Burn-in & Test Socket Workshop

March 2 - 5, 2003
Hilton Phoenix East / Mesa Hotel
Mesa, Arizona

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Burn-in & Test Socket Workshop

Technical Program

Presentation And Panel Discussion
Sunday 3/02/03 8:00PM

Reducing The Cost Of Test & Burn-in - What Are The Options?

"Cost Considerations In Burn-In Equipment Development"

Anne Sepic - Intel Corporation **Dan Weinstein** - Intel Corporation

Moderator:	**Fred Taber**	IBM Microelectronics
Panel Members:		
	Ken Heiman	Micro Control Company
	Marc Knox	IBM Microelectronics
	M.S. Maung	Advanced Micro Devices
	Helge Puhlmann	Yamaichi Electronics Deutschland
	Steve Strauss	Intel Corporation
	Bob Zacharis	Pycon

BiTS **Burn-in & Test Socket Workshop**

Panel Members

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Cost Considerations in Burn-In Equipment Development

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Anne Sepic & Dan Weinstein
Capital Equipment Development
Intel Corporation

BiTS
BURN-IN & TEST SOCKET WORKSHOP

Agenda

- **Semiconductor Industry Trends**
- **Burn-in trends:**
  - Costs
  - Capability
- **Equipment strategies for lowering total BI cost of ownership:**
  - Equipment architectures to enable high utilization
    - Process considerations
  - Cost drivers and tradeoffs
  - Design for extendibility
  - Design for reliability/maintainability

