Electric Drive Semiconductor Manufacturing (EDSM) Center

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Project ARRAVT030

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Project Overview

Timeline

- Project start date: 12 March 2010
- Project end date: 11 March 2012
- Percent complete: 10%

Barriers

- Equipment integration
- Material handling
- Agility to meet variety of products and industry standards
- Transition from prototype to production

Budget

- Total project funding
  - DOE share: $6,049,581.00
  - Powerex share: $2,592,678.00
- Funding received in FY09: $0
- FY10-11 funding: $6,049,581

Partners

- No partners in grant award
- Leveraging existing customer and supplier relationships

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Project Overview

- Powerex corporate offices in Youngwood, PA (near Pittsburgh)
- 250+ employees
- 120,000 square feet of facilities
- Design and manufacture
  - Rectifiers and Thyristors
  - Custom Modules
  - Integrated Power Products
- Markets Include: Automotive/ vehicle, transportation, wind, power generation & distribution, motor control, energy conservation

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Project Objectives/Relevance

Objective:

Powerex will modify its existing facility to house an integrated Electric Drive Semiconductor Manufacturing (EDSM) Center capable of producing over 100,000 electric drive semiconductor devices annually.

- **EDSM Facility** - Provide a facility capable of meeting all EDSM project objectives
- **Manufacturing Center** - Provide capability to produce, at a minimum, 100,000 electric drive semiconductor devices annually
- **Reliability Center** - Provide the capability to fully test and qualify semiconductor device performance and reliability
- **Prototype Center** - Provide the capability to develop new semiconductor device concepts through prototyping. This capability will reduce risk associated with new semiconductor device performance and reduce risk associated with high-volume manufacturing of new devices.

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Approach

Phased into Existing Facility

- Maintain continuity of current operations and reduce risk

Phases of Implementation

- **Phase 1**
  - Construct 3,000 sq ft class 10,000 clean room
  - Install & integrate highest risk manufacturing center equipment and processes
- **Phase 2**
  - Add 7,000 more sq ft to class 10,000 clean room; total 10,000 sq ft
  - Install the remaining manufacturing center equipment into the clean room
- **Phase 3**
  - Relocate existing prototype equipment into clean room
- **Phase 4**
  - Install reliability center equipment in space vacated by prototype equipment move
- **Phase 5**
  - Demonstrate capability through Low Rate Initial Production

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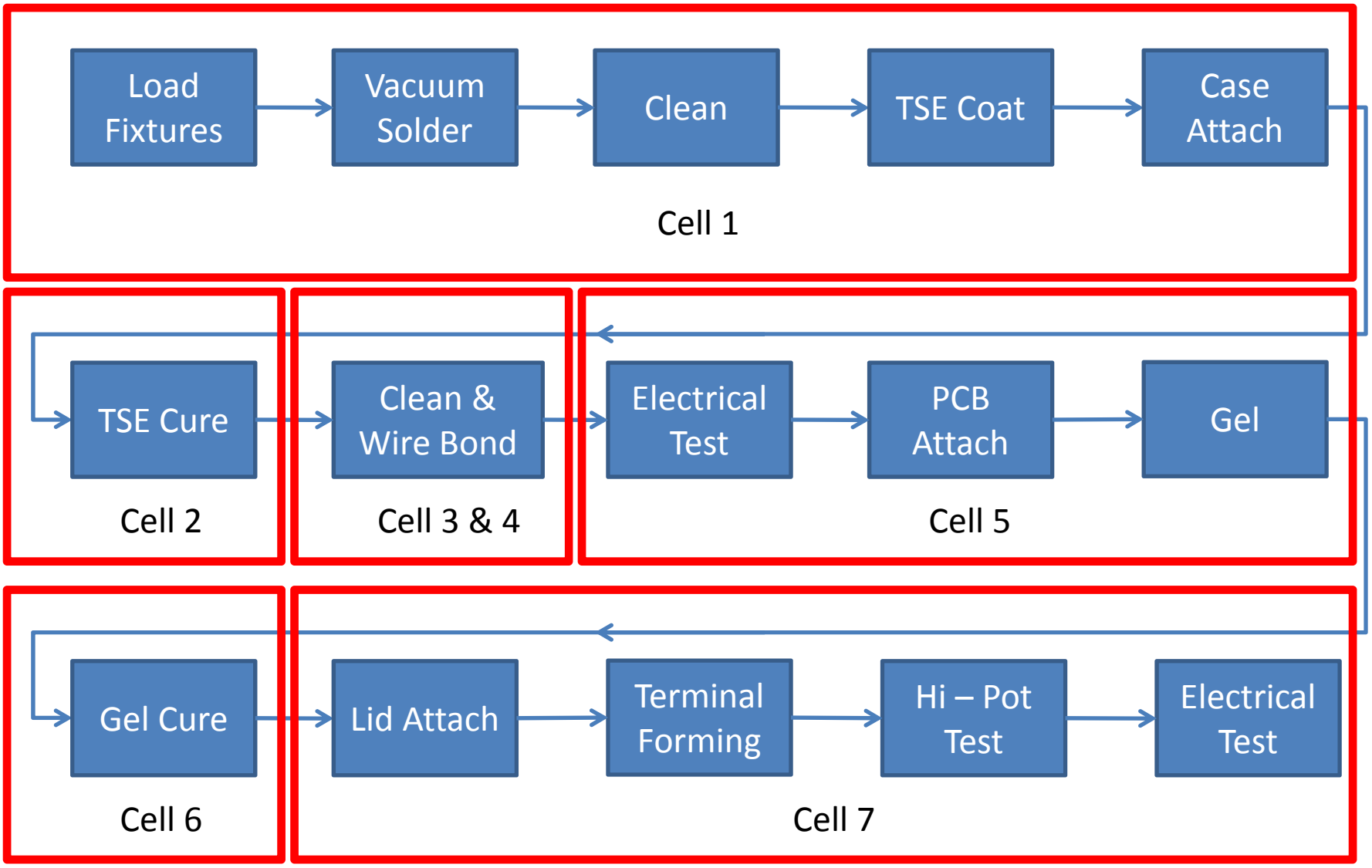
Approach – Production Process



