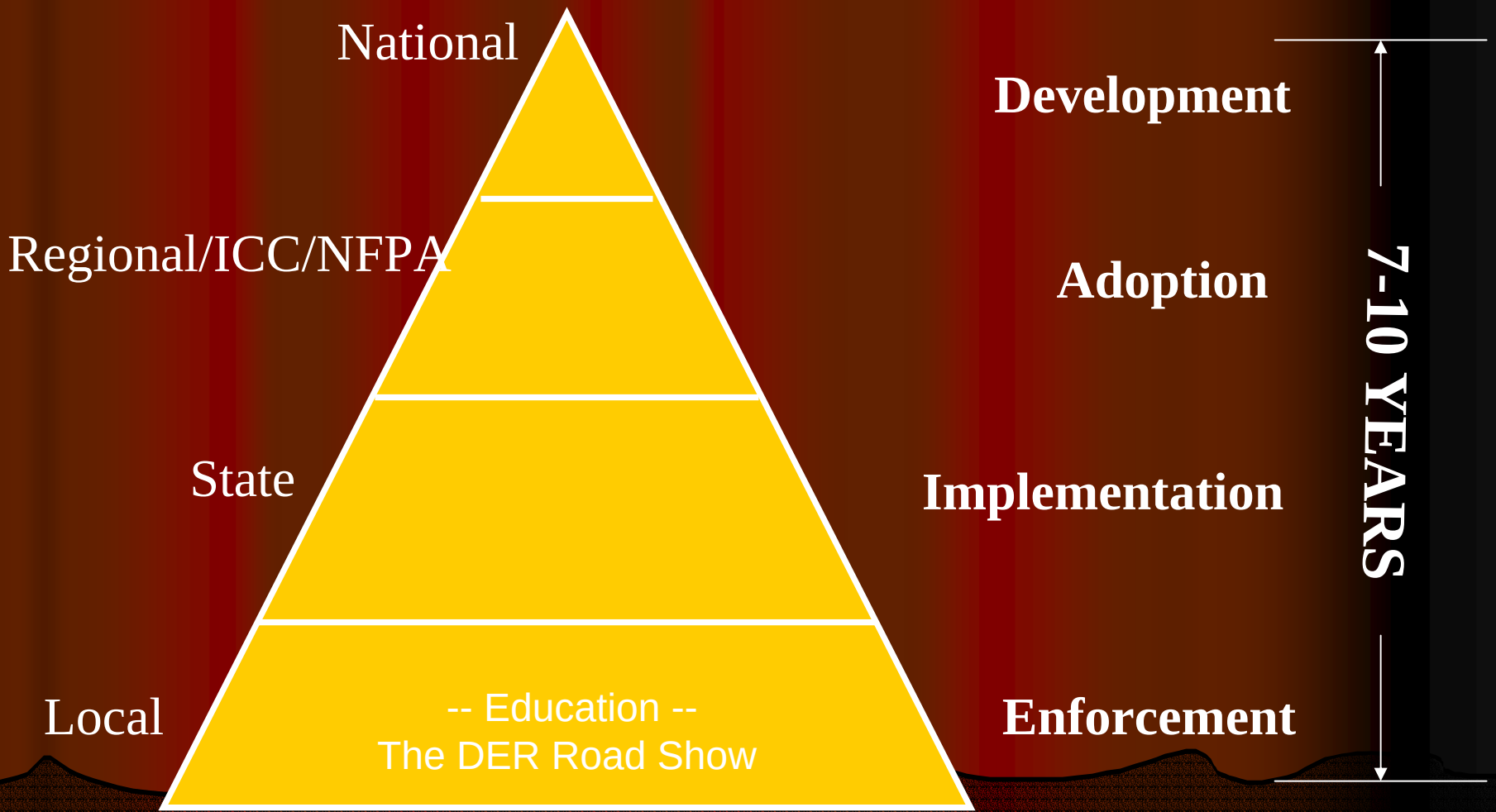
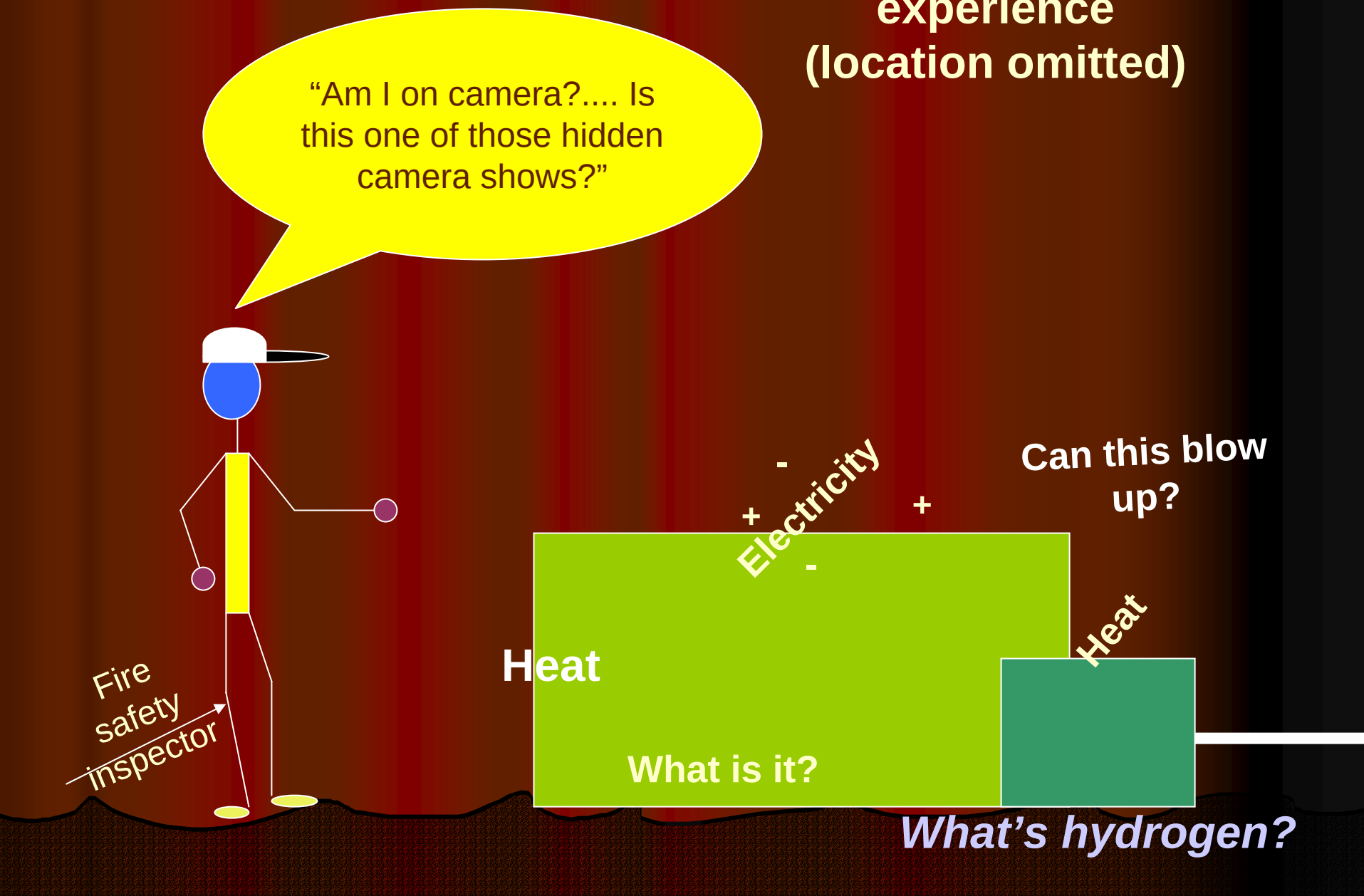
Distributed Energy Road Shows: 2003 Report

