Leveraging National Lab Capabilities

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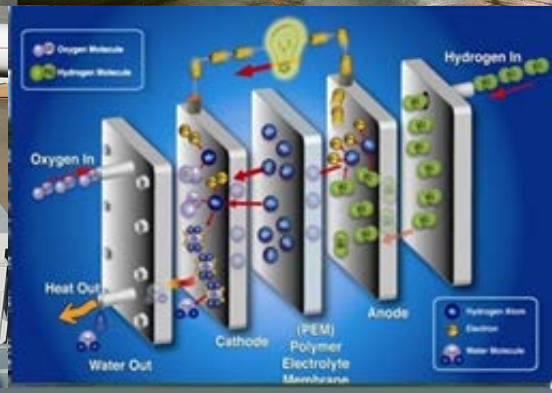


Fuel Cell Seminar & Energy Exposition

Los Angeles, California

November 11, 2014

Dr. Sunita Satyapal, Director

Chris Ainscough, P.E., NREL

Fuel Cell Technologies Office

U.S. Department of Energy

All-of-the-Above Energy Strategy

*"We've got to invest in a serious, sustained, **all-of-the-above energy strategy** that develops every resource available for the 21st century."*

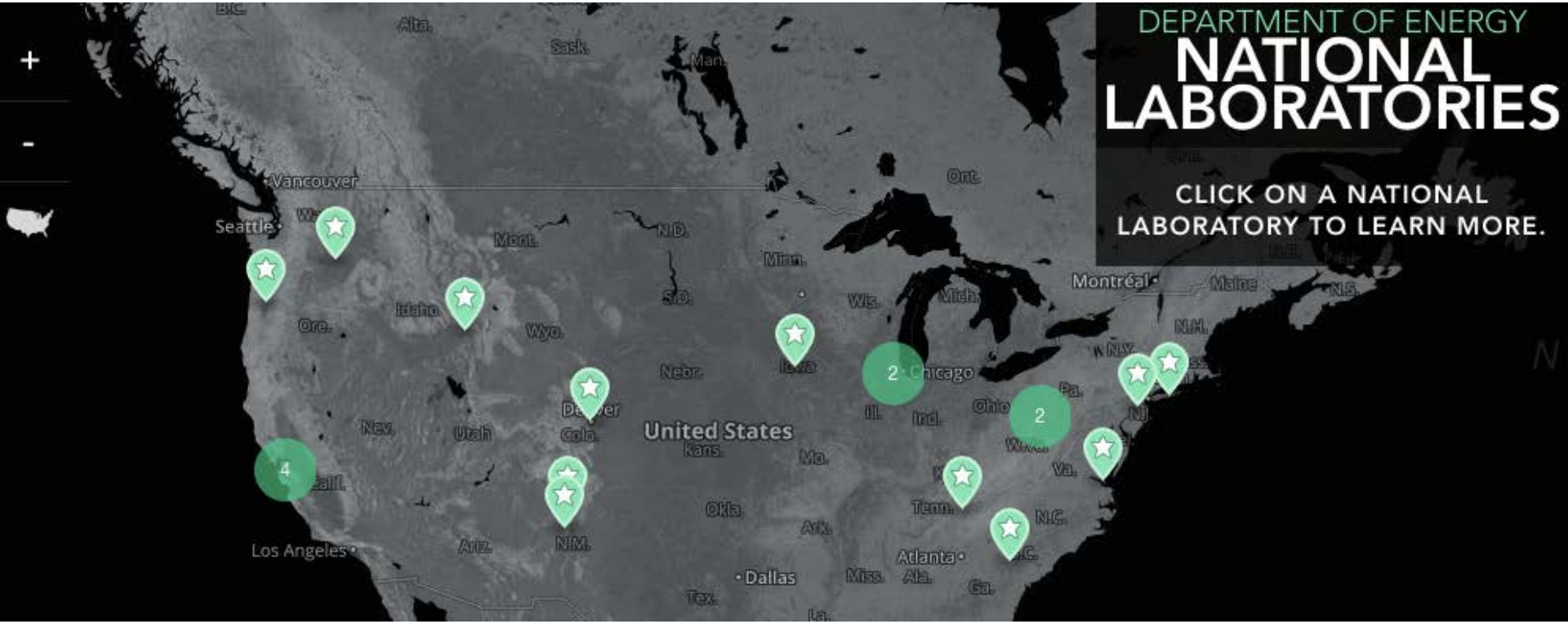
- President Barack Obama

"As part of an all-of-the-above energy approach, fuel cell technologies are paving the way to competitiveness in the global clean energy market and to new jobs and business creation across the country."