31%

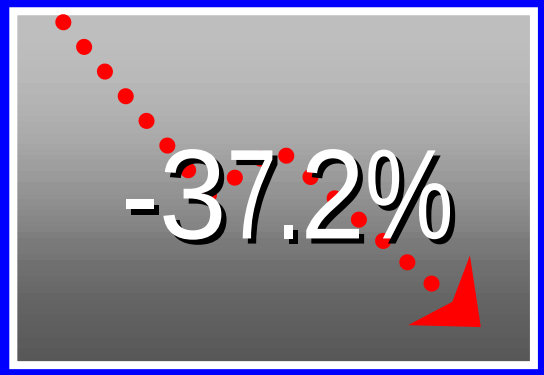
Semiconductor Revenues

High Tech Job Cuts

740,529

Chip Equipment Revenues

41%

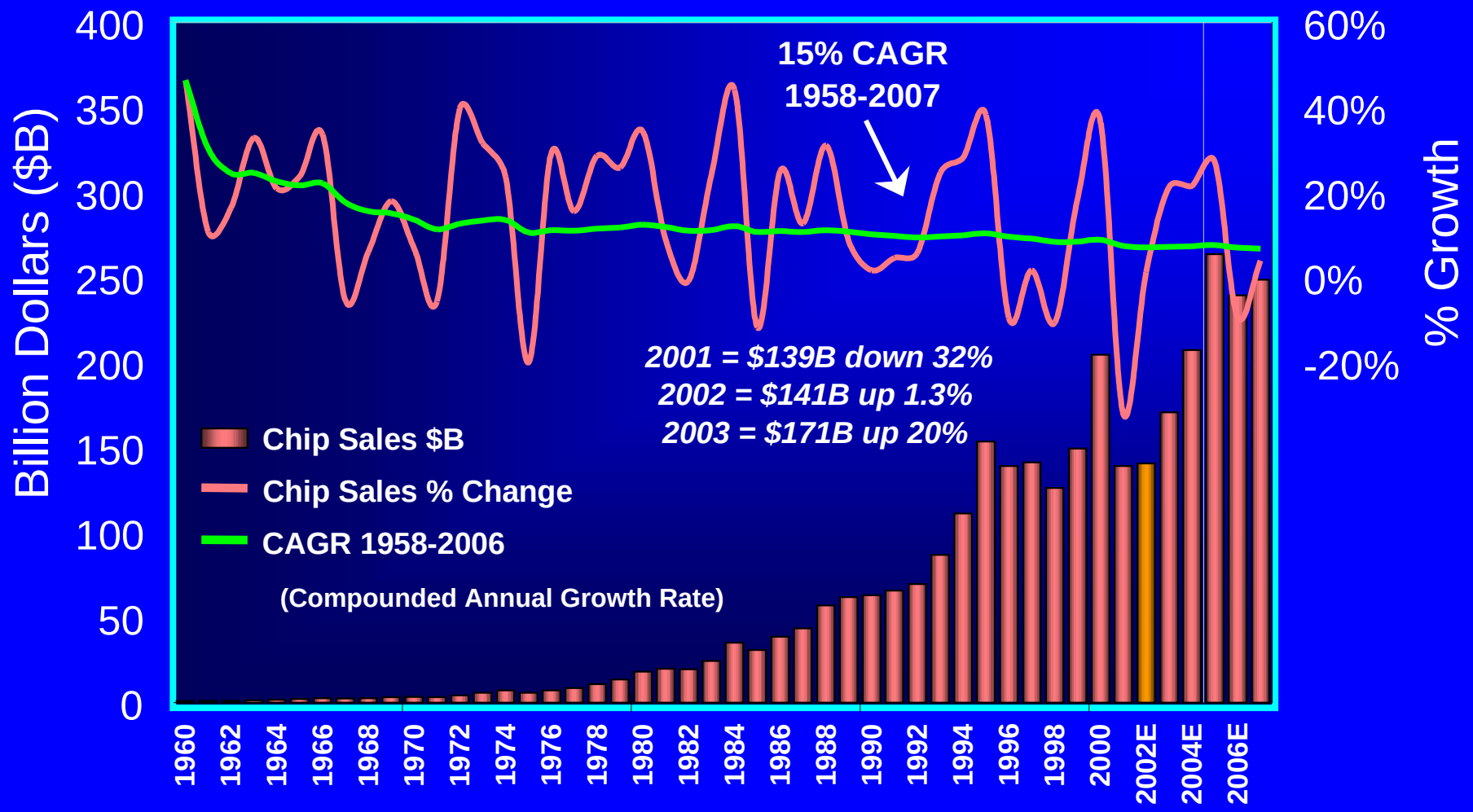


Tech Sector Return

March 2, 2003

