The Solid State Energy Conversion Alliance: A Paradigm Shift in Technology Development

Core Technology Program Workshop

February 14 & 15, 2001

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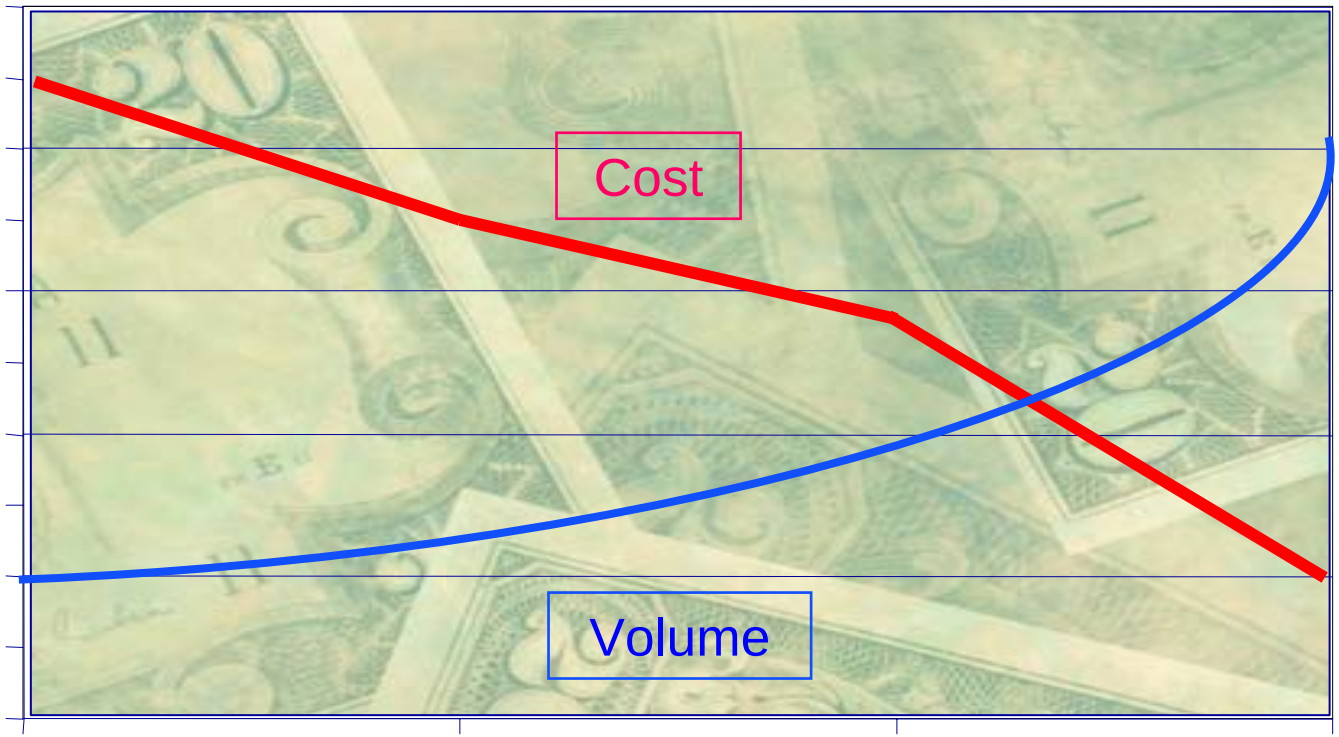
The Vision: *Fuel Cells in 2010*