- Secretary Moniz,
U.S. Department of Energy

Secretary Moniz at DC Auto Show

A National Network



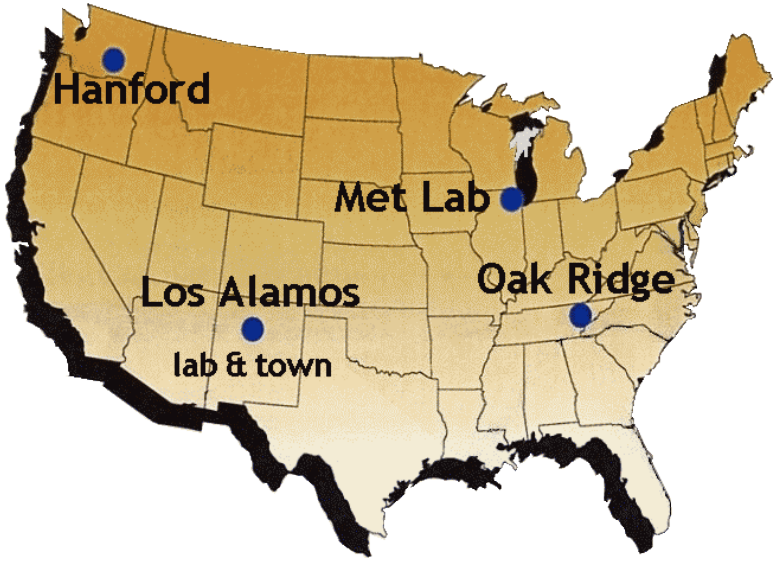
All 11 labs that work in the fuel cell industry are here today.

- Argonne (ANL)
- Brookhaven (BNL)
- Idaho (INL)
- Los Alamos (LANL)
- Lawrence Berkeley (LBNL)
- Lawrence Livermore (LLNL)
- National Renewable Energy Laboratory (NREL)
- Oak Ridge (ORNL)
- Pacific Northwest (PNNL)
- Sandia (SNL)
- Savannah River (SRNL)

The Beginning….

- DOE founded the National Laboratory system in the 1940s.

- The war effort motivated breakthrough scientific work
  - Manhattan Project
  - Development of Radar



Places of the Manhattan Project

What DOE invested…

From… in early 1940s

- A few million $

To… in 2012

- ~$5 billion

(~$10-billion including other federal agencies)

Examples of Lab Innovations

Modern water-purification techniques

Resilient passenger jets

Supercomputers

Fluorescent lights

Satellite technology

Advanced batteries

Better cancer therapies

Optical digital recording technology

DOE-Led Innovation in Fuel Cells

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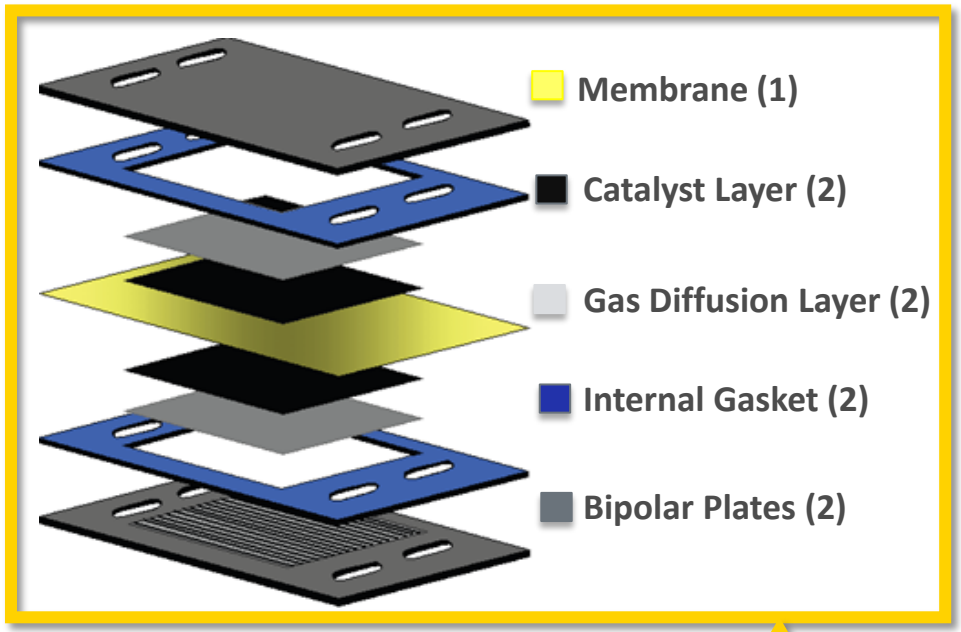
Innovation from LANL can be found in most fuel cells today

