



iNEMI

International Electronics Manufacturing Initiative

iNEMI China and the Green Electronics Roadmap

*Bob Pfahl
Jim McElroy
June 26, 2007*

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Outline

- **Introduction to iNEMI**
- **iNEMI and China**
- **iNEMI Environmentally Conscious Electronics Roadmap**
- **Summary**



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Introduction to iNEMI

- *Roadmapping the Industry Needs*
- *Closing the Gaps through Projects*

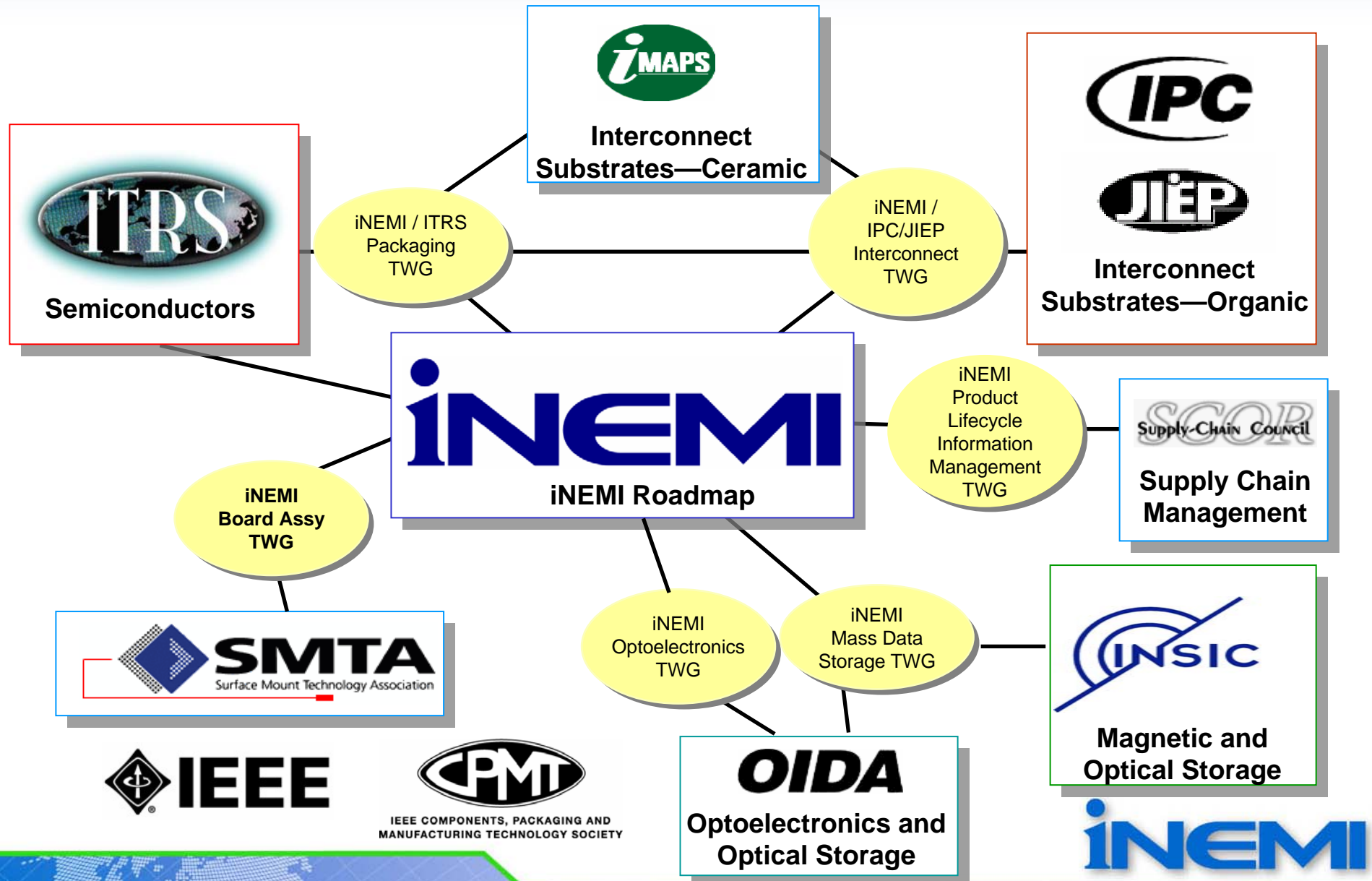
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2007 Roadmaps

