

# NEMI Pb-free Task Group Report

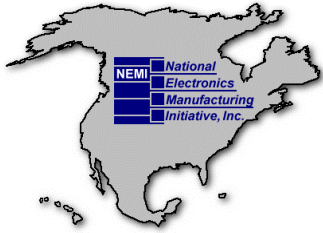


*Edwin Bradley*

*Motorola - Advanced Product Technology Center*

*Project Leader*

*01-17-01*

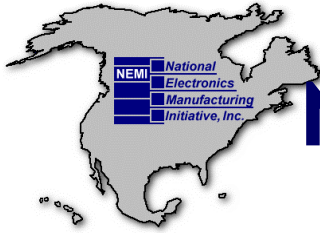


# NEMI Pb-free Forum Agenda

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<b>9:45-10:00a</b>	<b>General project overview</b>	<b>Edwin Bradley (Motorola)</b>
<b>10:00-10:20a</b>	<b>Pb-free Alloy Database</b>	<b>Carol Handwerker (NIST)</b>
<b>10:20-10:55a</b>	<b>Soldering Process</b>	<b>Jasbir Bath (Solectron)</b>
<b>10:55-11:20a</b>	<b>Solder Joint Reliability</b>	<b>John Sohn (Lucent)</b>
<b>11:20-11:45a</b>	<b>Component overview</b>	<b>Rich Parker (Delphi)</b>
<b>11:45-12:15p</b>	<b>Final Q&amp;A for panel</b>	<b>All</b>

- **Short Q&A after each presentation.**
- **Copies of the presentation emailed those leaving business cards.**



# NEMI Environmental Activities

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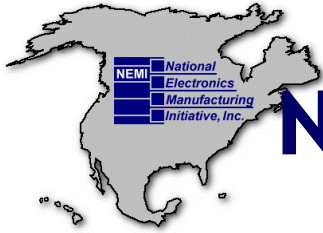
## ■ Bromine-free flame retardants

- Working with ITRI (US) on non-brominated flame retardants for PC boards.
- Looking at other plastics of concern to see if we can define the problem, and come up with some solutions.

## ■ Recycling

- Pb-free and bromine might go away if we had good recycling and reuse programs.

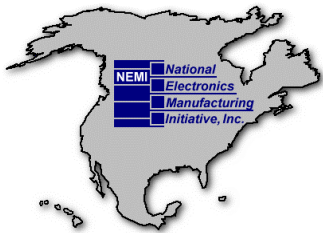
## ■ Pb- free Solder



# North America Electronics Goal

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- **N. American OEMs/CEMs need to prepare processes to be able to deliver Pb-free products in 2001 with an ‘eye’ to total Pb-elimination by 2004.**
  - **Japan driving “Green” consumer products.**
    - **Timetables seem to be holding (2001-2003)**
  - **NEMI companies received serious inquiries.**
  - **EU legislation positioned to ban lead in electronics in 2008.**
    - **Individual Countries can shorten timeframe.**



# Task Group Participants

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## OEMs/CEMs

Alcatel Canada  
Celestica  
Compaq  
Delphi/Delco  
IBM  
Intel  
Kodak  
Lucent  
Motorola  
SCI  
Solectron  
StorageTek

## Solder Suppliers

Alpha  
Heraeus  
Indium  
Johnson Mfg.  
Kester

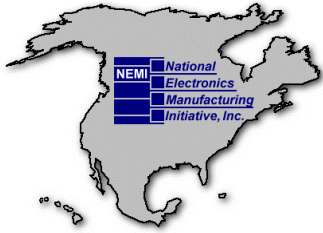
## Components

ChipPac  
Intel  
Motorola  
Texas Instruments  
FCI

## Govt. Agencies/Other

NIST  
SUNY-B/IEEC  
ITRI (US)  
IPC  
Universal Instr.  
Vitronics-Soltec

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# Lead Free Standards

## ■ Leverage of NEMI Member Companies

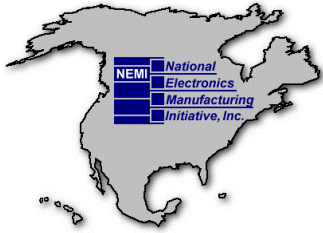
- NEMI membership represents a significant segment of the industry, show that Pb-free is real issue.
  - ✓ NEMI member companies employ over 1M workers
  - ✓ NEMI member companies recorded \$300B in sales during 1999.