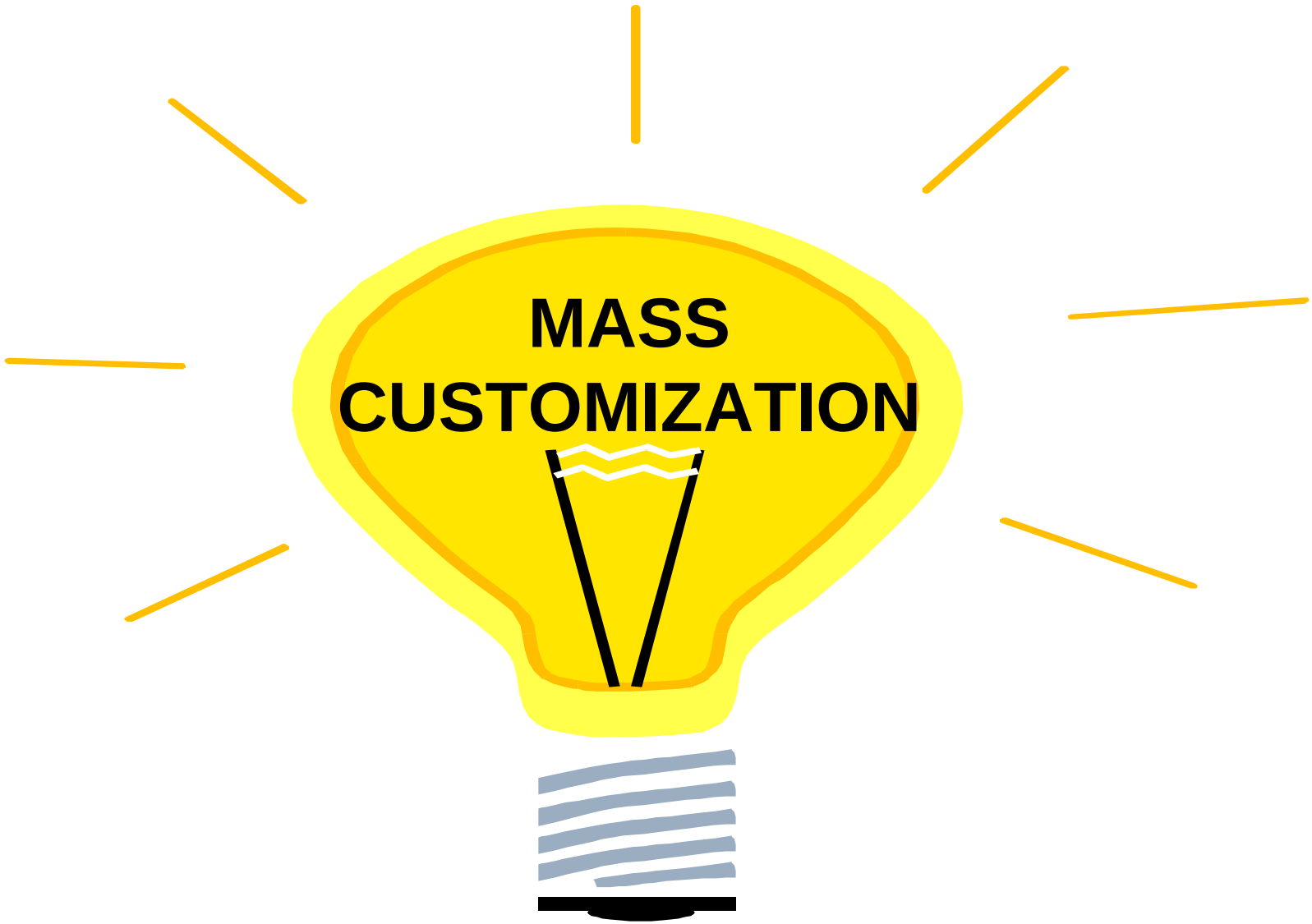


Low Cost/High Volume
< $400/kW/ > 50,000 units/yr

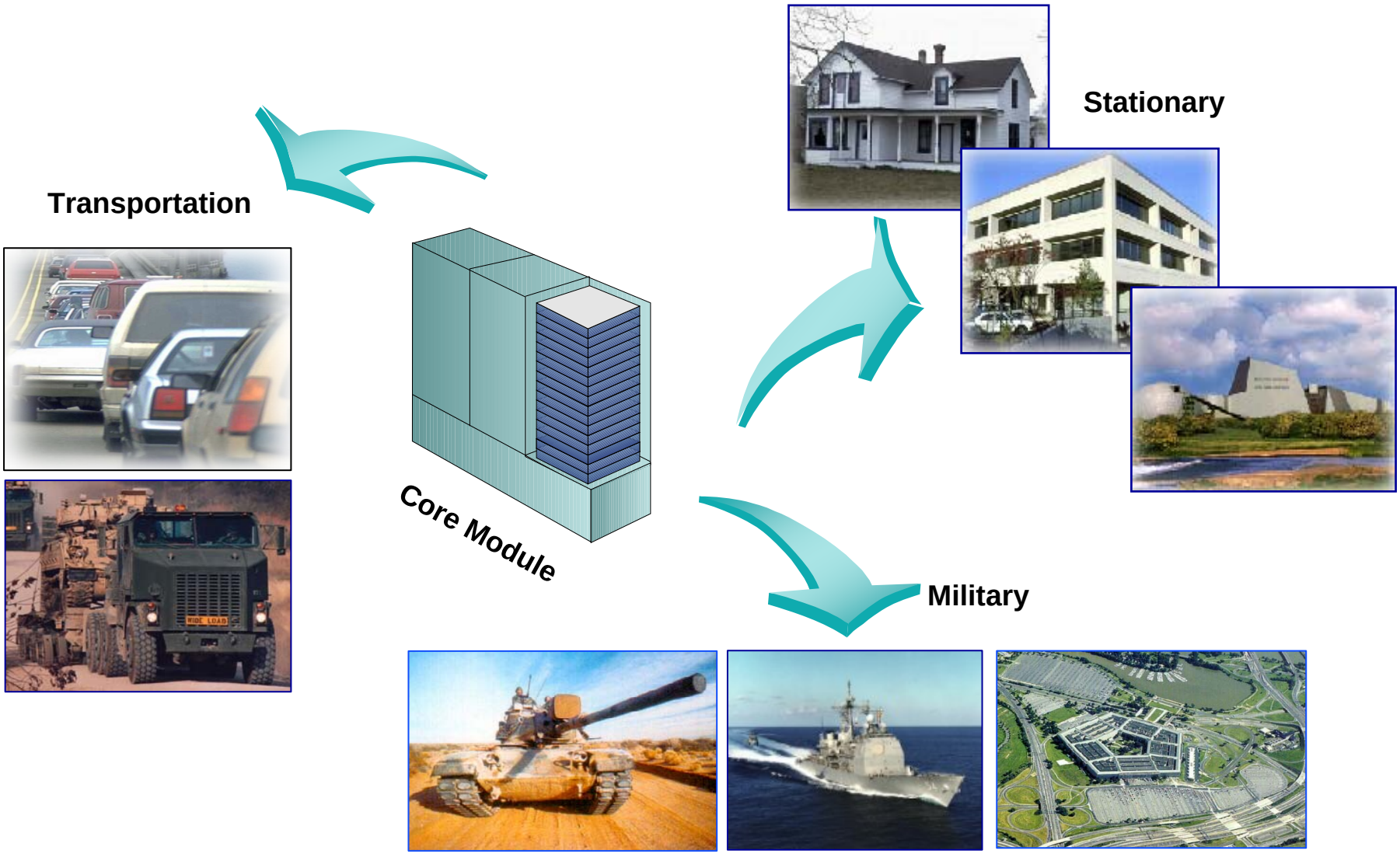
Multiple Fuels

Reduced CO_2 Emissions and negligible pollutants using fossil fuels

Double the efficiency of producing power from fossil fuels.


MASS
CUSTOMIZATION

A Core Module for Multiple Applications



SECA Development: Progressive Applications

2005

- $800/kW
- Prototype (β Unit)