19 Individual Roadmap Chapters

- Semiconductor Technology
- Packaging
- Mass data storage
- Board Assembly
- Final Assembly
- **Environmentally Conscious Electronics**
- Interconnect Substrates Organic
- Interconnect Substrates Ceramic
- Connectors
- RF Components & Subsystems
- Optoelectronics
- Passive Components
- Energy Storage Systems
- Organic & Printed Electronic
- Modeling, Simulation & Design Tools
- Thermal Management
- Test, Inspection & Measurement
- Product Lifecycle Information Management
- Sensors

9 Contributing Organizations



Statistics for the 2007 Roadmap

- **> 500 Participants**
- **> 265 Companies/organizations**
- **17 Countries from 4 Continents**
- **19 Technology Working Groups (TWGs)
(added Organic & Printed Electronics)**
- **5 Product Emulator Groups (PEGs)**
- **Over 1300 Pages of Information**
- **Roadmaps the needs for 2007-2017**

Research Priorities

- 2007 Gap analysis being completed
- 10 year priorities being created
- Distribute to members & others
- Contents:
 - Technology Research Needs by Product Sector
 - Priorities Summarized by Research Area
 - *Manufacturing Processes*
 - *System Integration*
 - *Materials & Reliability*
 - *Energy and the Environment*
 - *Design*
 - Significant Gaps and Issues from Roadmap
 - Options for Innovation



Closing Gaps: Environmental Projects to Eliminate Pb Solder

- **1998 Roadmap identified the technology gap.**
- **Phase I project developed the alloy, process, components and reliability from 1999-2002.**

Results:

- **The iNEMI efforts accelerated the establishment of SAC alloys as the standard and reduced the effort in each member company.**
- **Phase II projects expanded the technology base to include assembly and rework of large complex PWB assemblies.**



Closing Gaps: Environmental Projects to Eliminate Pb Solder

- **2002 Roadmap identified a number of business issues to convert to a Pb-free supply chain.**
- **Five Phase III project teams addressed these supply chain transition issues.**
- **Four Phase IV projects are on going to close the following technology gaps:**
 - **Wave/selective solder**
 - **Mixed assemblies (Pb-free BGA's in a SnPb assembly process)**
 - **Pb-free component surface finishes**
 - **Pb-free rework optimization**

OEM/EMS Members



Alcatel-Lucent



CISCO



ANALOGIC 

*The World Resource
for Health & Security Technology*



HUAWEI



DELPHI

invent



Medtronic

Alleviating Pain · Restoring Health · Extending Life

Microsoft [®]

JABIL



MICRO SYSTEMS
ENGINEERING



MOTOROLA

PLEXUS [®]



SANMINA-SCI



SOLECTRON [®]



Sun
microsystems

symbol [®]
The Enterprise Mobility Company [™]

Supplier Members



Ciba



Association/Consortium, Government, Consultant & University Members



NIST

National Institute of Standards and Technology

*Développement
économique
et régional*

Québec 

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Board of Directors

Directors

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Globalization and iNEMI China

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iNEMI Evolution – Phased Approach to Globalization

- **The Board of Directors embarked on a process in 2002 to change the organization to better meet the needs of member companies in today's global market place.**
- **They decided to adopt a phased approach to proceed in a deliberate and controlled way.**
- **For each phase there have been key goals and clear success criteria.**

Phase 1 – Global Roadmapping

Key goals:

- Expand roadmap process to create global view of future
- Explore regional deployment collaboration using experience in China as vehicle

Success criteria:

- Acceptance of Roadmap as global document
- Developing regional collaboration within membership

Completed

Regional Center in China

- **iNEMI Chinese Collaboration has been active for three years.**
 - Member forums
 - Project support
- **Made decision in 2006 to proceed with China center:**
 - Signed lease for Office in March.
 - Occupied the office June 25, 2007
 - Manager will be: Dr. Haley Fu
 - Official Starting Date July 23, 2007
 - PhD from Shanghai Jiao Tung University with studies at TU Berlin

Haley Fu **Ph.D.**
Manager of Operations-China

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Highlights from 2007 iNEMI Environmental Roadmap

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2007 ECE Roadmap Focus Areas

To remain competitive, the electronics industry must continue to keep pace with emerging:

- material restrictions,
- end-of life requirements,
- customer preferences for energy efficient products,
- holistic design requirements.

While meeting increasing reliability requirements:

- All packaging materials will change over the next decade to meet reliability, **environmental**, and **miniaturization** requirements.

