



**JOINT STATEMENT OF THE 16TH MEETING OF THE
WORLD SEMICONDUCTOR COUNCIL (WSC)
MAY 24, 2012
SARATOGA SPRINGS**

The world's leading semiconductor industry associations – consisting of the Semiconductor Industry Associations in China, Chinese Taipei, Europe, Japan, Korea and the United States – held the 16th meeting of the World Semiconductor Council (WSC) today. This meeting, held in Saratoga Springs, New York in the United States, was conducted under the “Agreement Establishing a New World Semiconductor Council” approved at the third WSC meeting and signed on June 10, 1999, and amended on May 19, 2005.

The WSC meets annually to bring together industry leaders to address issues of global concern to the semiconductor industry. The WSC has the goal of promoting cooperative semiconductor industry activities, to expand international cooperation in the semiconductor sector in order to facilitate the healthy growth of the industry from a long-term, global perspective. It also supports expanding the global market for information technology products and services. Further, it promotes fair competition, technological advancement, and sound environmental, health and safety practices. The WSC encourages cooperation in such areas as environment, safety and health practices, protection of intellectual property rights, open trade, investment liberalization, and market development. All WSC activities are guided by a basis of fairness and a respect for market principles consistent with World Trade Organization (WTO) rules and WSC member association bylaws. The WSC reaffirmed that markets should be open and competitive. Antitrust counsel was present throughout the meeting.

The meeting was chaired by Rich Beyer of Freescale Semiconductor for the Semiconductor Industry Association in the United States, who welcomed the delegates to Saratoga Springs. Regional delegations attending the meeting were chaired by Tzu-Yin Chiu of Semiconductor Manufacturing International Corporation (SMIC), Rick Tsai of TSMC, Carlo Bozotti of ST Microelectronics, Junshi Yamaguchi of Renesas Electronics Corporation, and Oh Chul Kwon of SK Hynix.

During the meeting, the following reports were given and discussed, and actions on these were approved:

Free and Open Markets

(1) Multi-component ICs

WSC calls upon GAMS to continue to facilitate the growth of the semiconductor market by ensuring free and open markets by eliminating tariffs and non-tariffs barriers for all semiconductor products including new types of semiconductor products such as multi-components ICs (MCO).

In order to facilitate progress of discussions among GAMS , WSC has agreed on a common industry proposal for a definition of such Multi-component ICs as appended to this Joint Statement in Annex 1 and requests GAMS to - at its 2012 meeting – agree on this definition and conclude an agreement to – per January 1, 2013 - eliminate import duties on these products.

In order to facilitate rapid conclusion on this issue the WSC suggests GAMS to have advanced consultations and convene a technical meeting if necessary before its September 2012 meeting.

In conjunction with this definition proposal the WSC recommends the GAMS to agree on an effective review mechanism, to ensure that the coverage of the MCO definition and the associated zero duty agreement is regularly adapted to keep pace with ongoing technology and product developments.

With respect to this annual review mechanism, the WSC recommends that Members of the GAMS shall at each annual meeting, upon the advice of the World Semiconductor Council, review the product coverage specified in this Agreement, with a view to agreeing, by consensus, whether in the light of technological developments, experience in applying the tariff concessions, or changes to the HS nomenclature, the coverage should be modified to include additional components or products.

WSC highly appreciates the agreement among GAMS to move forward on MCO and trusts that they will soon receive the same duty treatment as monolithic integrated circuits.

With regard to the 2017 Review of the Harmonized System, WSC requests the inclusion of semiconductor sensors, actuators, resonators and oscillators - as defined in Annex 2 to this joint Statement - in the general category of discrete semiconductors - HS 8541 - of the Harmonized system, and the inclusion of Multi-component ICs in HS heading 8542 for Integrated Circuits.

WSC respectfully requests GAMS to take the necessary steps.

In order to achieve expansion of the geographical coverage of the MCO agreement, upon conclusion, the WSC recommends that GAMS advocate for inclusion of the products covered by this

agreement into other multilateral agreements such as the ITA, the Doha/NAMA, or other multilateral Free Trade Agreements.

(2) Multichip ICs (MCP) agreement

The WSC recommends that the GAMS continue to work to expand the current geographic scope of the 2006 MCP agreement. The WSC appreciates the possibility that certain non-GAMS members may join the agreement. Against this background, WSC considers it of particular importance that all current GAMS members join the agreement. The WSC calls upon all GAMS members to consider pragmatic approaches to facilitate this objective.