2010

- $400/kW
- Commercial

2015

- Vision 21 Power Plants
- 70-80% efficient plants
- <$200?/kW propulsion

SECA Structure

Industry Input

Program Management

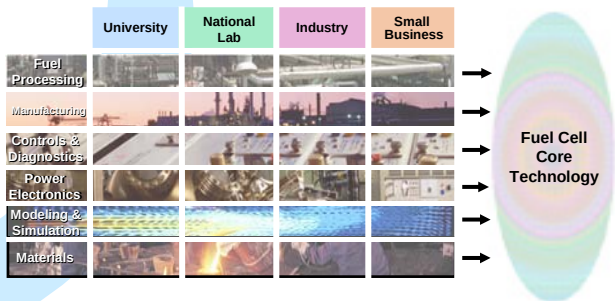
Project Management

Needs

Research Topics

Industry Integration Teams

Technology Transfer



Core Technology Program

SECA Industry Integration Teams

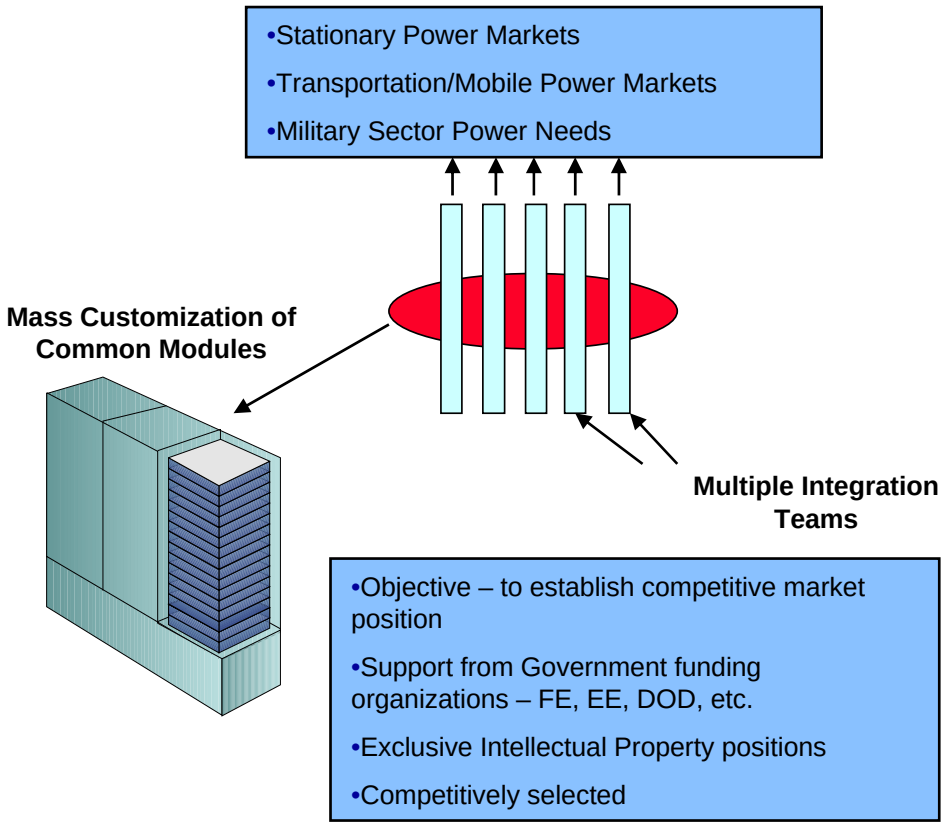
The Manufacturing Base

Multiple Integration Teams

Mass Customization of Common Modules

Industry Integration Teams

- Three to six DOE/DOD Teams
- β Prototype within four years of Award.
- 20% Cost Share in Phase I; 50% in Phase II and III.



Minimum Requirements

	PHASE I	PHASE II	PHASE III
Power Rating (Net)	**3kW – 10kW**	**3kW – 10kW**	**3kW – 10kW**
Cost	**$800/kW**	**$600/kW**	**$400/kW**
Efficiency (AC or DC/LHV)	**Mobile 25 -45%**	**Mobile 30 - 50%**	**Mobile 30 - 50%**
	Stationary 35 -55%	**Stationary 40 - 60%**	**Stationary 40 -60%**
Steady State Test @ Normal Operating Conditions	**1500 hours**	**1500 hours**	**1500 hours**
	80% availability	**85% availability**	**95% availability**
	Δ Power ≤2% degradation/500 hours at a constant stack voltage with R≥0.95.	**Δ Power ≤1% degradation/500 hours at a constant stack voltage with R≥0.95.**	**Δ Power ≤0.1% degradation/500 hours at a constant stack voltage with R≥0.95.**
	R-Linear Correlation Coefficient	**R-Linear Correlation Coefficient**	**R-Linear Correlation Coefficient**

Minimum Requirements (cont.)

	PHASE I	PHASE II	PHASE III
Transient Test	**10 cycles**	**50 cycles**	**100 cycles**
	Δ Power ≤ 1% degradation after 10 cycles at a constant stack voltage.	**Δ Power ≤ 1% degradation after 50 cycles at a constant stack voltage.**	**Δ Power ≤ 1% degradation after 100 cycles at a constant stack voltage.**
Test Sequence	**1) Steady State Test–1000 hours** **2) Transient Test** **3) Steady State Test–500 hours**	**1) Steady State Test–1000 hours** **2) Transient Test** **3) Steady State test–500 hours**	**1) Steady State Test –1000 hours** **2) Transient Test** **3) Steady State Test–500 hours**
Maintenance Intervals	**Design aspects should not require maintenance at intervals more frequent than 1000 operating hours.**	**Design aspects should not require maintenance at intervals more frequent than 1000 operating hours.**	**Design aspects should not require maintenance at intervals more frequent than 1000 operating hours.**

Minimum Requirements (cont.)