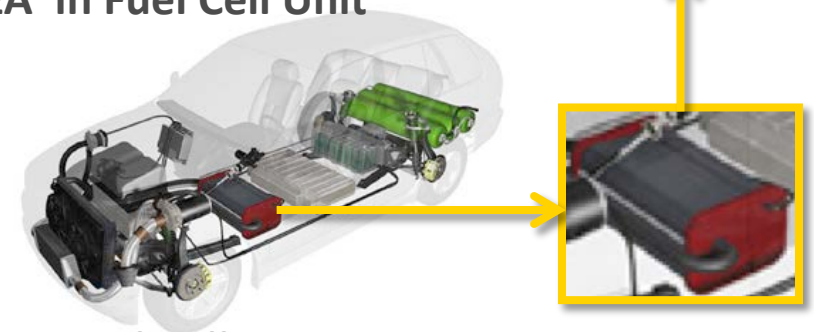
Examples of DOE-Led Fuel Cell Technology Breakthroughs

- **Ionomer-Impregnated Catalyzed Gas Diffusion Electrodes-** *US Pat 4,876,115 (1989)*
  *"**ELAT**" – Electrode, Los Alamos Type*
- **Catalyst-Coated Membranes-**
  US Pats 5,211,984 and 5,234,777 (1993)
- **Microporous Film on Gas Diffusion Layers-** *US Pat 5,641,586 (1997)*
- **Thermoset Composite Bipolar Plates-**
  US Pat 6,248,467 (2001)