## ■ However, maximum benefit achieved through world wide agreement .

- Tie to worldwide activities: SEMI, HDPUG

## ■ Update/create JEDEC standards.

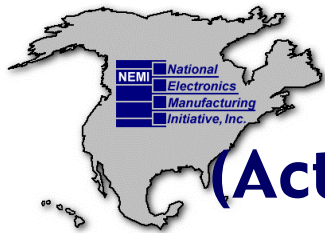
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# Major Task Group Objectives

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- **Demonstrate capability to deliver products in volume in 2001 with Pb-free interconnects.**
- **Facilitate a common Pb-free solder alloy composition for N.American electronics assembly.**
- **Work with component and PCB suppliers to develop specifications necessary to meet high temperature reflow conditions.**
- **Develop criteria that industry can use to evaluate Pb-free processes.**
- **Monitor environmental legislation to adjust activities if necessary.**



# Sub-Groups

(Actual Work Centers for Major Group Activities)

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## ■ Alloy

- Alloy section
- Material Property Database generation.
- Interface w/academia, gov't agencies.

## ■ Components/PCBs

- High temperature reflow
- Pb-free terminations

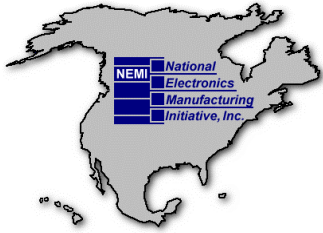
## ■ Solder Reliability

- Transparent test procedure.
- Common data to share with industry.