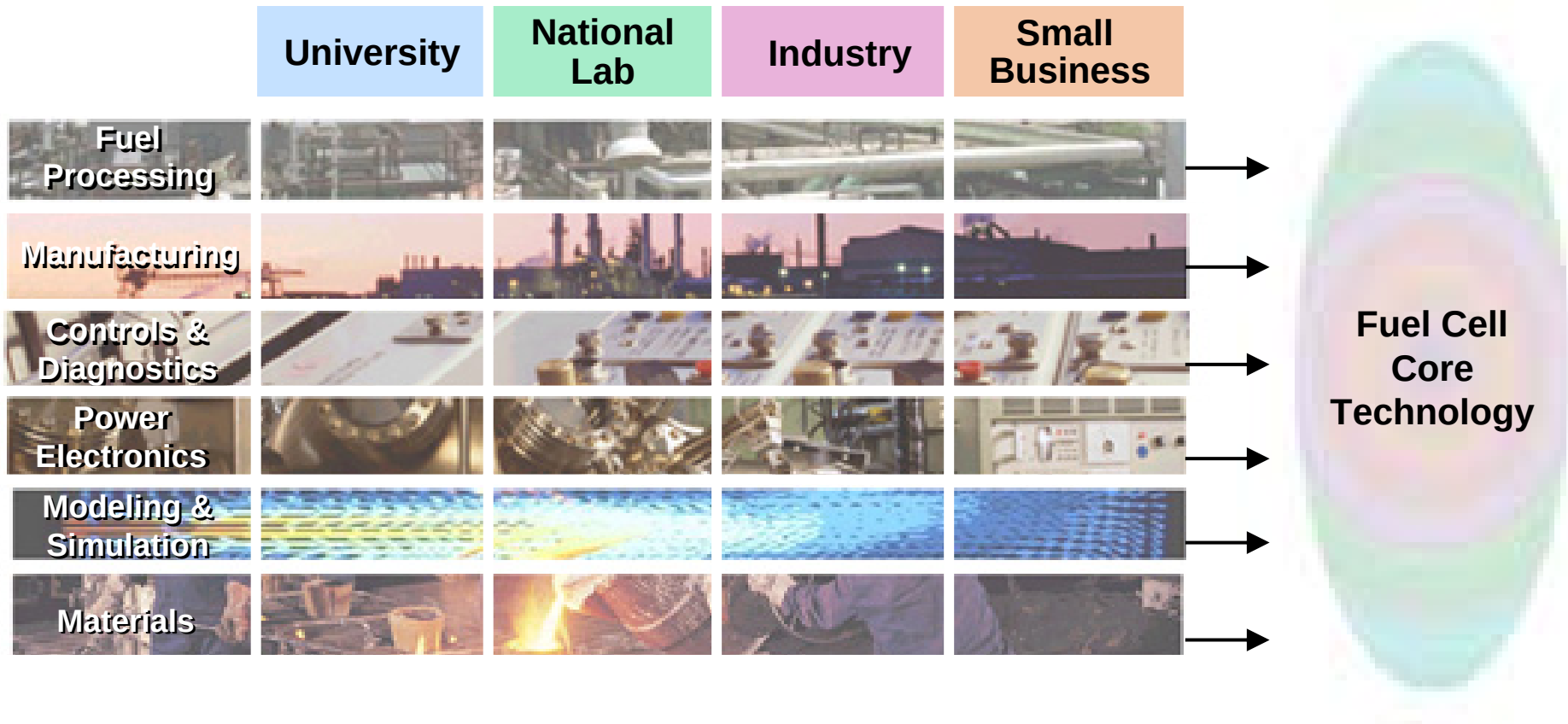
	PHASE I	PHASE II	PHASE III
Design Lifetime	**Not less than 40,000 operating hours for stationary applications and 5,000 hours for transportation**	**Not less than 40,000 operating hours for stationary applications and 5,000 hours for transportation.**	**Not less than 40,000 operating hours for stationary applications and 5,000 hours for transportation.**
Steady State and Transient Tests Fuel Type(s)	**Natural gas, gasoline, or diesel fuel(s) or a representative fuel base on respectively methane, iso-octane, or hexadecane. If multiple applications using different fuels are proposed split the total test time equally among the different fuel types.**	**Natural gas, gasoline, or diesel fuel(s) corresponding to the proposed primary application(s). If multiple applications using different fuels are proposed split the total test time equally among the different fuel types.**	**Natural gas, gasoline, or diesel fuel(s) corresponding to the proposed primary application(s). If multiple applications using different fuels are proposed split the total test time equally among the different fuel types.**

SOLICITATION COMPONENTS

1. Technical Approach
2. Cost Estimate
3. Statement of Work, Milestones, and Test Plan
4. Market Evaluation and Applicants Existing Experience
5. Capabilities, Facilities,Team Structure and Personnel

SECA Core Technology Program

The Technology Base



Core Technology Program

- **The objective: Raise The Baseline of the Technology.**

- **Projects selected will focused on specific problems encompassing any area of the fuel cell system. Little or no proprietary information from the Industrial Teams.**

Core Technology Program (Cont.)

