I. PRESENTATIONS

A. FOSSIL ENERGY MISSION AND THE FUEL CELL PROGRAM

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1. Introduction

- I'm pleased to be here at the Solid State Energy Conversion Alliance Workshop. I'd like to thank Rita Bajura, Director of the National Energy Technology Laboratory, for inviting me to speak about this exciting new DOE initiative.

- Later speakers will discuss in some detail the structure and applications of the Solid State Energy Conversion Alliance, or SECA. I would like to speak about SECA in a larger context: how it fits into the national energy strategy, and the goals and milestones of the fuel cell program.

2. Comprehensive National Energy Strategy

- The Comprehensive National Energy Strategy, issued in April 1998, set forth five common-sense goals for national energy policy:

  ! Improving energy efficiency.
  ! Ensuring reliability.
  ! Promoting clean energy technologies.
  ! Expanding energy choices.
  ! Cooperating internationally on energy issues.

- Fuel cells, and SECA, help us meet all five of these important goals:

  ! Fuel cells are highly efficient. With thermal recovery, the total efficiency of fuel cell systems could reach 85%.

  ! Fuel cells promise to be one of the most reliable power generation technologies, if not the most reliable. They are now being used by hospitals, hotels, and telephone companies as part of critical uninterruptible power systems. SECA will result in distributed generation products that will further increase grid reliability and safety.

  ! Fuel cells are clean. They generate no solid wastes, and have dramatically lower emissions of nitrogen compounds, particulates, and greenhouse gases.

  ! Fuel cells expand energy choices. They can be used in both distributed and centralized configurations. They provide siting and fuel flexibility. They allow us to use our abundant fossil-fuel resources in an environmentally friendly way.

- Fuel cells address environmental issues of global concern, including emissions of greenhouse gases. They are well suited for developing countries without an existing energy infrastructure, and will help meet a growing worldwide demand for energy. SECA will be an internationally cooperative effort. Through the SECA Core Technology Program, we expect to cooperate with the European Union, and others.

3. Near-Term Distributed Generation Market

- Given fuel cells' strengths, the abundance of fossil-fuel resources, and the need for highly efficient, clean energy technologies, the Department of Energy has funded fuel cell research for over two decades.

- The current fuel cell program is aimed at the near-term distributed generation market. The near-term market includes premium power applications: computer centers, hospitals, and other facilities that must have a reliable supply of high-quality electricity and are willing to pay for it.

- The current FE fuel cell program, now in the last phase of development, has two parts:

  - development of molten carbonate fuel cell systems, by Fuel Cell Energy, and
  - development of tubular solid oxide fuel cell systems, by Siemens Westinghouse.

- The program's goals are:

  - Commercialization of solid oxide fuel cell and molten carbonate fuel cell power plants in the 200-kW to 3-MW range by 2003.

  - Costs of $1,000 to $1,500 per kilowatt.

  - Efficiencies of 50 to 60%.

  - To have at least 50 MW per year of U.S. molten carbonate fuel cell manufacturing capacity, and to have at least 30 MW per year of U.S. solid oxide fuel cell manufacturing capacity by 2003.

- The U.S. and European growth and replacement market for near-term distributed generation is expected to approach 10 GW per year over the next decade. Globally it is expected to be 20 GW per year.

- The near-term developers, Fuel Cell Energy and Siemens Westinghouse, have had impressive test performance, and each plans multiple demonstrations within the next few years. Collectively, they could be capturing 1 to 2 GW per year of the global market by the end of the decade.

4. The Mature Distributed Generation Market

- To penetrate the mature distributed generation market, lower cost fuel cells are required. Distributed generation technologies must have low introductory and installation costs, and they must be reliable.

- SECA, which Ms. Bajura will describe in more detail, is a mechanism to build and integrate the industry base for low-cost fuel cells to penetrate the mature distributed generation market. SECA will build an alliance of government agencies, commercial developers, universities, and national laboratories to develop solid oxide fuel cells with the capability for immediate commercial success. SECA will build on the great progress to date in developing fuel cells and will assure a dramatic reduction in fuel cell cost down to $400/kW for stationary power applications, which in turn should guarantee a very large market share for fuel cells.

  The alliance will provide a focal point, an "organizational center" for the development of

  ! stationary power applications,
  ! auxiliary power units for military applications, and
  ! auxiliary power units for transportation applications.

- All three applications will benefit from the free flow of leveraged fuel cell technology development. SECA's cost goal for stationary applications is $400 per kilowatt by 2010. Long-term cost goals for military and transportation applications are $50 to $200 per kilowatt. Efficiencies for all applications will be greatly improved over current state-of-the art.

- The results of this program will also provide early low-cost power systems for mature distributed generation market applications, and will feed directly into the Vision 21 Fuel Cells Program.

5. Vision 21

- Fossil fuels currently provide 85% of global and U.S. energy supply. Even under a climate change scenario, we will need to use fossil energy well into the future. But we need to use it smarter. The goal of Vision 21 is to wring every possible bit of useful energy out of carbon-based feedstocks to produce energy products, while eliminating all environmental concerns regarding electricity generation, and doing so at comparative costs.

- The Vision 21 fuel cells segment will develop advanced fuel cell modules that would be integrated with other Vision 21 advanced technology modules, and would be tailored to meet specific market needs. Fuels cells are needed to obtain the 60% efficient coal-fueled and the 75% gas fueled Vision 21 power plants of the future.

- To reach these high efficiency targets, a hybridized, high-efficiency fuel cell is required. Getting the cost of the fuel cell power module to $400 per kW is a key factor in deploying Vision 21 systems by 2015. If this can be done, fuel cell/turbine hybrids could replace turbines as the power block in integrated gasification combined-cycle applications.

- These highly efficient combined systems, in multi-megawatt sizes, would have no environmental impact outside their own footprint. The goal is to make these modules ready for use in integrated systems by 2015. This program segment will accept additional technology input from the SECA program segments as solid state fuel cells become available.

- Fuel cells also have an advantage in Vision 21 sequestration applications. Fuel cells have inherently high efficiency and can also be configured to produce concentrated CO2 streams. Under the recent Vision 21 solicitation, Siemens Westinghouse received an award to reconfigure their tubular solid oxide fuel cell to produce a concentrated CO2 stream for use in enhanced oil recovery and other applications.

6. Conclusion

- Part of the Department of Energy's mission is "to foster a secure and reliable energy system that is environmentally and economically sustainable." Fuel cells, and SECA, will help us meet this challenge.
- Fuel cells, with their roots in the space program, have the potential to truly revolutionize power generation. SECA is a natural extension of the existing fuel cell program, a logical next step.
- Thank you for joining us as we take this step into the future.