In order to achieve expansion of the geographical coverage of the MCP agreement, the WSC recommends that GAMS advocate for inclusion of the products covered by this agreement into other multilateral agreements such as the ITA, the Doha/NAMA, or other multilateral Free Trade Agreements.

(3) Encryption Standards and Regulations

In response to the GAMS 2011 request for “further WSC inputs on the semiconductor perspective on encryption and on the role of semiconductors in addressing global information technology challenges, and reporting back in 2012,” WSC reiterates its statements on encryption standards and regulations issued in 2009, 2010, and 2011 and would like to submit the following 2012 Statement:

The use of encryption has become more common and widespread in a multitude of commercial ICT applications. Indeed, nearly all ICT products contain encryption to prevent data loss, ensure security and integrity of data (e.g. personal data or in communication) and allow for valuable commercial applications such as mobile payments, e-health, e-passports.

Although encryption is a secondary feature for widely available ICT products such as garage door openers, mobile phones, ATM machines, internet browsers, DVD players and other common products, consumers demand it in their technological devices to ensure their communications are secure and private. Encryption is now part of the foundation of the internet and e-commerce developments. In many of these applications encryption functionality (besides other functions) is provided by semiconductors.

The WSC Encryption Principles developed and communicated over the last three years provide a solid set of best practices to ensure the continued growth of the ICT industry, and the significant demand for and trade in semiconductors. The WSC Principles make it clear that generally there should be no regulation of cryptographic capabilities in widely available products used in the domestic

commercial market because mandating or favoring specific encryption technologies will reduce, not increase, security and also raise product costs. Technology mandates often become outdated as technologies quickly evolve, and they create significant interoperability issues.

The 2011 WSC Encryption Principles strongly encourage the use of global or international standards, including normative algorithms, as essential to avoid fracturing the global digital infrastructure and creating unnecessary obstacles to trade. Because security functions are growing in global ICT products and applications, interoperability has become more critical and thus international security standards such as Common Criteria for Information Technology Security Evaluation will increase in importance.

These security standards often define encryption functions for protection of information and data, as well as specify cryptographic algorithms that are developed or identified for the target application areas. Using standard cryptography as part of common protocols and specifying encryption algorithms to be used (along with making provisions for handling key management, etc.), enables an infrastructure to achieve global interoperability between security functions in products and systems. Whenever possible, the WSC will continue to support greater adoption of international security standards, rather than and instead of technology mandates.

Technology mandates, including any that involve encryption use in domestic commercial markets, act as non-tariff barriers that the WSC opposes because of the significant impact they can have on society and our industry. Very few countries have regulations governing the importation and use of encryption. The global trend is toward further de-regulation for mass marketed or widely available IT items in recognition of their widespread use and very limited value in regulating the commercial market.

Nevertheless, there are several governments that are considering implementing new regulations that may affect the domestic use of encryption in the commercial market. For instance, to our knowledge one government told industry as recently as last year that it is considering regulating the importation of encryption. So far, no draft regulation has been issued. But the government is trying to understand where and how to increase its security against terrorist acts, and has experimented already in ways that have been unproductive. In particular, in 2010, the government issued proposed amendments to its telecommunication licenses that would have required equipment vendors to transfer certain technology to service providers and disclose source code as a condition of sale to those providers. The amendments disrupted the country's telecom market, and sales of equipment and the build out of telecom infrastructure abruptly halted. The controversial provisions that formed the license amendment were eventually removed due to its market impact and strong policy concerns expressed by various governments.

WSC encourages GAMS to advocate for transparency in any additional regulatory developments concerning the use of encryption in domestic commercial markets. Such transparency should include information on proposed testing and conformity assessments related to those regulatory developments. Testing and conformity assessments can create significant market barriers if they are not transparent, non-discriminatory, fully protective of intellectual property rights, based on international standards and done by qualified independent laboratories.

The availability of relevant information gives GAMS an option to weigh in on and shape the direction of potential regulatory measures and any implementing rules concerning encryption, which could impact trade in semiconductors and contradict WSC Principles, before those measures and rules are finalized. Indeed, as we noted in the 2009 Encryption Principles, “The WSC requests the governments and authorities participating in GAMS to continue their efforts to ensure that all WTO members observe the principles set forth above.” GAMS’ efforts to increase transparency and help our industry ensure compliance with the WSC Principles going forward will help keep markets open and allow innovation and the digital economy to flourish.