- A mix between short (1-2 year) projects that address the needs of preferably multiple Industrial Teams and a few longer term projects that would add significant value to all projects.

- The Industrial Teams, Core Technology Program participants, and the Project Management Team will meet at least twice a year to make SECA participants aware of results from the Core Technology Program work and promote discussion of needs and approaches.

Intellectual Property - Cornerstone of the Alliance

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- “Exceptional Circumstance”
- Promotes Collaboration - Limits Redundancy
- Benefits U.S. National Interests
- Non-Exclusive License Core ➡ Industry Teams
  - Ready market of potential licensees
  - Best designs vs. highest bidder

Exceptional Circumstance Provisions

- **Each Industrial Team will be offered a non-exclusive license for Intellectual Property generated by the Core Technology Program in the solid-oxide field of use.**

- **Offers must be open for 1 year after issue of a U.S. patent.**

SECA/DOD Support Activities

- **Core Tech**
  - Accelerate Development
  - Logistic Fuels
- **Militarization**
  - Survivability, Shock & Vibration, etc.
- **Integration**
  - Balance of Plant Packaging
- **Testing**
  - Laboratory to Field Environment

SECA - Realizing the Vision

SECA:

- **An alliance of industry teams, R&D performers, and government funding organizations**
- **Develops an integrated strategy**
- **Focuses research**

Current SECA Players/Efforts

- **Industry**

McDermott

NexTech Materials

Hoogovens

TMI Systems

DELPHI

Automotive Systems

- **National Labs**

NETL

Pacific Northwest National Laboratory

Argonne National Laboratory

Oak Ridge National Laboratory

- **Advanced Research**

Hoogovens

Siemens Westinghouse

The University of Utah

University of Florida

University of Missouri @ Rolla

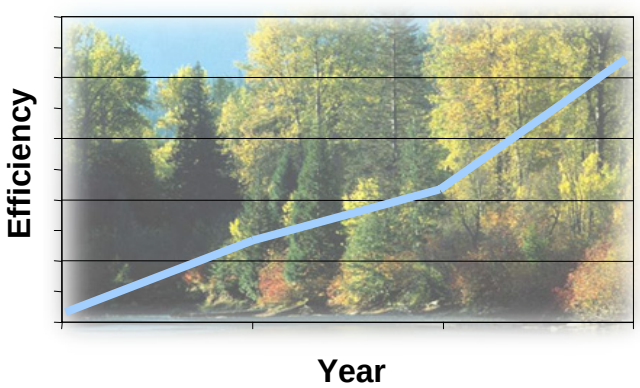
Northwestern University

SECA Timeline

• 1st Annual SECA Workshop	June 1-2, 2000
• Industry Team Solicitation Issued	November 3, 2000
• Proposals Due	January 24, 2001
	January 4, 2002
	January 3, 2003
• SECA Core Technology Program Workshop	February 14 & 15, 2000
• 2nd Annual SECA Workshop	March 29-30,2001
• 2001 Industrial Teams Selected	*April 2001*
• Core Technology Program Solicitation Issued	*April 2001*

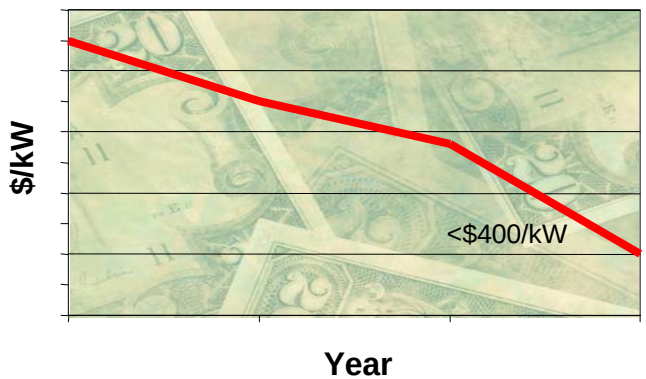
Public Benefits

High Efficiency



Grid Stability

Cost Reduction



Responding to the Needs of the Nation

President - elect Bush and I are deeply committed to developing an energy policy that includes . . . developing new technologies that conserve fossil fuels and reduce energy-related pollution.

Spencer Abraham, Secretary of Energy