Los Alamos NATIONAL LABORATORY EST. 1943



MEA in Fuel Cell Unit



Fuel Cell Car

Fuel Cell Stack

FCEV Technology Advancements

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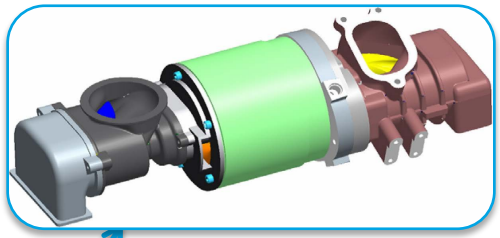
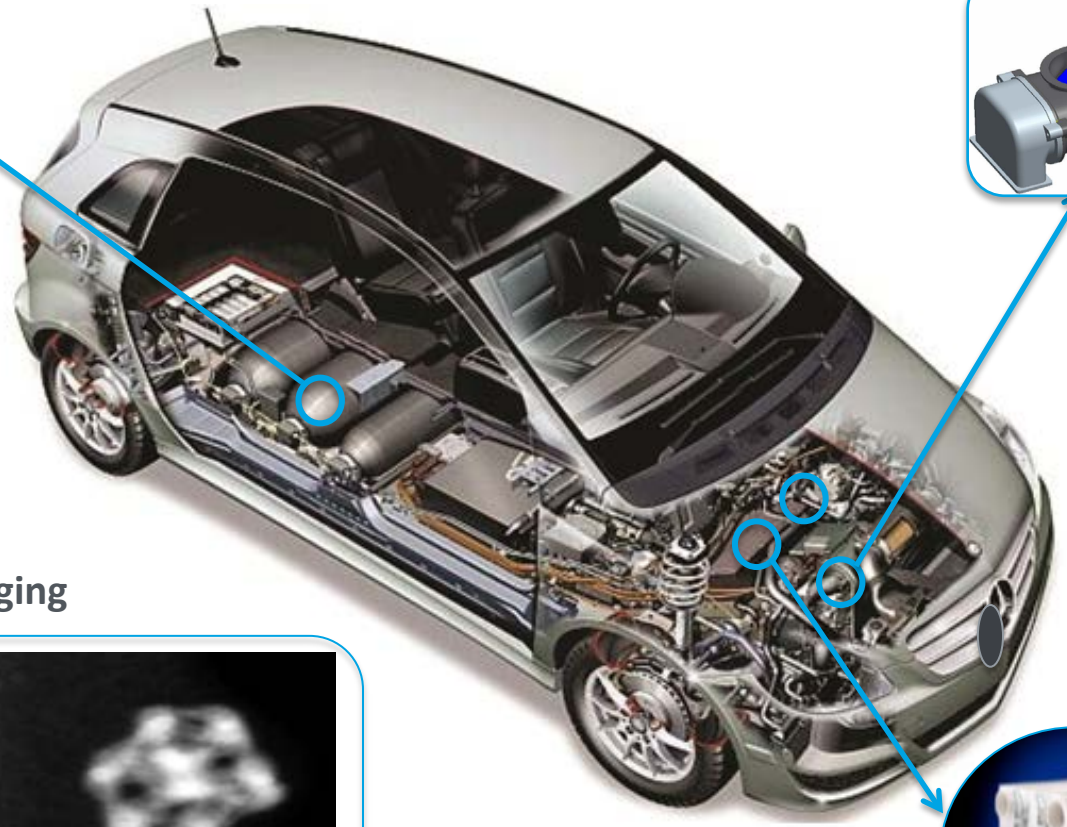
DOE funded R&D has advanced the state of technology for FCEV systems

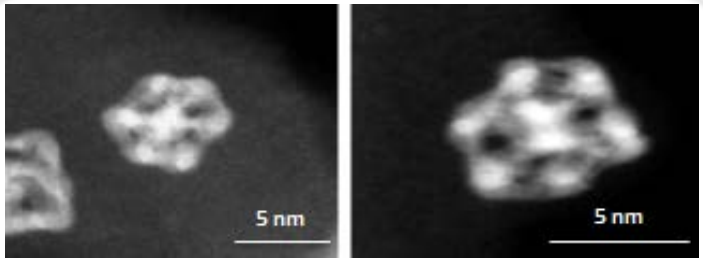
700 bar composite overwrapped pressure vessels