(4) Trade and Innovation Policy

Various international organizations are developing innovation policy principles to guide governments on how to help industry generate greater domestic innovation without distorting trade and impeding market access. Representing a global and extremely innovative industry, the WSC supports such efforts as a general matter. More specifically, the WSC requests that its members review the 14 Innovation Policy Principles adopted by APEC Leaders in November 2011.

Information Technology Agreement (ITA)

Access to affordable ICT products, including semiconductors, promotes economic development by increasing productivity across all ICT dependent industries and providing the infrastructure needed to compete in the digital age. The elimination of tariffs on a wide range of ICT products through the WTO Information Technology Agreement (ITA) has made those products more affordable and significantly increased their demand and diffusion, benefitting consumers, businesses, and the ICT industry, including semiconductor manufacturers which provide key components for the global digital infrastructure.

The WSC welcomes the recent initiative by many ITA signatories to take into account the major technology developments since 1996 and expand the ITA. In particular, WSC urges the ITA signatories to include new types of advanced and innovative semiconductors like MCPs and MCOs.

The WSC also requests the all GAMS members work closely with each other and other ITA signatories to ensure a successful and timely conclusion of the expansion of the ITA. Progress on ITA is needed to establish further trust and confidence in the WTO and the world trading system.

Export and/or Import Regulatory Restrictions

The WSC strongly supports international commitments and national efforts for creating a favorable environment that facilitates high-tech trade for civil use, including facilitation of imports and exports for civilian uses and users among major trading partners. This implies efforts to ensure that import and export controls are administered in a transparent, consistent, objective, timely and dynamic manner that takes account of technological and market realities.

The WSC recognizes that export/import restrictions on semiconductors could affect the global market. Moreover, as a hi-tech business rapidly progressing, outdated export/import regulatory restrictions and/or unnecessary administrative procedure may in reality hamper the growth and development of the global semiconductor industry.

The WSC urges GAMS members to actively communicate with WSC and provide information on each region's related revisions and reforms of export and import regulations, including the impact of those reforms on the worldwide semiconductor industry and ensure there are opportunities for further dialogue on issues such as administrative licensing requirements and procedures and improving administrative efficiency.

Analysis of Semiconductor Market Data

The WSC reviewed a semiconductor market report covering market scale, market growth and other key industry trends. The report found that in 2011 the semiconductor market had reached a record \$299.5 billion. The report highlighted how the WSC's work benefits all market segments, such as the WSC's anticounterfeiting efforts reducing counterfeit semiconductors that can effect air bags in the automotive segment, the WSC's commercial encryption work protecting privacy of medical records, and the WSC's MCO work improving trade in products that make more capable cell phones in the communications segment. The WSC also heard a special market report presentation by Nick Santhanam of McKinsey & Company on cloud computing.

Cooperative Approaches in Protecting the Global Environment

The WSC is firmly committed to sound and positive environmental policies and practices. The members of the WSC are proactively working together to make further progress in this area.