Source: VLSI Research

Semiconductor Industry Cycles



March 2, 2003

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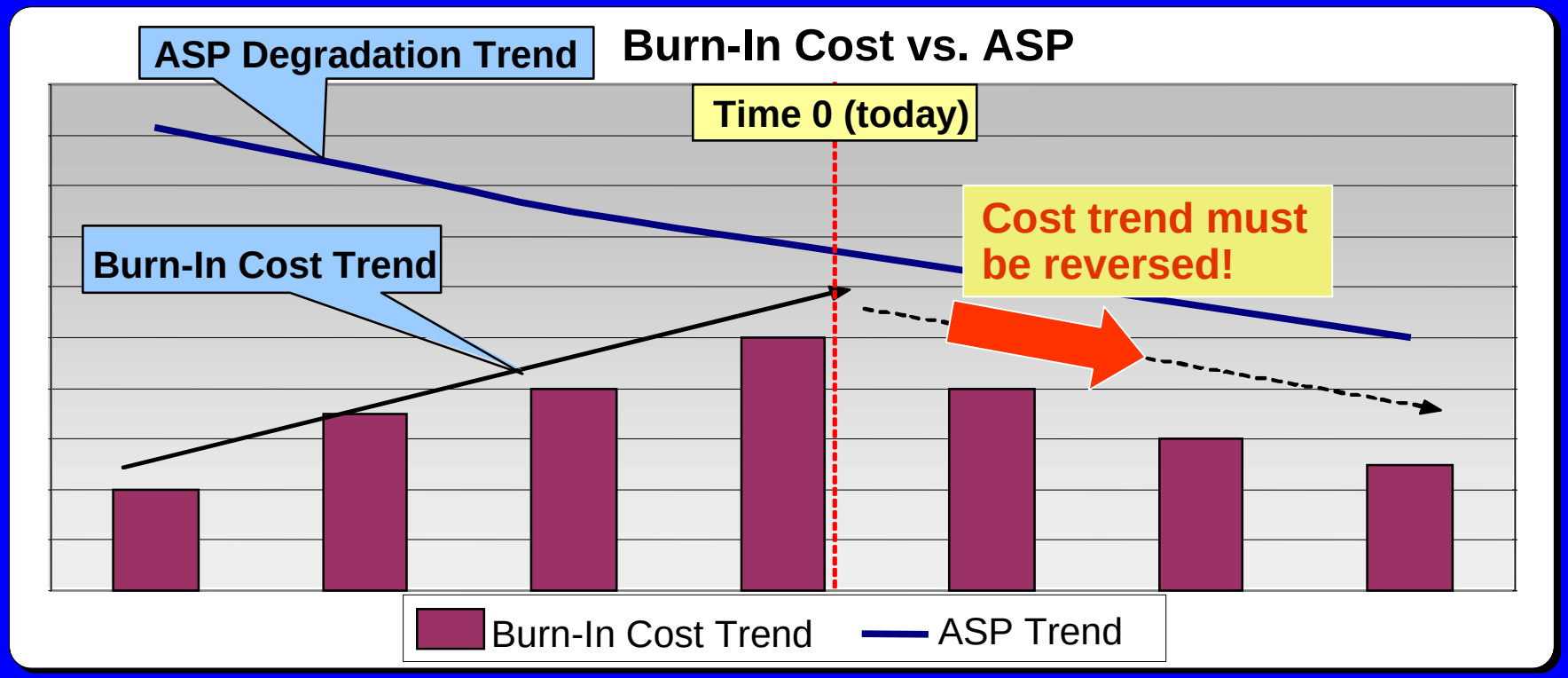
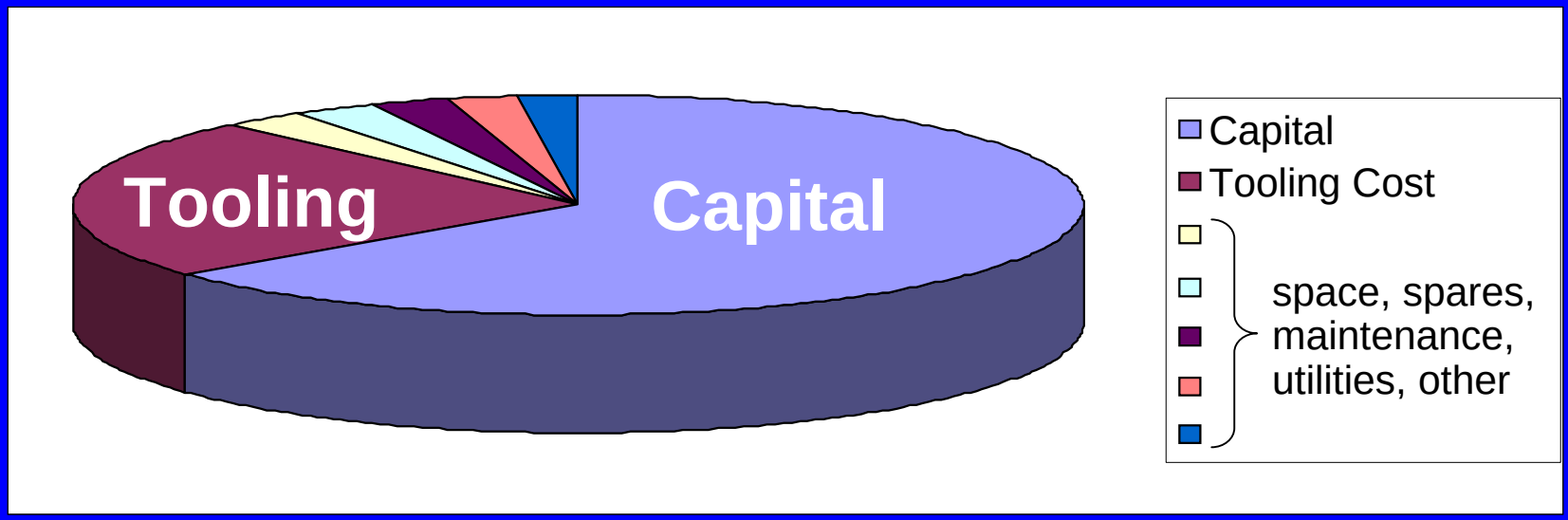
CPU Cost Trends