Strategic Issues from ECE Roadmap

1. To minimize supply chain chaos and reduce the need to manufacture region-specific products it is critical that emerging international requirements of a given topic do not substantially differ in scope:
 - Harmonization through international standardization is essential.
 - Equally important that industry harmonize its technical responses.
2. The area of Corporate Social Responsibility (CSR) is being driven by multiple factors, including:
 - Globalization of the world economy,
 - Failure of firms to effectively police themselves,
 - ability of the Internet to provide almost instant access to information.
 - With environment as one of the pillars of CSR and an area of increasing global concern, there will be **increasing need to demonstrate that a firm is actively engaged.**

Strategic Issues from ECE Roadmap

An Increasing Need To Influence & Optimize The Global Regulatory Process

1. **Set Regulatory Goals Which Allow Flexible Compliance Strategies**
 - Recognize Diversity Of Products & Business Operations
2. **Support Harmonized International Standards**
 - Standards Effectively Preserve Regulatory Objectives
 - Can Be Integrated Efficiently Across Different Business Models And Extended Supply Chains
 - Ensures The Benefits Of Technology Reach Consumers & The Community In The Most Efficient Way.



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Pb-free Conversion: Current Situation

- *High Volume Market has converted*
- *High Rel. Market has not converted*

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Industry Readiness

- **9 of 11 Telecommunications OEMs Polled took Pb-free Exemption for Solder In Network Infrastructure Equipment**
- **A dual component supply chain has resulted**
 - **Pb-free components for high volume consumer market**
 - **Traditional SnPb components for**
 - **Telecommunications**
 - **Servers**
 - **Military products**
 - **Medical electronics**
- **Reliability of Pb-Free Components with Eutectic Solder has not been fully demonstrated for long life products.**
- **Some Telecom service providers are now demanding that mission critical equipment remain with SnPb solder.**
- **Suppliers are not willing to provide traditional components to small high reliability market.**

iNEMI High Rel Task Group

Objectives

- **Gain a common understanding of the supply chain challenges facing High Reliability OEMs/EMS providers who are:**
 - Taking Pb exemption (e.g. telecom switching, high end servers, etc.)
 - Out of Scope of RoHS (e.g. measurement equipment, medical)
- **Share experiences between OEMs/EMS providers on current state of supply base**
- **Define the gaps that this Pb-free move leaves for the high reliability products.**
- **Influence supply base to meet on-going needs of these industry segments.**
- **Consumer Electronics drive the cost and the market**
 - **The high rel. market must develop a viable scenario to take advantage of consumer components and meet their reliability requirements.**

Scenarios

- **Long term solution is to reduce reliability risk of Pb-free components and assembly.**
 - The economic incentive is compelling
 - Well worth technology investment
 - Could take several years to complete but this is cumulative, so strides made today are useable.
- **What can we do in the short term to help encourage the availability of SnPb compatible BGAs?**
- **What can we do in the mid term to close remaining knowledge gaps that the High Rel. segments face?**
- **What can be done longer term to better understand and predict reliability of electronics hardware using Pb-free components and assembly?**

Additional Issues

- **Proliferation of Pb-Free metallurgies is significantly complicating the issue of closing knowledge gaps!**
 - Alloys behave differently
 - Can effect form/fit/function
 - supplier A part does not behave like supplier B part in mfg. and/or use.
 - Users are demanding new part numbers from their suppliers
- **Transition in Reliability Concerns**
 - Initial concerns with SAC alloys were thermal cycling
 - Current concern is mechanical failure.

Conclusions

- **All Materials will continue to be modified**
 - **Reliability verification of these changes is crucial**
- **Consumer Electronics drive the cost and the market**
 - **The high rel. market must develop a viable scenario to take advantage of consumer components and meet their reliability requirements.**
- **Firms are expected to be Socially Responsible**
 - **Industry must establish proactive science based programs to addresses potential environmental risks.**
 - **Stakeholders must be involved in the process from the beginning.**



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Summary

- *Roadmapping the Industry Needs*
- *Closing the Gaps through Projects*

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Sino-European Workshop on Green Electronics Technology

- **iNEMI is a Global Organization:**
 - **We are starting a center in China**
 - **We have strong participation in Europe**
- **iNEMI is the leader in roadmapping and closing the technology gaps for Green Electronics.**
- **We welcome alliances with regional organizations and membership for firms who share our objectives.**





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