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Project Milestones

Milestone	Milestone Date
Clean Room Contract Awarded	June 1, 2010
Phase 1 Manufacturing Center Installation Complete	February 1, 2011
Phase 2 Manufacturing Center Installation Complete	June 1, 2011
Prototype Center Operational	June 1, 2011
Reliability Center Operational	August 1, 2011
Delivery of 10 LRIP Units	October 1, 2011
Initial Operational Capability/Project Complete	November 1, 2011

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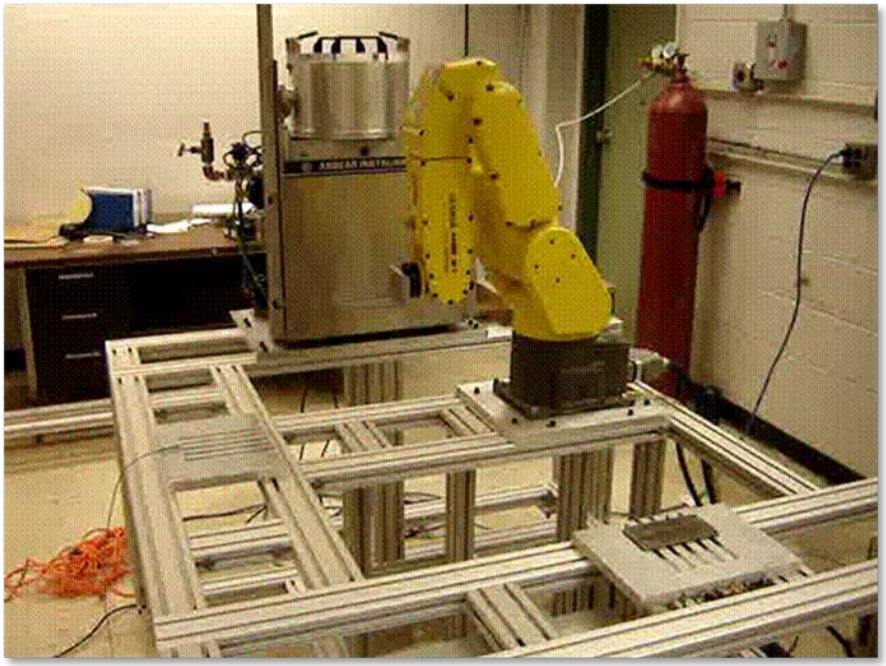
Technical Accomplishments

- Identified highest risk manufacturing processes and equipment
- Purchased initial manufacturing and reliability center equipment
- Built and demonstrated automated vacuum soldering equipment that will be used in production



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Deployment Accomplishments

- Defined plan to implement project in phases, allowing implementation without impacting on-going plant operations
- Awarded clean room contract
- Plant area being cleared for Phase 1 clean room construction

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Collaboration & Coordination

- No partners are directly involved in execution of grant
- Strong, collaborative partnerships with many critical material suppliers and service providers
- Access to rapid technical analysis (e.g., electron and acoustic microscopy, material characterization)
- Long-standing teaming arrangements with universities, federal agencies and companies engaged in state-of-the-art power module research

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Future Work

In 2010

- Complete Phase 1 clean room installation
- Install, test and integrate high-risk manufacturing processes and equipment

In 2011

- Expand clean room from 3,000 to 10,000 sq ft
- Install, test and integrate balance of manufacturing center equipment
- Relocate existing prototype equipment to clean room
- Install and test reliability center equipment
- Conduct low rate Initial Production to demonstrate new capacity

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Project Summary

- Grant awarded in March 2010
- Objective: create capacity to design through prototyping, produce and test 100,000 semiconductor power modules annually
- 2-year phased approach to permit risk reduction and implementation in existing plant without impacting on-going production operations
- Initial work aimed at getting Phase 1 clean room in place, installing, integrating and testing highest risk manufacturing equipment and processes
- Already accomplished initial demonstrations of a prototype automated vacuum solder furnace cell

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