U.S. Fuel Cell Summit VIII – June 15-17, 2004 – Miami, FL

From National Standards to Local Building Codes



Actual fuel cell permitting experience (location omitted)



What's hydrogen?

What's a *Road Show?*

- One-day training for fire marshals, building code inspectors, utility engineers, city & county planning staff
- The installation, fueling, interconnection, permitting, and safe operation of any customer-sited energy technology including fuel cells, hydrogen, methanol, and other "DE" products)
- Hands-on experience with operating demonstration units at the training site.

After a Road Show.....

An attendee will know:

- Fuel cell basics
- how it is installed, operated
- Hydrogen fundamentals, including safety and storage
- Where to go for permitting assistance (names, contact information, web sites, associations)

Attendance may include CE credits

Sample Agenda - Austin

Welcome (City of Austin)
DE: The National Perspective (DOE)

CHP: Applications & Benefits (Burns & McDonnell)
Microturbines: Installation & Operation (Capstone & Lower Colorado River Authority)

Interconnection (Austin Energy)
Texas DG Programs (State Energy Conservation Office)

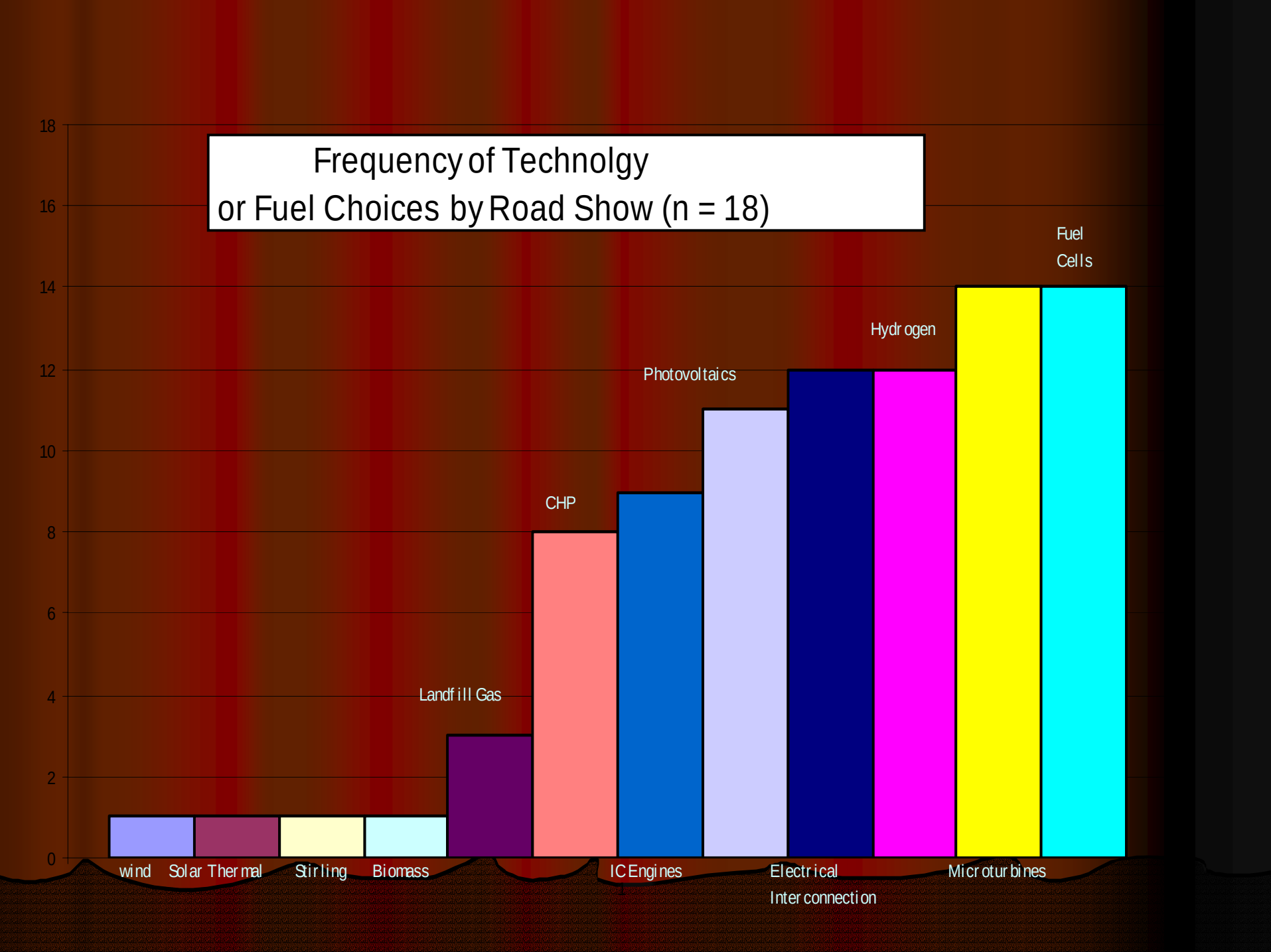
PV: Installation & Operation (Janet's Electric, Inc.)
Fuel Cells: Installation & Operation (Southwest Research Institute)
Hydrogen (Houston Advanced Research Center)

Structured Discussion and Q&A (DOE)