(1) PFC (Perfluorocompound) Emission Reduction

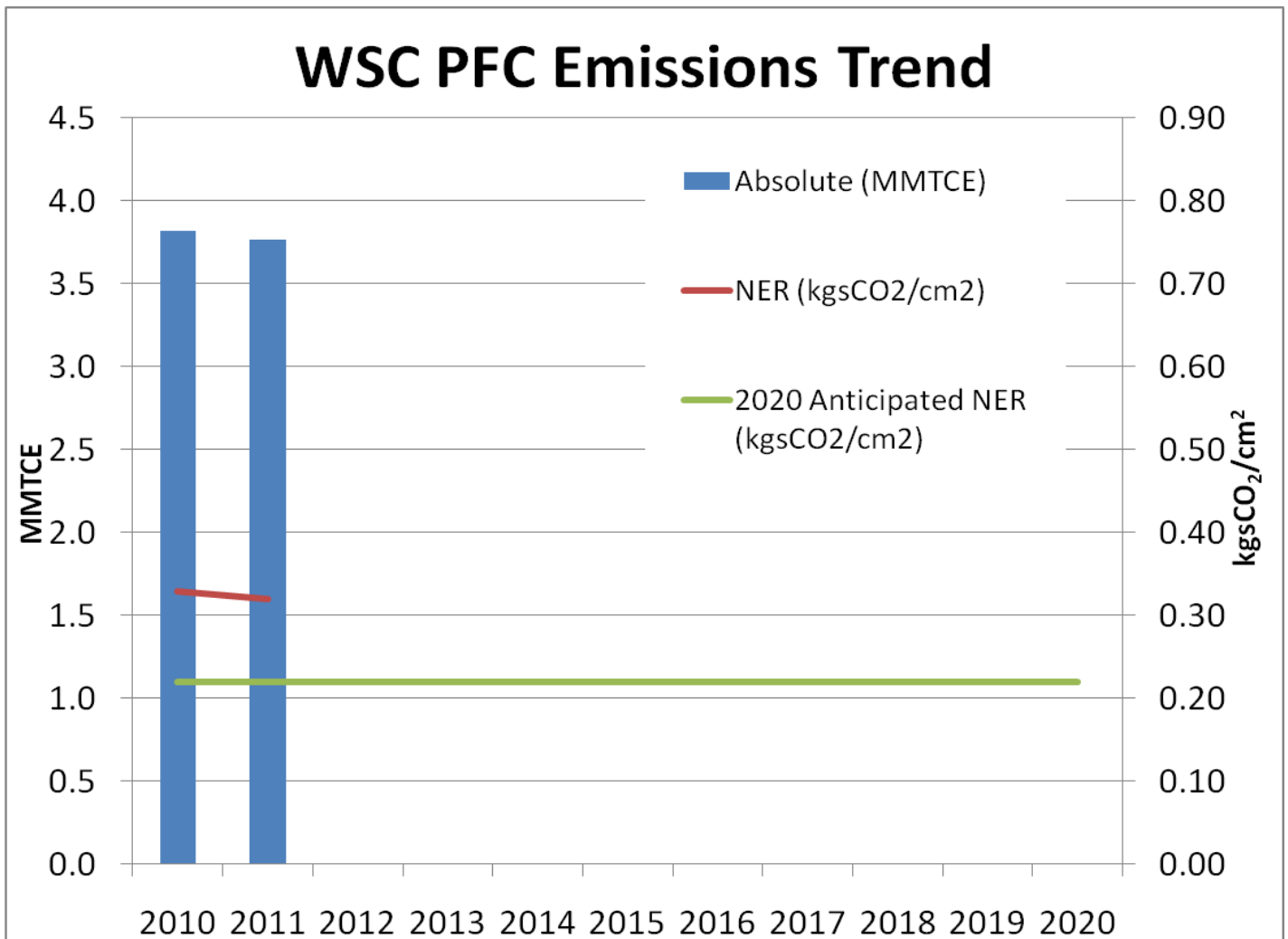
The global semiconductor industry is a very minor contributor to overall emissions of greenhouse gases, and the industry is continuously working to further reduce our contribution to emissions of GHGs. One important part of our GHG emission reduction efforts is our voluntary reduction of PFC gas emissions. In 1999, the WSC (consisting at that time of each of the original regional semiconductor associations in the U.S., the European Union, Japan, Korea, and Chinese Taipei) agreed to reduce PFC emissions by at least 10% below individual baselines for each regional semiconductor association by the end of 2010.

In 2011 the WSC announce that, the industry had far surpassed this goal. Over the 10-year period, the WSC has achieved a 32 percent reduction. The WSC also announced a new voluntary PFC agreement for the next 10 years. The elements of the 2020 goal include the following:

- The implementation of best practices for new semiconductor fabs. The industry expects that the implementation of best practices will result in a Normalized Emission Rate (NER) in 2020 of 0.22 kgCO₂e/cm², which is equivalent to a 30% NER reduction from 2010 aggregated baseline. Best practices will be continuously reviewed and updated by the WSC.
- The addition of “Rest of World” fabs (fabs located outside the WSC regions that are operated by a company from a WSC association) in reporting of emissions and the implementation of best practices for new fabs.
- A NER based measurement in kilograms of carbon equivalents per area of silicon wafers processed (kgCO₂e/cm²) that will be a single WSC goal at the global level.