Compressor Expander Motor Module for Air Compression System



ORNL microscopy imaging



TEM- Karen Morre, ORNL

Module for Humidifier

DOE-Funded Patents

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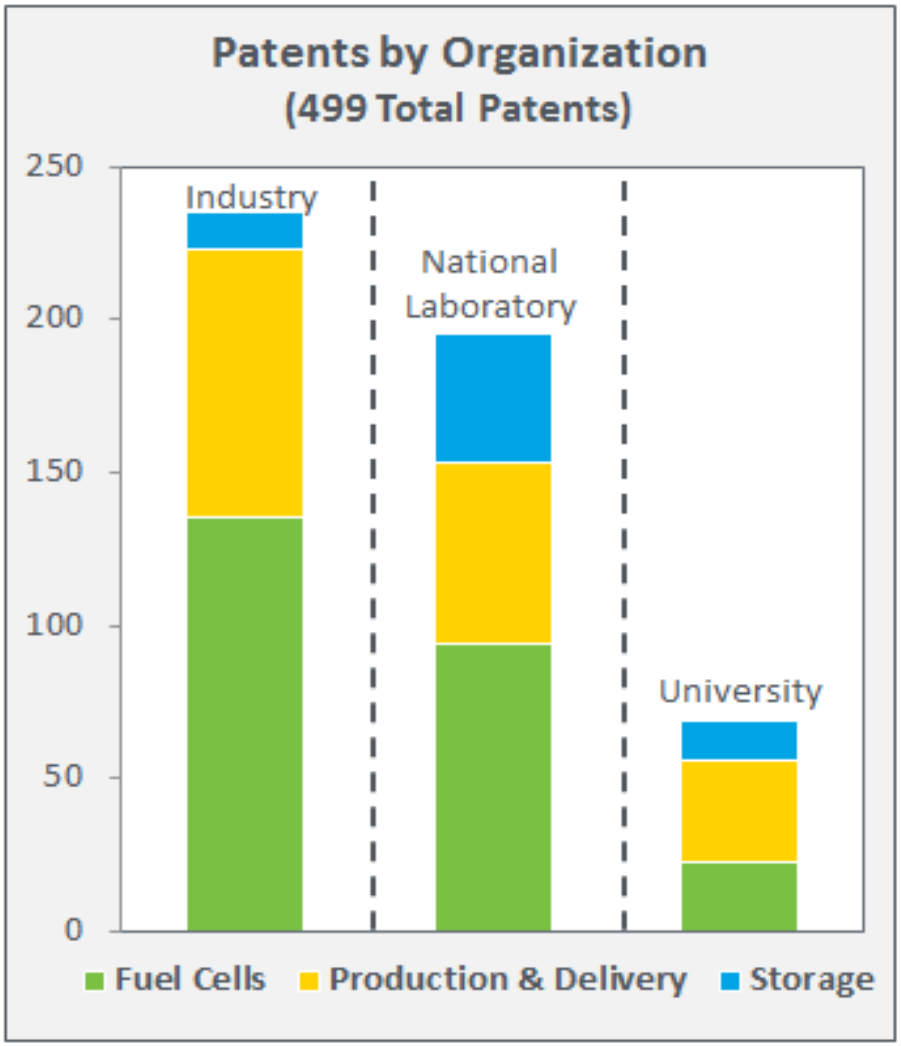
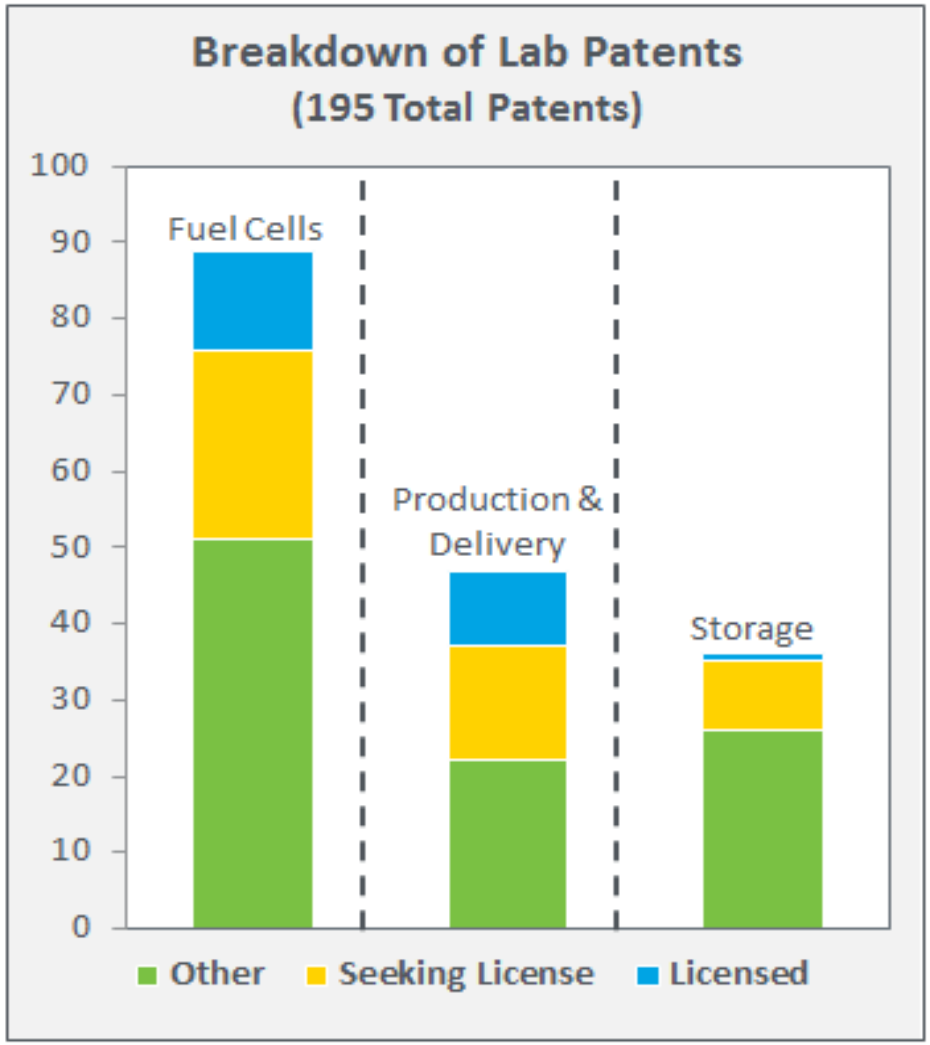
DOE has enabled nearly 500 patents, ~200 from labs





