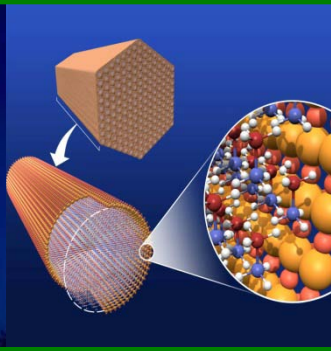
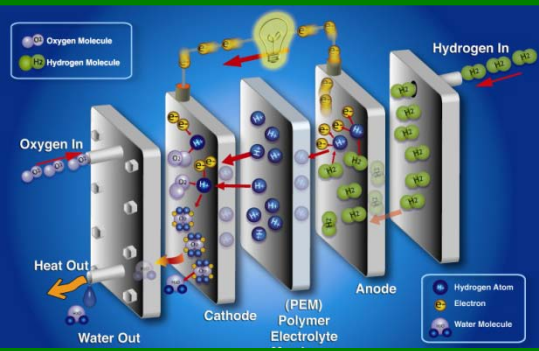




U.S. DEPARTMENT OF
ENERGY



Manufacturing R&D

DOE Fuel Cell Technologies Program

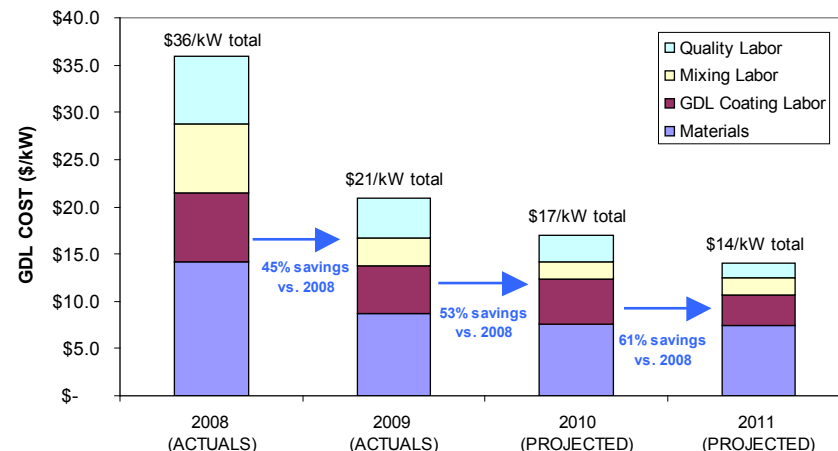
Pete Devlin

2010 Annual Merit Review and Peer Evaluation Meeting
June 7th, 2010

Goal: Develop and demonstrate technologies and processes that will: Reduce cost of components and systems for fuel cells, storage, and hydrogen production and Grow domestic supplier base

Program Milestones

- **2011:** Complete development of standards for metrology of PEM fuel cells.
- **2012:** Develop continuous in-line measurement for MEA fabrication.
- **2013:** Establish models to predict the effect of manufacturing variations on MEA performance.
- **2013:** Demonstrate pilot scale processes for assembling stacks.