The WSC agreed to report its progress on this new voluntary agreement on an annual basis. This external reporting will provide aggregated results of the absolute PFC emissions and NER trends. These figures represent combined emissions for the six WSC regional associations, in their own regions and in the “Rest of World” fabs described above. The first year results are as follows: in 2011, combined WSC absolute emissions of PFCs decreased by 1% compared to 2010, from 3.82 MMTCE in 2010 to 3.77 MMTCE in 2011. The Normalized Emissions Rate (NER) decreased by 3%, from .33 kgCO₂e/cm² in 2010 to .32 kgCO₂e/cm² in 2011. Please see the graph below which compares these results to the 30%

reduction anticipated by 2020. In addition, to improve transparency, the WSC will make its Best Practices for PFC Reduction available on the WSC website before the end of 2012.



(2) Energy Savings in Semiconductor Manufacturing

The energy consumed in the semiconductor manufacturing process continues to be a key focus of the industry’s environmental and sustainability practices worldwide. The industry’s energy consumption is relatively small, however it is through the energy efficiency enabling functions of semiconductors as deployed in a wide-range of products that the energy benefits in reducing consumption throughout society are visible. The industry continues to innovate in the field of energy efficiency by offering more products that can lead to significant environmental benefits and opportunities for cost savings.

The WSC continues to focus on reducing greenhouse gas emissions and energy consumption in the manufacture of semiconductors and will work on the technical aspects with our suppliers to evaluate cost-effective improvements to existing tool-equipment sets and establish active and meaningful optimization goals as part of new equipment design.

(3) Quantitative Targets

The WSC members are continuing to focus on resource conservation activities in the production process. The normalized reduction (per cm² of silicon wafers processed) of electricity from 2001-2011 was 36%, water used in manufacturing 45%, and waste generated 44%, compared to 2001. The WSC continues to pursue environmental conservation programs in these areas.

(4) Chemical Management Policy

The WSC recognizes the important role that materials innovation, advancements in the use of chemicals, and emerging technologies has in achieving further technological progress in the semiconductor industry in producing technologies that provide numerous societal and economic benefits. In addition, the industry is committed to achieving the environmentally sound and safe use of materials, chemicals, and new technologies. In achieving the proper balance between continued innovation and the protection of the environment and safety, the WSC is concerned that some emerging global regulations may cause unnecessary restrictions on the industry's ability to innovate, develop new and more efficient semiconductor technologies, and allow for the global distribution and use of finished semiconductors. We wish to work cooperatively with governments and other stakeholders to ensure that regulations continue to achieve our mutual goals of continued innovation and protection of human health and the environment.

The WSC is particularly concerned with international initiatives relating to chemicals management, such as the Strategic Approach to International Chemicals Management (SAICM), an initiative of the United Nations Environment Programme (UNEP). Most of the Chemical in Products work of SAICM focused on the electronics industry is duplicative of activities being undertaken by other international bodies and national governments, and we urge governments to avoid the creation of new requirements that are already being addressed in existing regulations or that fail to leverage ongoing initiatives of the electronics industry.

The WSC urges governments to proceed carefully in regulating materials, chemicals, and new technologies in the highly innovative semiconductor industry. Such regulations should acknowledge the long-established practices in the industry relating to risk management and the use of enclosed manufacturing systems. The WSC also recommends that governments take measures that improve harmonization with existing mandatory or voluntary requirements. Our principles for government

regulation in our industry are set forth in the following link on the WSC website:
<http://www.semiconductorcouncil.org/wsc/agreements-white-papers>

Conflict Minerals

WSC acknowledges public concerns and recent governmental actions to address conflict minerals and will continue to monitor these developments.

As potential regulations and guidance are considered by governments and authorities, WSC recommends a coordinated approach to this matter – one that takes into account global industry-led initiatives to identify conflict-free smelters.

Effective Protection of Intellectual Property

(1) Fighting the proliferation of semiconductor counterfeiting

The WSC strongly believes that the proliferation of counterfeit semiconductor products creates risks to public safety and health and to critical infrastructure. The WSC welcomes the efforts of GAMS Customs officials on countermeasures being undertaken in each of the regions, and at bilateral and multilateral levels, to fight the proliferation of counterfeits. In addition, the WSC welcomes and fully supports the conclusions of the GAMS in September 2011 that further efforts, including interdicting counterfeits at the border and vigorous prosecution of those that make and distribute counterfeits, are necessary given the growth of the problem. The WSC looks forward to further cooperation with and support to GAMS customs and enforcement agencies in these efforts.