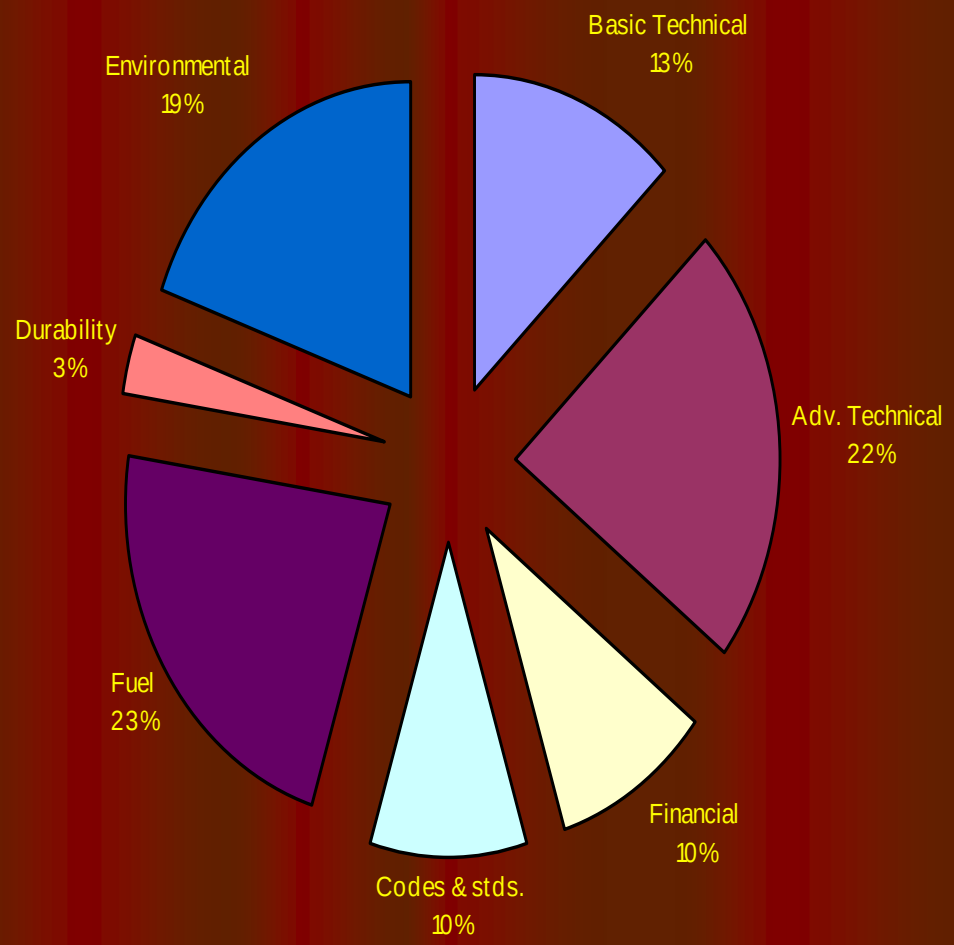
Fuel Cell Tour – RBJ Health Center

Road Shows to-date

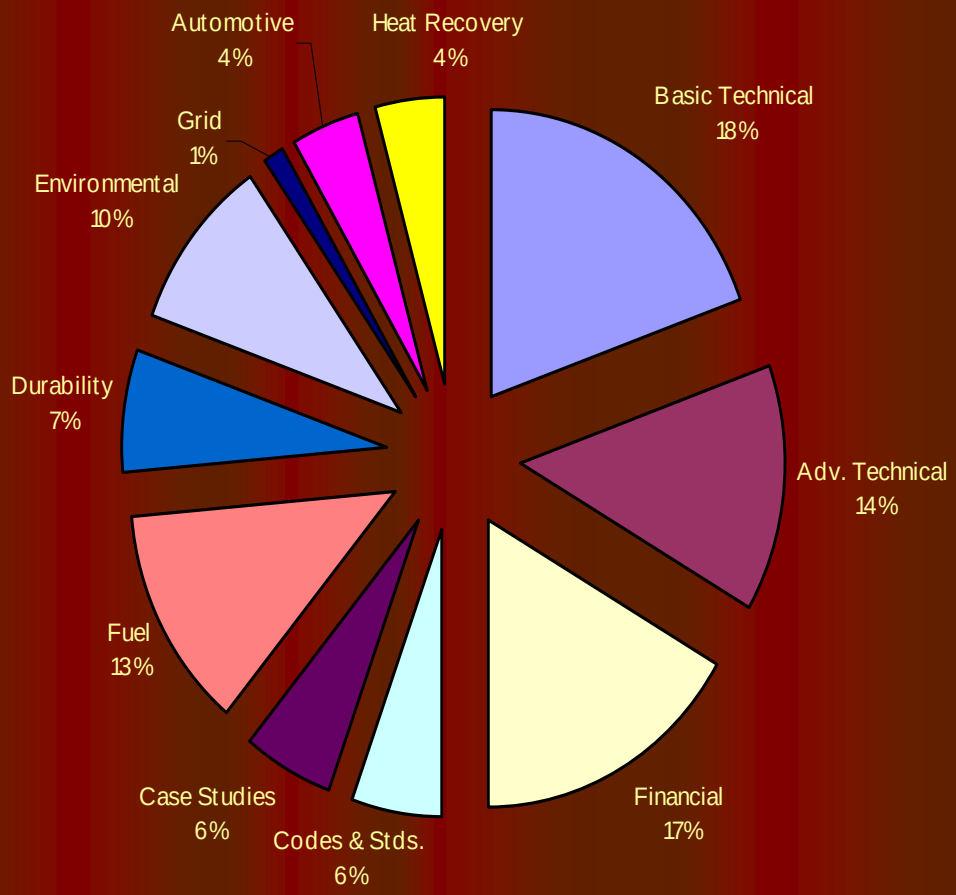
- San Diego, San Jose, Sacramento, CA
- NY City, Long Island, Albany
- Las Vegas, NV
- Seattle, Portland, Eugene OR
- Novi MI
- Burlington, VT
- Concord, NH
- Portland, ME
- New Haven, CT
- Amherst, Boston, Sturbridge MA
- Cocoa FL,
- Warner Robins GA,
- Clemson SC
- Denver, Fort Collins CO
- Madison & Milwaukee WI
- Burlington, MN
- Plainfield, IN
- Austin, San Antonio & Dallas TX
- Virgin Islands (St. Croix, St. John)
- Anchorage, AK


Frequency of Technolgy
or Fuel Choices by Road Show (n = 18)
18
16
14
12
10
8
6
4
2
0
wind
Solar Thermal
Stirling
Biomass
Landfill Gas
CHP
IC Engines
Photovoltaics
Electrical
Interconnection
Hydrogen
Microturbines
Fuel
Cells