Gas Diffusion Layer
Cost Reduction Data

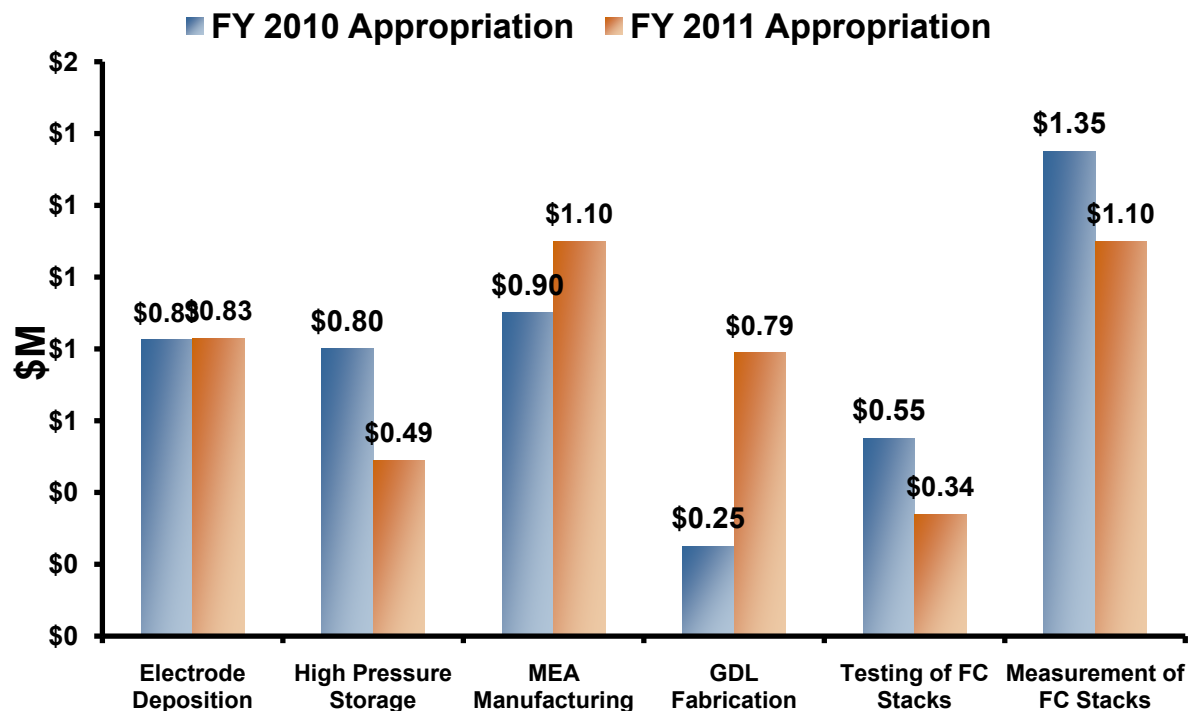
Near Term Target for Early Markets

- Lower fuel cell stack manufacturing cost by \$2,000/kW (\$4,000 to \$2,000/kW)

Fuel Cell Manufacturing Budget

FY 2010 Appropriations = \$5.00M

FY 2011 Request = \$5.00M



FY 2010 EMPHASIS

- Complete technical process designs for fuel cell stack and components and go/no-go decisions.
- Start Phase 2 of continuing projects with and complete by EOY 2012.

- **Fuel Cell MEA Measurement R&D (NREL)**
 - **Developed IR-based test stand for multi-function defect detections such as pinholes, shorting, and electrode thickness variations.**
- **High Speed, low cost fabrication of gas diffusion electrodes for MEAs (BASF)**
 - **Developed an innovative on-line XRF**
 - **Developed a predictive model for electrode variation and defect impacts on MEA performance**
- **Developed process model for controlling GDL coating conditions (Ballard)**
 - **Significant improvement in quality yields and GDL cost reduction estimated at 53% to-date.**