At the same time, WSC acknowledges progress being made in many regions for anti-counterfeiting activities. It confirms that results can be achieved through an effective cooperation between the industry and customs officials and enforcement agencies. It also recognizes the benefits of an integrated approach to fighting counterfeiting both at borders and within borders. Full customs recordation remains an issue industry needs to address to secure effective seizures.

The WSC encourages GAMS members to continue to implement appropriate measures (including domestic, bilateral and multilateral countermeasures) to deal with counterfeit semiconductors. The WSC also welcomes GAMS members' efforts to share information on these measures with each other's customs agencies and to report the results of these measures at the 2012 GAMS.

Building on the successful GAMS/industry anti-counterfeiting activities, the WSC would like to commit to an increase in semiconductor industry cooperative activities, alongside our governments and authorities, by formulating a specific anti-counterfeiting work plan which would be subsequently approved and supported in its design and implementation by the WSC. These enhanced anti-counterfeiting activities would help ensure that industry and governments/authorities are clearly focused on reducing and eliminating semiconductor counterfeits in the global market. This commitment from the industry side specially would also help ensure that the following five multi-lateral actions, proposed to the GAMS by the WSC (Arlington GAMS 2011), are realized:

1. Encourage companies to file trademarks in the various countries so customs agencies can take action when infringements are found
2. Work with the six governments/authorities to identify semiconductors and electronic products as key items sought by customs officers
3. Work with the six governments/authorities to develop information that will help them develop joint operations such as those previously conducted
4. Encourage semiconductor companies to provide improved materials and training for government customs agencies to enhance their ability to identify trademark infringing semiconductors
5. Develop better communications about the effects of counterfeit products with more extensive examples of the potential health and safety impacts as well as the threats to critical infrastructure

(2) Patent Quality

The WSC has long recognized that to maximize the beneficial effect that intellectual property protection has on stimulating and sustaining innovation, patent offices around the world should implement examination procedures that result in the granting of the highest quality patents possible consistent with the statutory requirements of patentability. This is of paramount importance to the WSC because the semiconductor sector is one of the most innovative and patent-intensive sectors in the global economy.

The WSC supports the centralized collection of standardized statistics regarding the processing of patents by patent offices globally, as well as the adoption of a common set of metrics to assess patent examination quality at the patent offices, and urges the GAMS to take note of this goal. The WSC believes that the centralized collection and dissemination of such data would enable more refined assessment of international patent examination practices and thereby facilitate improvements in global patent quality. The WSC also recognizes the leading role that the World Intellectual Property Organization (WIPO) serves in facilitating the collection of important IP data internationally, and in promoting patent quality and harmonization of best practices in the IP area. The WSC hopes to

cooperate with the WIPO on issues such as patent quality and in particular the collection of data relevant to monitoring patent quality. To this end, the WSC is sending a communication to WIPO requesting that WIPO consider efforts on this and related initiatives to improve patent quality, and the WSC requests GAMS to take note of this.

(3) Non-Practicing Entities (NPEs)

The WSC heard a presentation from Dr. John Allison of the McCombs School of Business, University of Texas at Austin, an independent third-party consultant retained by the Semiconductor Industry Association in Korea, regarding his recently released study on "The Effect of NPE Patent Litigation on the Semiconductor Industry."

Regional Stimulus

While WSC supports appropriate stimulus measures by the respective governments and authorities, WSC confirms its views that government actions should be guided by market principles and avoid adoption of protectionist or discriminatory measures. WSC confirms that competitiveness of companies and their products, not the interventions of governments and authorities, should be the principal determinant of industrial success and international trade, and that assistance should be provided in a market-oriented fashion. WSC reiterates that stimulus measures that promote the adoption of information technology, green IT, energy savings, and support research and development in particular have the potential to foster growth and benefit society in the years to come. WSC advocates that these policies be sustained. Discussion on this subject will be continued.

Approval of Joint Statement and Approval of Recommendations to Governments/Authorities

The results of today's meeting will be submitted by representatives of WSC members to their respective governments/authorities for consideration at the annual meeting of WSC representatives with the Governments/Authorities Meeting on Semiconductors (GAMS) to be held in September 2012 in Berlin, Germany.

Next Meeting

The next meeting of the WSC will be hosted by the Semiconductor Industry Association in the Europe in Lisbon, Portugal on May 23, 2013.