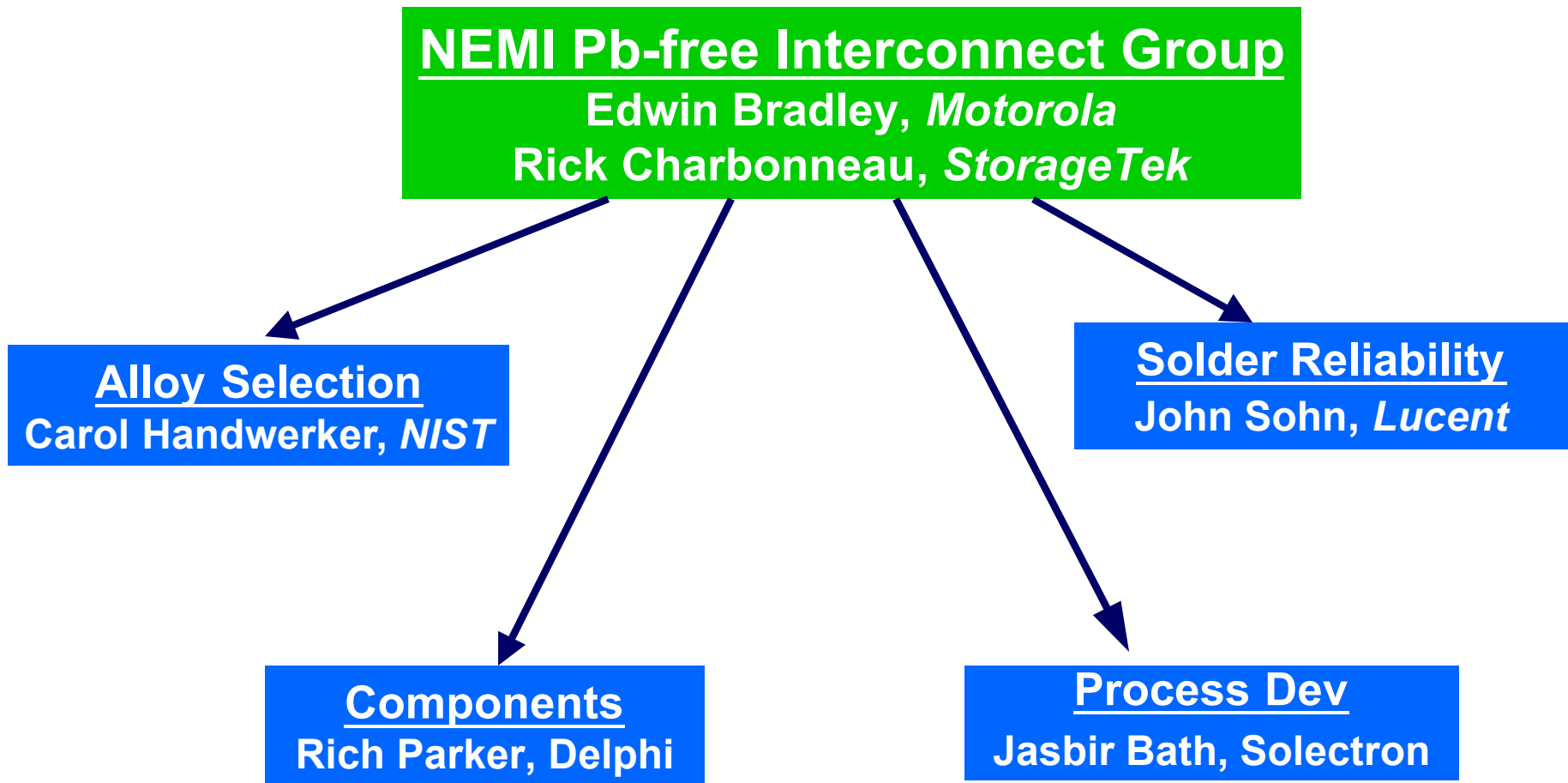
## ■ Process Development

- Generic process for Reliability test boards.

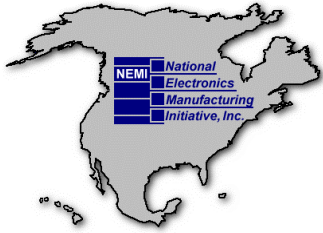
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# Task Group Structure

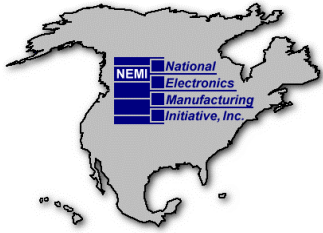


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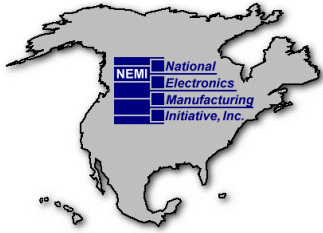
# Communications

- **IPC Works, Oct. 1999 presentation and helped organize technical session.**
- **SUNY Binghamton Lead-free Symposium, Dec. 1999**
- **Circuits Assembly Article, Dec. 1999.**
  - General project summary.
- **Advanced Packaging article, Feb. 2000.**
  - Alloy selection published, more detailed project summary.
- **Panel Discussion at APEX 2000.**
- **Circuit Assembly, May, 2000.**
  - Specific Pb-free alloy paper.
- **Circuitree article, July 2000.**
- **HDPUG/SEMI meeting, Oct. 2000.**
- **Organized APEX 2001 Pb-free session.**



# Overall Summary

- **Recommended Sn-3.9Ag-0.6Cu (+/-0.2) for reflow, Sn-0.7Cu for wave in Oct. 1999.**
- **Defined solder parameters needed for reliability modeling.**
  - **Communicated needs; posted on <http://www.nemi.org/>**
  - **Workshop hosted by NEMI/NIST/NSF/TMS planned 2/15/01**
- **In middle of test plan for solder reliability to complement other consortia tests.**
- **Working with JEDEC committee leadership on development of appropriate component specs.**
  - **Carried out study on IC packages MSL data to quantify seriousness of problem.**



# Overall Summary

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- **Defined reflow profile for component evaluations.**
  - **Developed reflow process/profile for reliability boards.**
- **Working with ITRI(U.S.) on suitable board materials and lead finishes.**
- **Plan to complete project in September, 2001.**
- **Actual Pb-free implementation decision up to member companies.**