This is the first time a scanning XRF has been used on GDEs – BASF

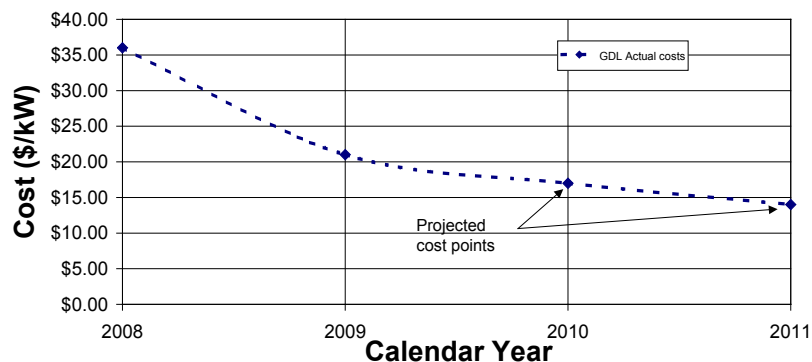
- **Manufacturing of Low-Cost, Durable MEAs Engineered for Rapid Conditioning (GORE)**
 - **Cost model results indicate that a new 3 layer MEA process has potential to reduce MEA cost by 25%**
- **Developed and Tested Non-Contact sensors for Bi-Polar Plate Process control (NIST)**
- **Developed and Tested Leak-Test and Conditioning Stand (Ultracell)**
- **Adaptive process controls and ultrasonic's for high temp PEM MEA manufacturing (RPI)**
 - **Ultrasonic welding of HT MEA components stronger than thermal welds, with a cycle time less than 1 sec, and more than 95% energy savings.**



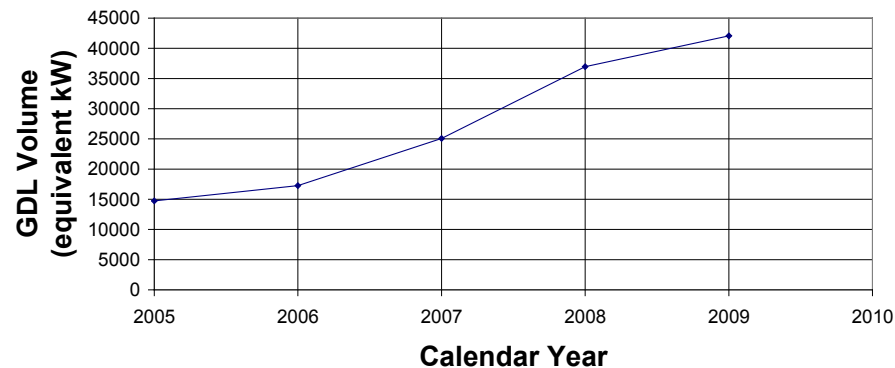
Non-Contact Sensor for Bi-Polar Plate Manufacturing Process Control and Smart Assembly - NIST

- **Evaluated manufacturing process**
 - **Determined high labor costs and low product yields were keeping GDL cost high**
 - **Initial focus was on substrate manufacturing to allow for full-width production**
 - **Now focused on three key areas:**
 - **Improve process understanding**
 - **Reduction of processing steps**
 - **Implementation of on-line measurement techniques to improve product quality and reduce process scrap**