Key Documents and WSC Website:

Annex 1: WSC Consensus MCO IC Definition

Annex 2: WSC Common Industry Proposal to Amend H.S. 8541

All key documents related to the WSC can be found on the WSC website, located at:
<http://www.semiconductorcouncil.org>

Information on WSC member associations can be found on the following websites:

Semiconductor Industry Association in Europe:

<http://www.eeca.eu>

Semiconductor Industry Association in China:

<http://www.csia.net.cn>

Semiconductor Industry Association in Chinese Taipei:

<http://www.tsia.org.tw>

Semiconductor Industry Association in Japan:

<http://semicon.jeita.or.jp/en/>

Semiconductor Industry Association in Korea:

<http://www.ksia.or.kr>

Semiconductor Industry Association in the US:

<http://www.sia-online.org>

ANNEX 1)

World Semiconductor Council's Consensus Multi-component (MCO) IC Definition

May 24, 2012 – Saratoga Springs

Multi-component integrated circuits (MCOs) are a combination of one or more monolithic, hybrid, and/or multi-chip integrated circuits with one or more components^A classifiable under heading 8532, 8533 or 8541, inductors classifiable under heading 8504, or silicon based MEMS^B; formed to all intents and purposes indivisibly into a single body like an integrated circuit, as a component of a kind used for assembly onto a printed circuit board (PCB) or other carrier, through the connecting of pins, leads, balls, lands, bumps, or pads.

^A: The components may be discrete, manufactured independently then assembled onto the rest of the MCO, or integrated into other components, so they are not outwardly visible.

^B: Silicon based^{iv} MEMS includes silicon based sensors, actuators, oscillators, resonators and combinations thereof.

Silicon based sensors consist of microelectronic and/or mechanical structures that are created in the mass or on the surface of a semiconductor and that have the function of detecting physical or chemical quantitiesⁱ and transforming theseⁱⁱ into electric signals, caused by resulting variation[s] in electronic propertiesⁱⁱⁱ or displacement of a mechanical structure.

Silicon based actuators consist of microelectronic and mechanical structures that are created in the mass or on the surface of a semiconductor and that have the function of transforming electrical signals into physical movement.

Silicon based resonators and silicon based oscillators consist of microelectronic and/or mechanical structures that are created in the mass or on the surface of a semiconductor and that have the function of generating a mechanical or electrical oscillation of a predefined frequency that depends on the physical geometry of these structures.

ⁱ Physical quantities relating to real world phenomena, such as pressure, acoustic waves, acceleration, vibration, movement, orientation, strain, magnetic field strength, electric field strength, light, radioactivity, humidity, flow, chemicals concentration etc.

ⁱⁱ e.g., energy, mechanical displacement, photo-signals, etc

ⁱⁱⁱ e.g. resistance, capacitance

^{iv} "Silicon based" refers to devices built on a silicon substrate, or made of silicon materials, or manufactured onto integrated circuit die

ANNEX 2)

World Semiconductor Council's Common Industry Proposal to amend the Harmonised System classification to add MEMS as defined below as a subcategory to HS 8541

May 24, 2012 – Saratoga Springs

This (HS) category includes semiconductor sensors, actuators, oscillators, resonators and combinations thereof.

Semiconductor sensors consist of microelectronic and/or mechanical structures that are created in the mass or on the surface of a semiconductor and that have the function of detecting physical or chemical quantities¹ and transforming these² into electric signals, caused by resulting variation[s] in electronic properties³ or displacement of a mechanical structure.

Semiconductor *actuators* consist of microelectronic and mechanical structures that are created in the mass or on the surface of a semiconductor and that have the function of transforming electrical signals into physical movement.

Semiconductor *resonators* and semiconductor *oscillators* consist of microelectronic and/or mechanical structures that are created in the mass or on the surface of a semiconductor and that have the function of generating a mechanical or electrical oscillation of a predefined frequency that depends on the physical geometry of these structures.

Notes:

¹: Physical quantities relating to real world phenomena, such as pressure, acoustic waves, acceleration, vibration, movement, orientation, strain, magnetic field strength, electric field strength, light, radioactivity, humidity, flow, chemicals concentration etc.

²: e.g., energy, mechanical displacement, photo-signals, etc.

³: e.g. resistance, capacitance