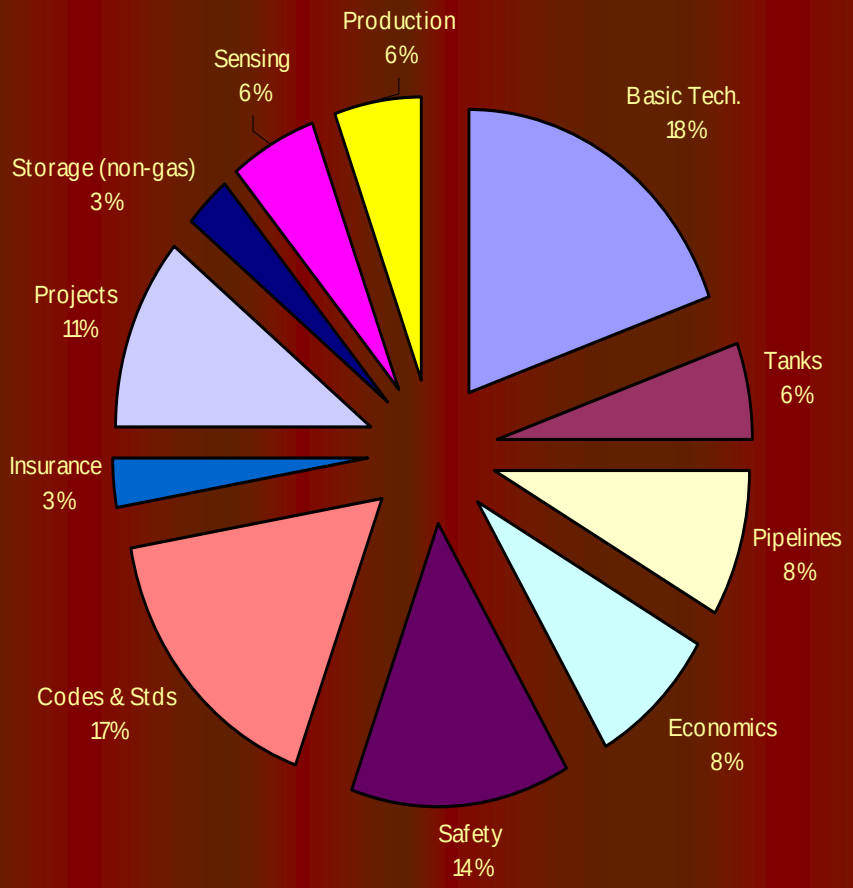
Audience Questions by Subject: IC Engines



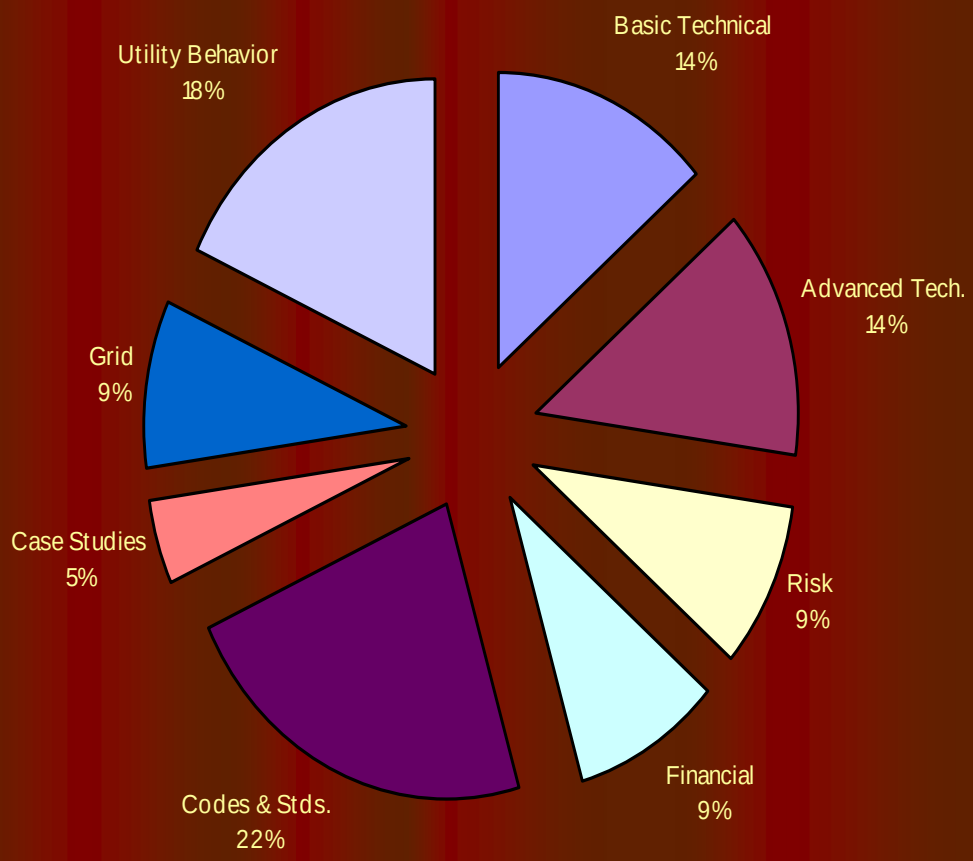
Audience Questions by Subject: Fuel Cells