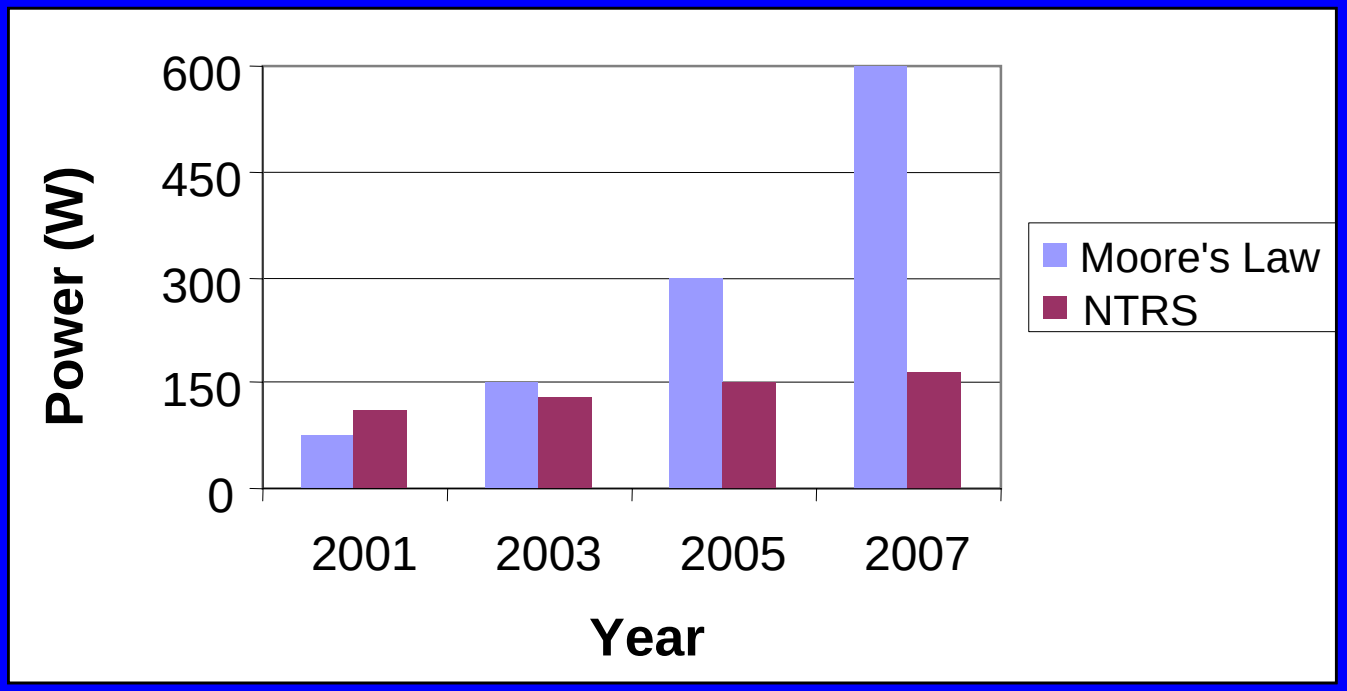
- Margins continue to erode as ASP's decline and competition increases.
- Cost pressures require revolutionary changes
- The supply base must provide a highly capable manufacturing solution at a low cost.

BI Module Cost Distribution



- Equipment capital cost is by far the largest cost driver.
- Tooling cost is substantial and increases proportionally with *cycle time*.

Industry Power Trends vs. Moore's Law



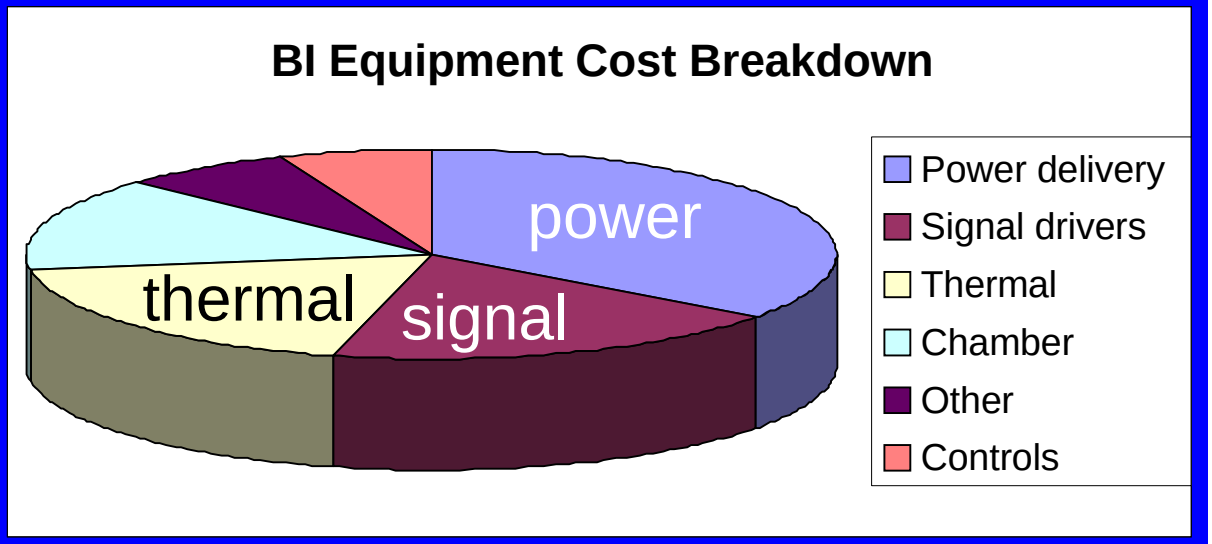
- Expect actual power to be in the middle of these prediction extremes.
- Industry will face ever-increasing challenges in power delivery and dissipation