**GDL Actuals vs DoE Target
Costs
(\$/kw)**

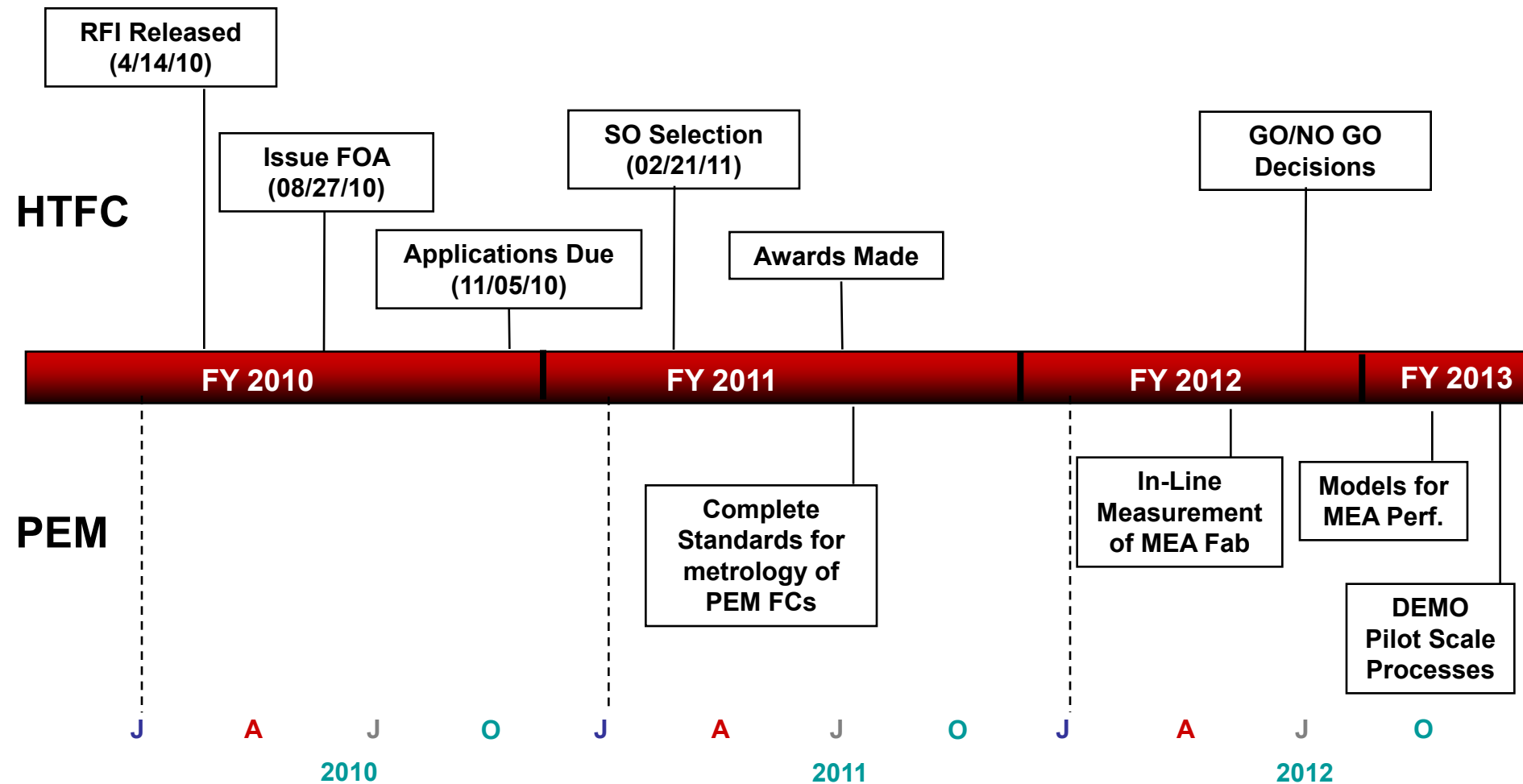


**BMP's Annual volume
of Paper based GDLs sold
(equivalent kW)**



Ballard Cost Reduction Forecast and Realized Cost Reduction to Date

Major Milestones & Future Solicitations



Focus on progress toward cost goals and early market applications.

PEM

- **Establish Quality Assurance (QA) protocols**
- **Validate Manufacturing Processes and Quality Control**
- **Achieve quantified near term polymer fuel cell cost targets**
- **Develop process models and initiate research for HT stationary power**

HTFC

- **Conduct Model Analysis**
- **Award HTFC Projects**
- **Reduce capital cost to competitive range with out incentives**

- This is a review, not a conference.
- Presentations will begin precisely at the scheduled times.
- Talks will be **20 minutes** and **Q&A 10 minutes**.
- Reviewers have priority for questions over the general audience.
- Reviewers should be seated in front of the room for convenient access by the microphone attendants during the Q&A.
- Please mute all cell phones, BlackBerries, etc.

- Deadline for final review form submittal is **June 18th**.
- ORISE personnel are available on-site for assistance. A reviewer lab is set-up in room 8216 and will be open Tuesday –Thursday from 7:30 AM to 6:00 PM and Friday 7:30 AM to 3:00 PM.
- Reviewer feedback session – **Friday, at 12:30pm (after last Manufacturing R&D session), in this room.**

Fuel Cell Technologies Program

Manufacturing R&D Team

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