 Source: US DOE 2/13/2015

Committed to…

- EERE-National Lab Guiding Principles
- Long-term and committed relationship with National Labs
- Impact on industry
- Lab brand and identity

EERE Assistant Secretary David Danielson launches one of EERE Lab Impact Initiative key component– ***The Tech-To-Market (T2M) Approach***

Tech-to-Market (T2M) Strategy

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Improving technology transfer and targeted impact from lab to market

T2M Strategy

	Activities
Increase Industry Contact	• Business-to-Business Product Theater (Eleven Labs) • Manufacturing Road Show
Listen to the Voice of the Customer	• Key Staff Exchange with Industry
Develop Technology Transfer Skills	• Business Plan Development Training • Lab Corps

Increase Market Understanding

Improve Private Sector Relationships

Today's Session

What do we want to accomplish today?

1. Demystify process of working with national labs
2. Identify actions to increase lab-industry collaboration

Ultimate Goal

Accelerate widespread commercialization of H_2 and fuel cell technologies

Agenda

3:00-4:00

- Richard Rankin: LLNL
- Betsy Quayle: LBNL
- Elizabeth Jordan: ANL
- Jennifer Hodas: PNNL
- Owen Lu: Ford
- Steve Szymanski: Proton Onsite

4:00-4:50

- Panel Discussion, Q&A and Networking

Understanding Lab Agreements

Name	Stands for…	What is the purpose?
CRADA	Cooperative Research and Development Agreement	Collaborate and share results of a jointly conducted R&D project
WFO	Work for Others	No joint IP; specific work for industry

Other Examples…		
FIA	Funds-In Agreement	Labs perform mission-related reimbursable national lab work
TSA	Technical Services Agreement	
ACT	Agreements for Commercializing Technology	
IAG	Interagency Agreement	Perform work for non-DOE federal agencies

Myth #1

- The labs are inaccessible.

Reality #1

- National Labs can be easily accessed and have active programs to engage and work with industry.

Myth #2

- The labs are too expensive.

Reality #2

- Many labs have programs where lab time can be accessed free of charge *(e.g., 1 week)* or can be cost-shared with DOE.

Myth #3

- Lab researchers don't understand industry.

Reality #3

- Many lab researchers have deep industry experience.

Myth #4

- The government will take all the IP I develop with the labs.

Reality #4

- Research agreements have provisions for joint and individual IP.
  The lab/government does not commercialize technology, industry does.

Myth #5

- Labs aren't working on new and novel issues.

Reality #5

- Labs have enabled cutting-edge programs with ~200 patents related to hydrogen and fuel cells.

Myth #6

- It takes too long to set up agreements with the labs.

Reality #6

- Some agreements can take just a few weeks (blanket agreements, express licensing, etc. can help)

Example of Tech to Transfer Opportunities (TTO)

Transferring lab-developed technologies to industry applications

What:

Open TTO on NREL's quality control IP.

Letters of intent December 15th.