Equipment Architecture

- **Process cycle time = Cost.**
- **Employ the Lean Manufacturing objectives and methods to reduce individual device non-stress time through process optimization:**
  - Minimize material transfer time.
  - Inter-module: Oven proximity to inline operations.
  - Intra-module: Handler and oven linking.
  - Continuous device feed instead of batch level
  - Reduce burn in boards as ‘expensive’ device carriers.
- **Burn In equipment must be treated as an integral link in the assembly and test processing chain and the processes which it impacts.**

Equipment Cost Drivers and Tradeoffs

- **Power delivery:**
  - The industry uses custom solutions and interconnects at a high cost.
  - Can requirements be adjusted to use lower cost, off the shelf solutions?



- **Thermal capability:**
  - Higher power devices on verge of exceeding passive control capability, but active thermal control technology costs too high.
  - Breakthroughs in ATC technology are needed to achieve higher capability at costs *less* than passive control.
- **Signal delivery:**
  - Precise signal drivers and complicated burn in boards assist in routing signals to the devices.
  - Does the evolution in firmware designs change how we test our devices?

Design for Reliability and Maintainability

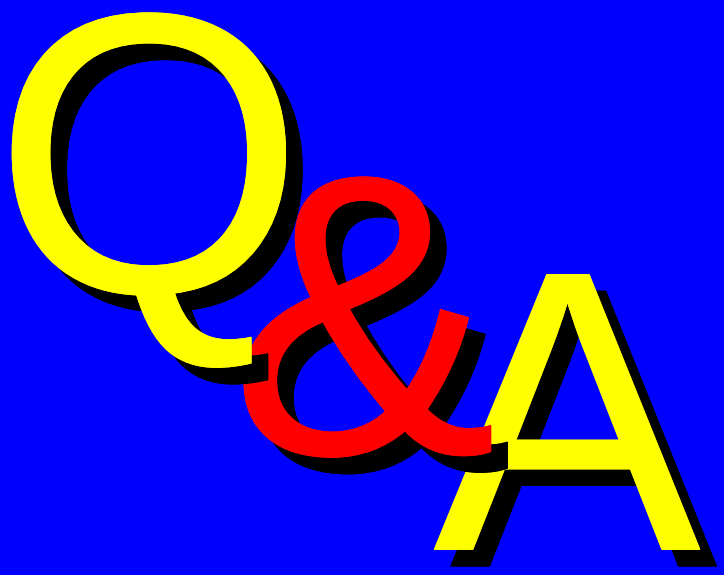
- **Reliable equipment costs less.**
  - Minimal efforts to manage spares.
  - Dedicated field service support is not required.
  - Equipment engineering activity reduced.
- **Reliability must be designed up front.**
  - Incorporate input from engineering field work and customer feedback.
- **As complexity and component count increases ? AT&T Reliability Model produces reduced performance indicators.**
  - If components are to fail, ensure maintenance required is simple.

Design for Extendibility

- **Exponential rise of power requirements requires radical thinking in planning future equipment extensions.**
  - What is requested today runs the risk of being outdated upon introduction.
- **Can the infrastructure to support more power delivery or thermal removal be designed into the system?**
  - With what cost impact?

Conclusion

- The increased product power roadmaps and reduced cycle time demands drive the need for burn in equipment development to go through a revolutionary change.
- The process architecture and core technology improvements will facilitate a low cost burn in solution.
- The industry is not keeping ahead of the capability or cost pressures!


Q&A

System Power Analysis