



Pb-Free Electronics Overview of the Drivers, R&D, and Status of Implementation

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Outline

- ◆ Drivers
- ◆ Overview of R&D
- ◆ Status of Implementation

Drivers for Elimination of Pb

◆ Increasing Environmental Legislative Activity

- Pb-Bans in Products
 - ◆ All Electronics-RoHS in Europe (July 2006)
 - ◆ Cables (100 PPM) Proposition 65, California (2002)
- End-of-Life Disposal Legislation
 - ◆ Electric Home Appliances Recycling Law in Japan (1998)
 - ◆ WEEE in Europe (July 2005)
 - ◆ Automotive Legislation in Europe
 - ◆ EOL legislation pending in 20 states

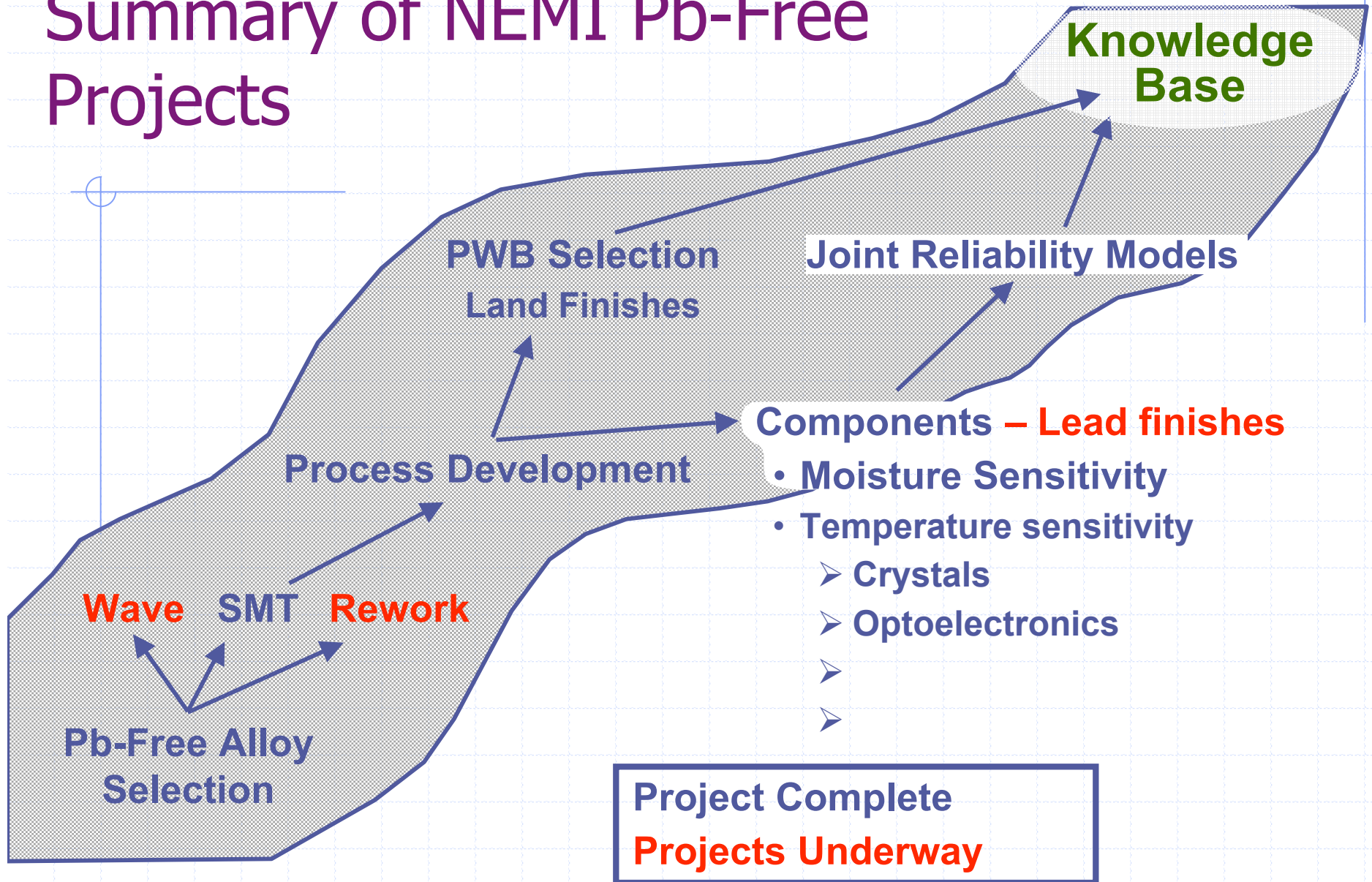
◆ Commercial Customer Requirements

- Multiple motivations at work
 - ◆ Corporate stewardship/image
 - ◆ Product marketing advantage

Situation Analysis: Technology

- ◆ NCMS Pb-free Program 1994 To 1998
- ◆ NEMI Pb-free Projects 1999 To Present
 - Lead Free Assembly Project:
 - ◆ Alloy, Process, Components, Reliability
 - Advanced Pb-free Assembly and Rework Development Project:
 - Tin Whisker Modeling project:
 - Tin Whisker Accelerated Test Project:
 - Tin Whisker Users Group:

Summary of NEMI Pb-Free Projects



Pb-Free Project Summaries

◆ Solder Alloy

- Recommended Sn-3.9Ag-0.6Cu for reflow and Sn-0.7Cu for wave.

◆ Components

- 240C max achievable for large IC's, 250C max for small IC's on Boards \square 0.92" thick
- JEDEC Revised J-STD-020B standard 250°C -5/+0

◆ Process

- Manufactured with existing assembly process equipment
- Performance of Pb-free pastes and fluxes are adequate.

◆ Reliability

- **Demonstrated Pb-free Joints are more reliable than Tin-lead**

On-Going Technology Development

- ◆ Work still needed to implement/understand SnAgCu solders. Projects underway on:
 - Board Laminates & ability to withstand higher temp.
 - Board finishes for SnAgCu soldering
 - Component lead finishes
 - ◆ Tin whisker accelerated stress testing
 - ◆ Fundamental understanding of tin whisker formation
 - Component replacement & rework
 - ◆ Thin (0.060") and thick (0.130") Boards
 - Wave Solder for Pin-in-hole components

Situation Analysis: Implementation

- ◆ Widespread introduction of Pb-free solders in Japan
- ◆ Limited introduction of Pb-free solders in North America and Europe
- ◆ The most pressing implementation issue for Pb-free solder is the availability of components specified to meet higher soldering temperatures
- ◆ Pb-free components are becoming available; however, lead finishes are still under debate for high reliability applications.
- ◆ Need effort on eliminating Pb in Cables
- ◆ NEMI evaluating how to facilitate the conversion of the supply chain.