more efficient, reliable, and economical because of standards. Standards allow manufacturers to produce products that meet stringent quality tests down the line, minimizing costly delays, rework, or scrap. If a product is built according to an accredited standard, the product will most likely be of premium quality. Standards allow for efficient manufacturing, high quality products, and cost efficient manufacturing resulting in overall industry success.

Standards are more effective than regulations for advocating best industry practices. IPC standards are created by contributions from multiple sources. Typically, all sources for standard creation have some type of subject matter expertize as well as a vested interest in development of the standard. IPC standards development committees are made up of volunteers from the electronics community. There is a proactive and balanced approach taken within the standards process that does not typically occur within the regulatory process. The standards development process is consensus-based allowing for an honest discussion on a topic and reaching a general consensus among stakeholders rather than regulatory requirements being imposed on stakeholders. The open, consensus-based nature of standards allows for the creation of useful, important standards that benefit the electronics industry and are widely adopted.

Federal Involvement in Private Sector-Led Standards Development is Effective and Necessary

Federal participation in standards for the electronics industry has been proven effective over the past two decades. In the development of highly technical standards, government expertise and knowledge has been a significant factor in deploying advanced technology to small to medium size manufacturing companies. Due to collaboration among government and industry better standards have been developed and accepted by the industry. Federal agencies, such as NIST, have participated in IPC standards-setting activities directly as subject matter experts and by taking an active role in both identifying a need for standards and leading the standards development process in collaboration with the private sector. Several NIST employees have provided extremely valuable information and guidance that is essential to the effectiveness of standards in the electronics industry. NIST's involvement in IPC standards has enabled many IPC standards to be more sophisticated and robust in what they aim to accomplish. Federal participation in IPC standards has been highly effective, beneficial to the industry, and should continue.

NIST has taken a leadership role in the development of standards for high-speed/high-frequency electronics that support many defense electronics manufacturers. Several NIST employees have provided excellent test method protocols for evaluating loss of dielectric substrates and propagation delay of lines on printed boards, which have been incorporated into standards development efforts in these areas. The IPC D-24b High Frequency Resonator Test Method Task Group developed the *IPC-TM-650, Method 2.5.5.13, Relative Permittivity and Loss Tangent Using a Split-Cylinder Resonator*, which is a non-destructive test methodology for measuring the relative permittivity and loss tangent of unclad dielectric substrates at microwave frequencies. The IPC D-24a Propagation Delay Test Methods Task Group created the *IPC-TM-650, Method 2.5.5.11, Propagation Delay of Lines on Printed Boards by Time Domain Reflectometry* (*TDR)*, a methodology that specifies TDR procedures for measuring and calculating the propagation delay of uniform, controlled impedance transmission lines fabricated in printed board technology. Without NIST's leadership in this task group, IPC would not have had the ability to describe in detail the measurement apparatus (split-cylinder resonator) utilized within IPC-TM-650, Method 2.5.5.13, nor the expertise needed to convey how to properly measure relative permittivity and loss tangent. NIST's Electromagnetic Properties of Materials Project in Boulder, CO was also crucial in providing a source for executable code in the software used for making such measurements. NIST involvement in these standards allowed for better, more effective standards in the electronics industry.

NIST has also provided leadership for industry guidelines on controlled impedance and RF/microwave design for printed boards. The IPC D-21b High Speed/High Frequency Design Task Group's development of the *IPC-2252 Design Guide for RF/Microwave Circuit Boards* was chaired by a NIST employee. Without NIST's leadership, the ability to collect and validate the equations used in the standard would have taken significantly longer, pushing back the release of IPC-2252. NIST contributed heavily to the rewriting of numerous sections, as this document was a replacement for the previous IPC-D-316 design guide, creating a more effective standard. NIST employees also led the effort to revise *IPC-2141 Design Guide for High-Speed*

Controlled Impedance Circuit Boards. NIST's leadership was crucial in obtaining unbalanced line equations for surface and embedded microstrips and symmetric and asymmetric strip lines in transmission lines. NIST participation has resulted in better practices in high speed/high frequency electronics which benefit all users and suppliers in the electronics market.

NIST participation and leadership during the initial development of the *IPC-1752A Materials Declaration Management Standard* allowed for a better standard to be implemented throughout the entire electronics supply chain. During the effort, industry and NIST personnel worked together to develop a standard that communicates regulatory reporting for electronic products throughout the supply chain. IPC-1752A focuses on materials, or substances, in products. Exchanging information on substances in products allows for easy determination of compliance. NIST personnel developed a data model for this standard, and others in the same series that allows for a more robust and better designed standard that is widely adopted. NIST also provided expertise in developing an XML schema that makes the standard much stronger and has led to the TC111 standard being modeled after IPC-1752A. The implementation tool developed by NIST was distributed without charge to the electronics manufacturing community for their use in meeting the new restrictions, which allowed for easy, widespread adoption of the standard.

Federal involvement in IPC standards has enabled the creation of effective, necessary standards that are beneficial to the entire electronics industry. NIST's support of IPC standards has helped in producing better designed, robust standards that support U.S. electronics manufacturing. The electronics industry is extremely fortunate to have NIST involvement in the standards development process.

Adequate Resources Are Needed For Successful Standards

Adequate resources are needed for the development and completion of successful standards. The availability and commitment of financial resources, personnel, and expertise is essential to the success of standards. IPC's standards development process is entirely voluntary and does not require an IPC membership to be part of a standards development committee. Developing an open, consensus-based standard typically takes years to complete, requiring long-term commitment from interested, knowledgeable stakeholders. Federal participation in IPC standards typically involves devoting individuals' time and technical expertise. The financial resources associated with Federal involvement in IPC standards tends to be minimal and varies depending on the specific standard but certainly includes allocation of staff time and travel monies. Contributions of valuable expertise, knowledge, and time are the most valuable resources for developing and finalizing a successful standard.

Conclusion

Throughout all industry sectors, standards are an essential aspect to successful business practices. Standards allow for reliable products, cost efficient manufacturing, and improved supply chain communication. Federal participation in industry standards is critical because of the expertise and technology that is deployed into the electronics industry through the adoption of standards. The cooperative efforts between industry and Federal agencies, such as NIST, allows for the United States to be more competitive in the world electronics market place. The cooperation between IPC and NIST has been in existence for over twenty years. The IPC looks forward continuing to be the world leader in development of standards for the electronics industry. We are hopeful that Federal agencies will continue to support the electronics industry through collaborative standards development. We believe the Federal investment into standards development activities will improve the competitiveness of the entire U.S. supply chain on a global basis.