Audience Questions by Subject: Hydrogen



Audience Questions: Electrical Interconnection



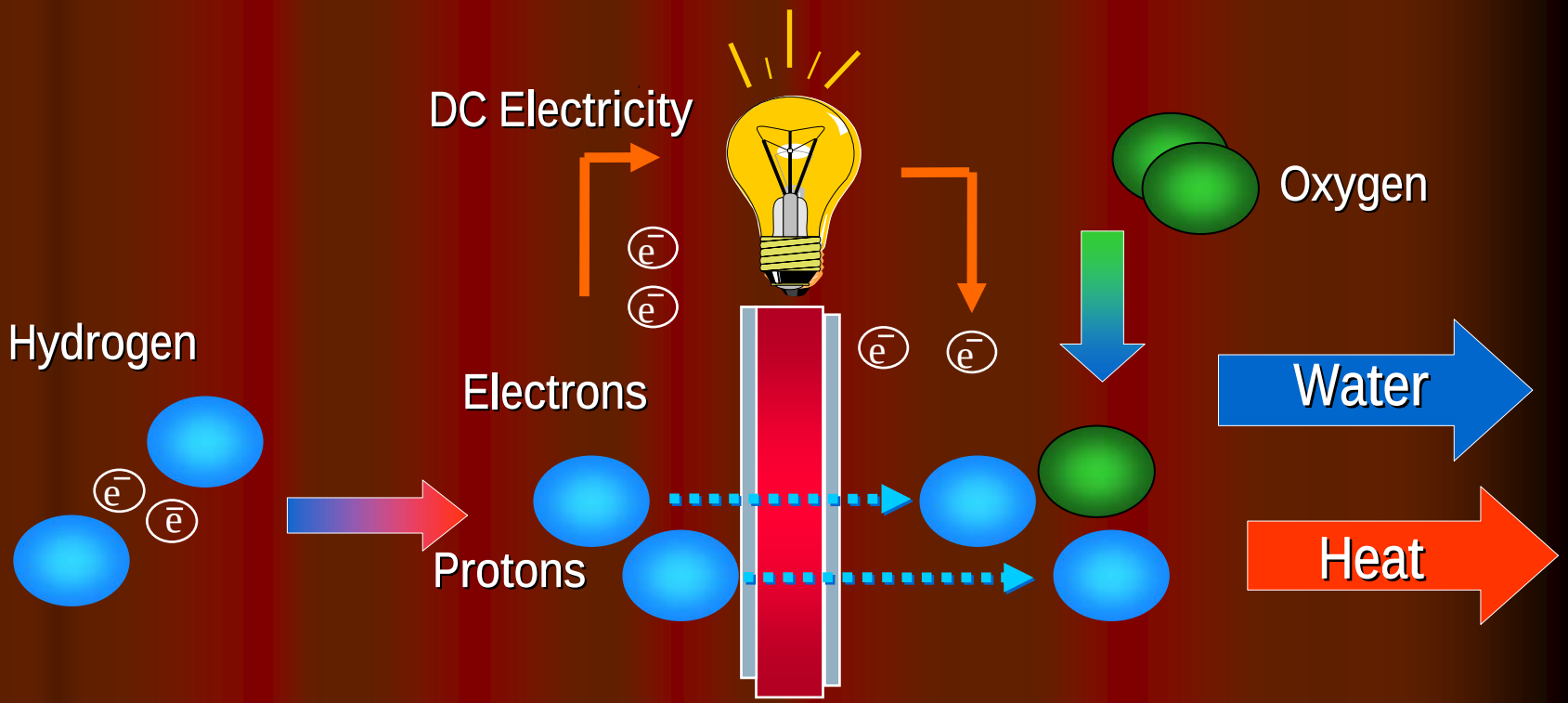
Presenting on Fuel Cells at a Road Show:

The Good, The Bad,

and *the Ugly*

The Fuel Cell Process

As presented by Plug Power



$H_2 \Leftrightarrow 2H^+ + 2e^-$

0 Volts

$1/2O_2 + 2e^- \Leftrightarrow 1/2O_2^{--}$

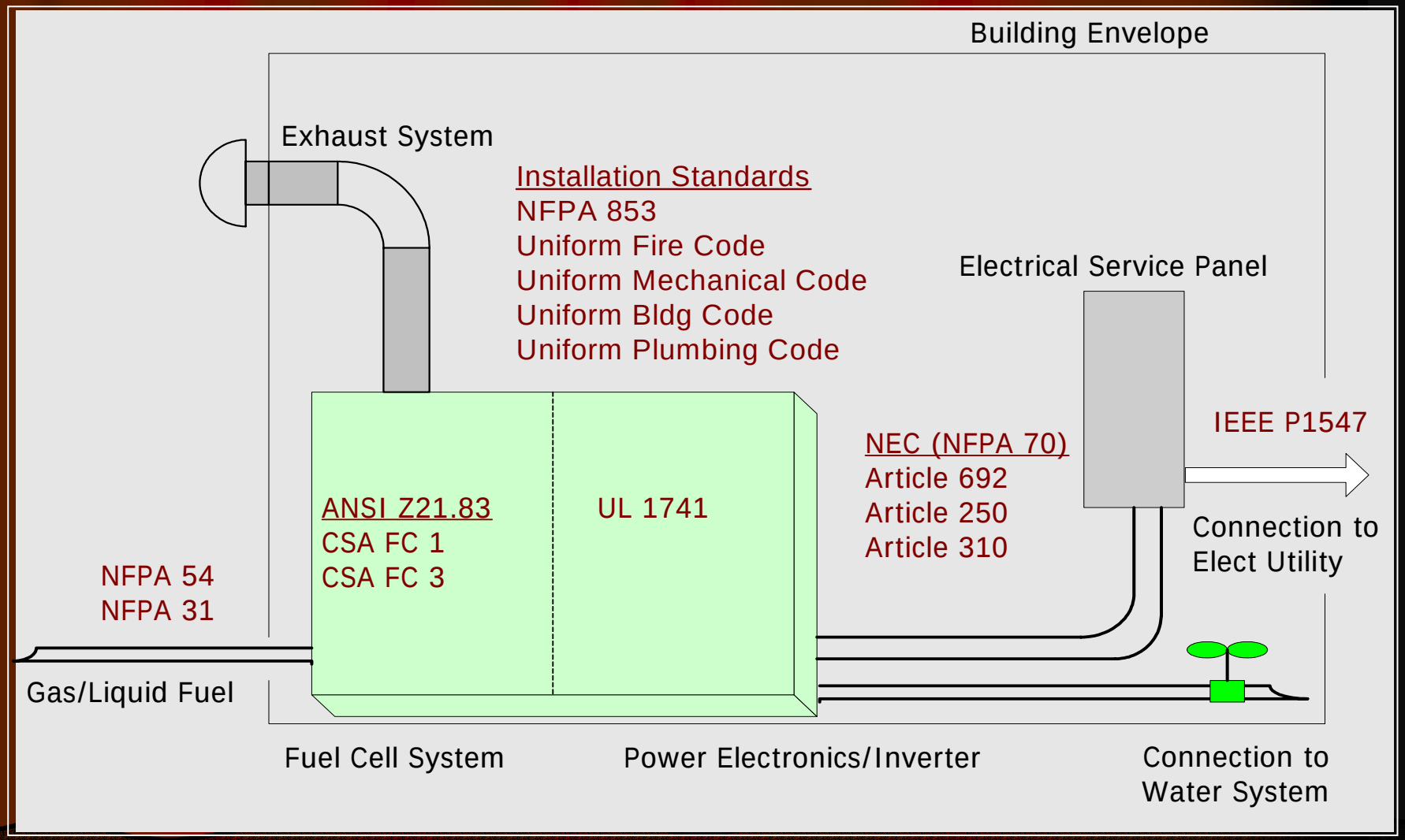
~1.23 Volts

$\mathbf{H_2 + 1/2O_2 \dashrightarrow H_2O}$

Approx. 1 volt or less/cell, therefore add cells together

Installation Configuration - Interfaces - Codes and Standards

As presented by Plug Power



DO

- Be aware of popular literature.
- Understand your audience REALLY wants to learn about fuel cells and hydrogen--from you.
- Detail EVERY Input/Output
  - Be direct, but simple
- Give examples of other fuel cell technologies.