Purpose:

Have interested companies commercialize technology

Steps

1. **NREL's QC IP offered to industry**
2. **Small business solicited to commercialize QC IP**

T2M Activities at the Fuel Cell Seminar and Exposition

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Visit DOE-sponsored T2M events during this conference

- **Tools**
  - Workshop sessions
  - Business-to-business product theater
- **Key Questions**
  - How do I work with the National Labs?
  - Why should I work with the National Labs?
- **Objective**
  - Collaboration and understanding between national labs and industry

FCTO's ad on T2M Showcase Activities for the FCS

DOE National Lab Collaboration Corner

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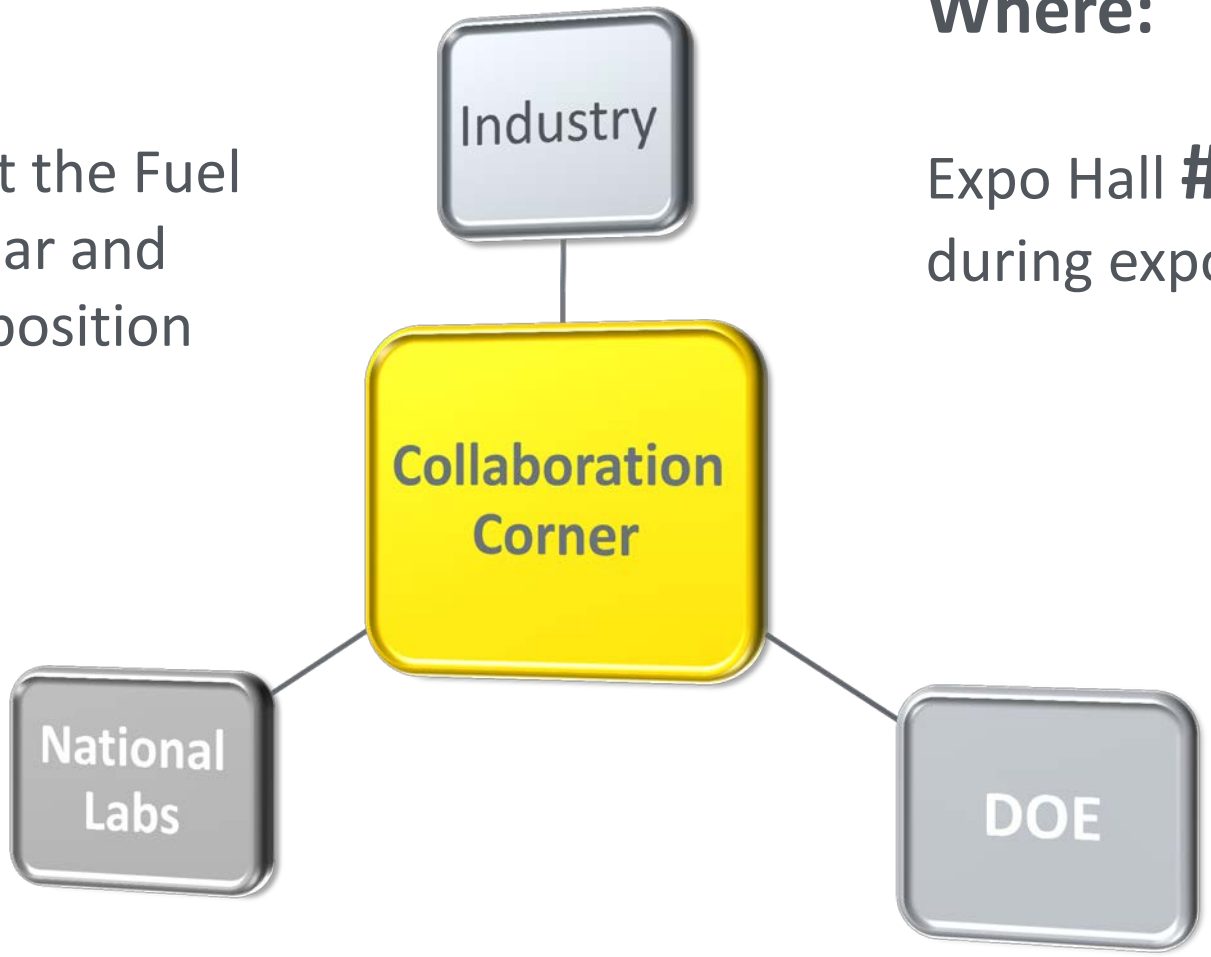
Networking opportunity for Industry, DOE and National Labs

When:

All week at the Fuel Cell Seminar and Energy Exposition



Where:

Expo Hall **#404** during expo hours

Thank You

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