DO NOT…

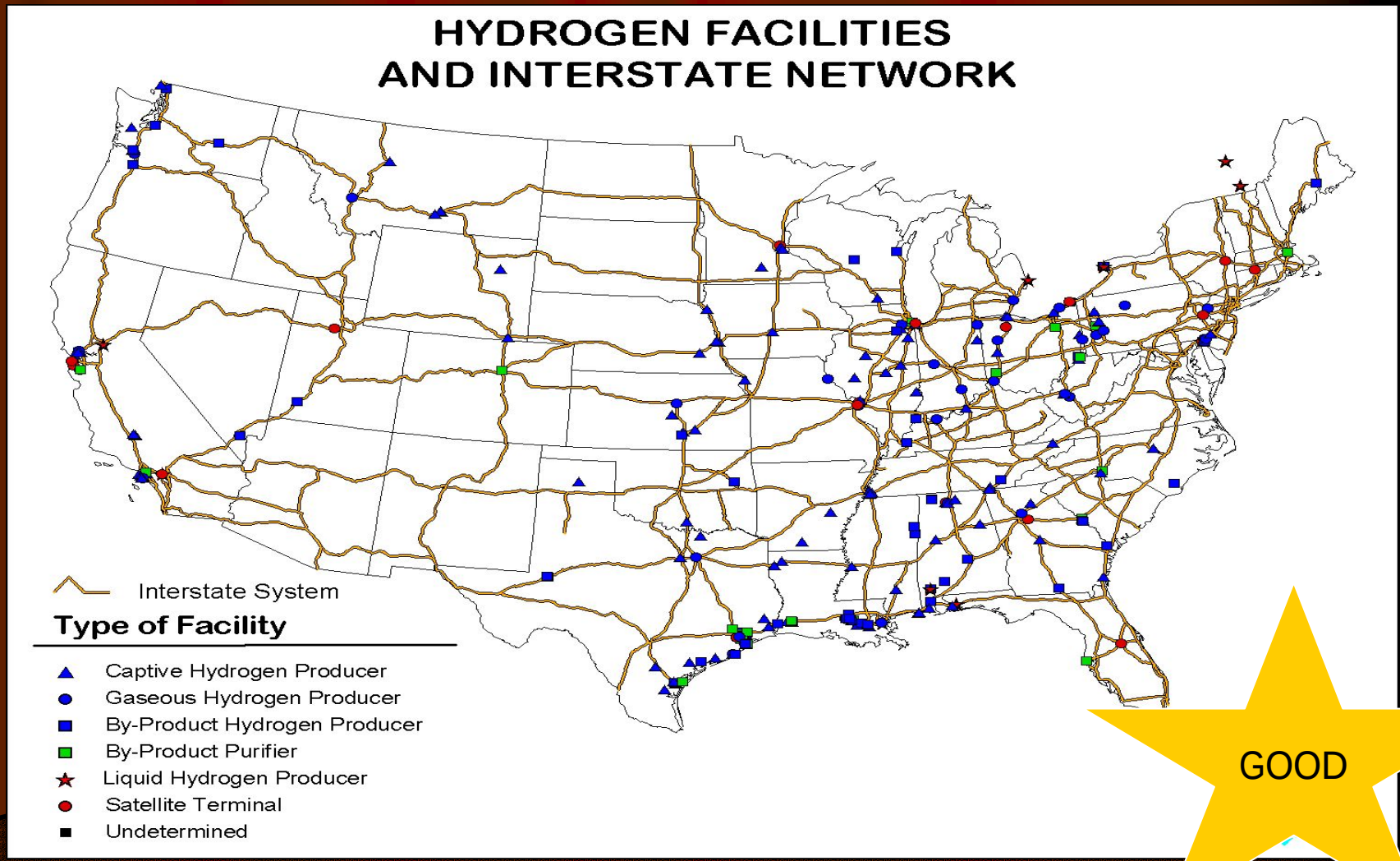
- Claim all other traditional technologies are a disaster and you've come to save the world.
- Show lovely pictures of your new manufacturing facility.
- Incorporate quantum physics into your presentation.
- Sidestep a question.

Presenting on Hydrogen at a Road Show

The Good, The Bad,

and *The Ugly*

Graphics



GOOD

International – Not

Identification Number	Title	Working Group	Convener (Country)
DIS 13984	Liquid H_2 - Land Vehicle Fueling System Interface	WG 1	SCC (Canada)
DIS 14687	H_2 Fuel-Product Specification	WG 3	ANSI (USA)
NP 15594	Airport H_2 Fueling Facility	WG 4	DIN (Germany)
NP 15866	Gaseous H_2 and H_2 Blends--Vehicular Fuel Systems	WG 5	ANSI (USA)
NP 15869	Gaseous H_2 - Vehicle fuel tanks	WG 6	ANSI (USA)
NP 15916	Basic requirements for safety of H_2 systems	WG 7	DIN (Germany)
WD 13985	Liquid H_2 - Land vehicle fuel tank		SCC (Canada)
WD 13986	Tank containers for multimodal transport of liquid H_2		SCC (Canada)

Sample Talking Points: H2 Diffusion into Air --

- Hydrogen is only 7% as dense as air (14 times lighter) and diffuses into air very rapidly.
- Methane is 55% as dense as air and has ¼ the diffusion rate of H_2.
- Gasoline is 3.4 to 4 times denser than air and has $^{1}/_{12}$ the diffusion rate of H_2

As presented by Stuart Energy

Sample Talking Points: Flammability Properties of H2

- The Lower Explosive Limit (LEL) for hydrogen in air is 18% and its Lower Flammable Limit (LFL) in air is 4.1%.
- The Upper Explosive Limit (UEL) is 75% in air and 96% in oxygen
- In the lean range, the ignition energy of H_2 is about equal to methane. However it is much less at concentrations of 25 – 30%
- H_2 has a higher ignition temperature (585^o C) than other fuels

As presented by Stuart Energy

“Hydrogen Permitting Recommendations”

1. Rely Upon Best Engineering Judgment derived from Codes and Standards
2. Incorporate Knowledge From Other Sources and Experts (Recommended Good Practices & Guidelines)
3. Perform Due Diligence
4. Work as a “Team”

Join Us !!

Thank You

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