US Fuel Cell Council

www.usfcc.com

Fuel Specifications

Presenter

W. Collins – UTC

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Existing Hydrogen Standards

There are several Hydrogen Quality Standards presently available:

- MIL-P-27201
- California 229.7
- CGA G-5.3-1997
- JIS K0512-2001
- ISO 14687-1999

After review of these standards, various groups (industry segments, government agencies, international agencies, etc.) have concluded that the existing standards are not adequate. This is because these standards only test for impurities of interest to specific industry segments and these impurities are not necessarily the impurities of concern to the manufacturers and users of hydrogen powered fuel cells.

Existing Hydrogen Standards (cont.)

Having recognized this deficiency various groups are discussing either modifying the existing standards or writing new standards. As an example:

- Japan
  - Modify JIS K0512
  - Modify ISO 14687
- USA (DOE/NREL)
  - Stationary Applications – Modify CGA G-5.3
  - Transportation Applications – SAE is to write a new “J” document

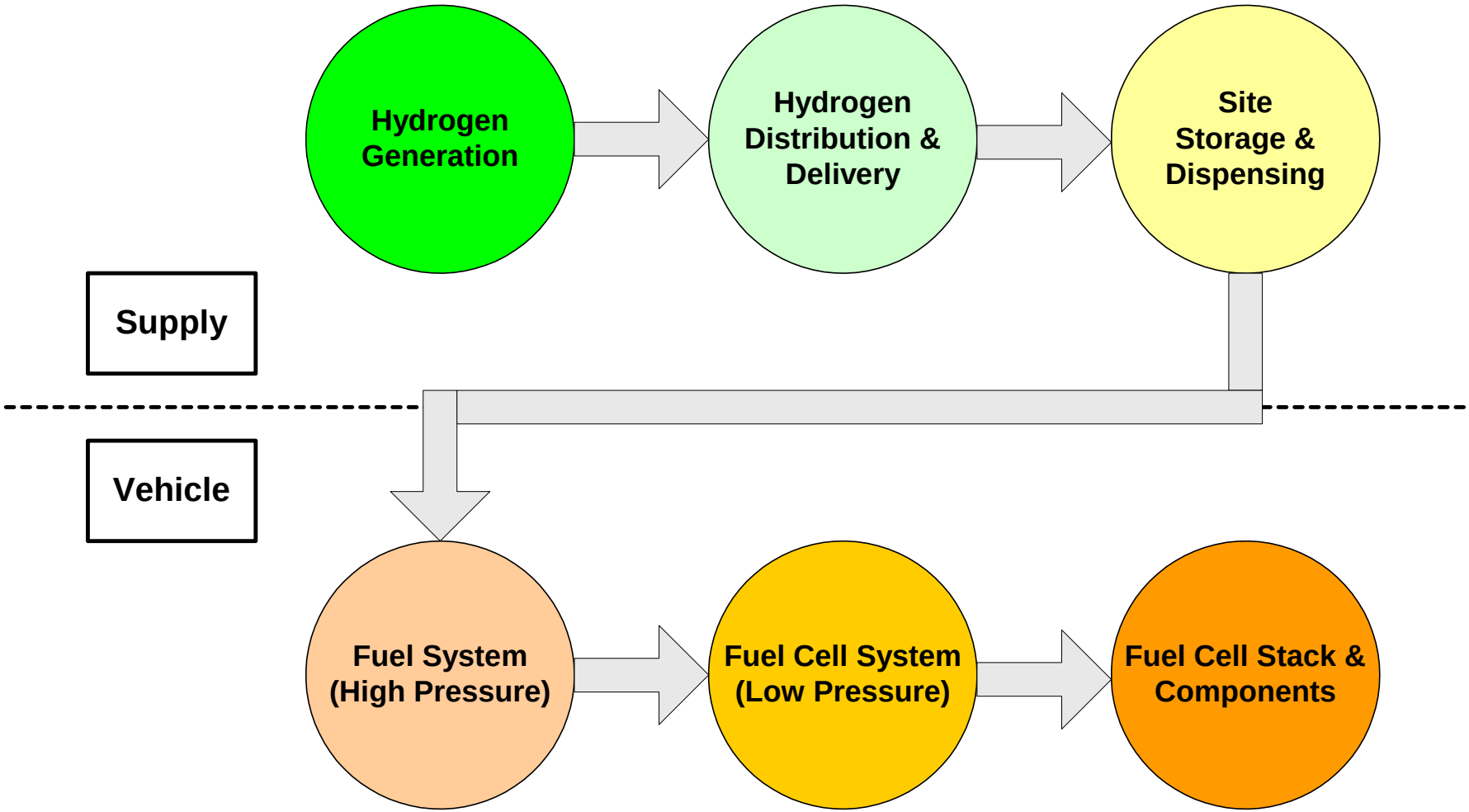
Stakeholders

Figure 1 represents the generation and consumption process. This process will have a number of stakeholders.

Each stakeholder has a vested interest because their part of the process may affect the stakeholders downstream and may be affected by the stakeholders upstream.

Therefore a valid Hydrogen Quality Specification needs input from all of the stakeholders.

Figure 1 – Generation and Consumption Process



Issues

The issue with generating (or modifying) a hydrogen quality standard is to determine the following:

- What are the potential sources of impurities?
- What impurities and concentrations are to be considered contaminants?
- How are these contaminants detected?

Additionally, the source of impurities may be due to:

- The process
- House keeping

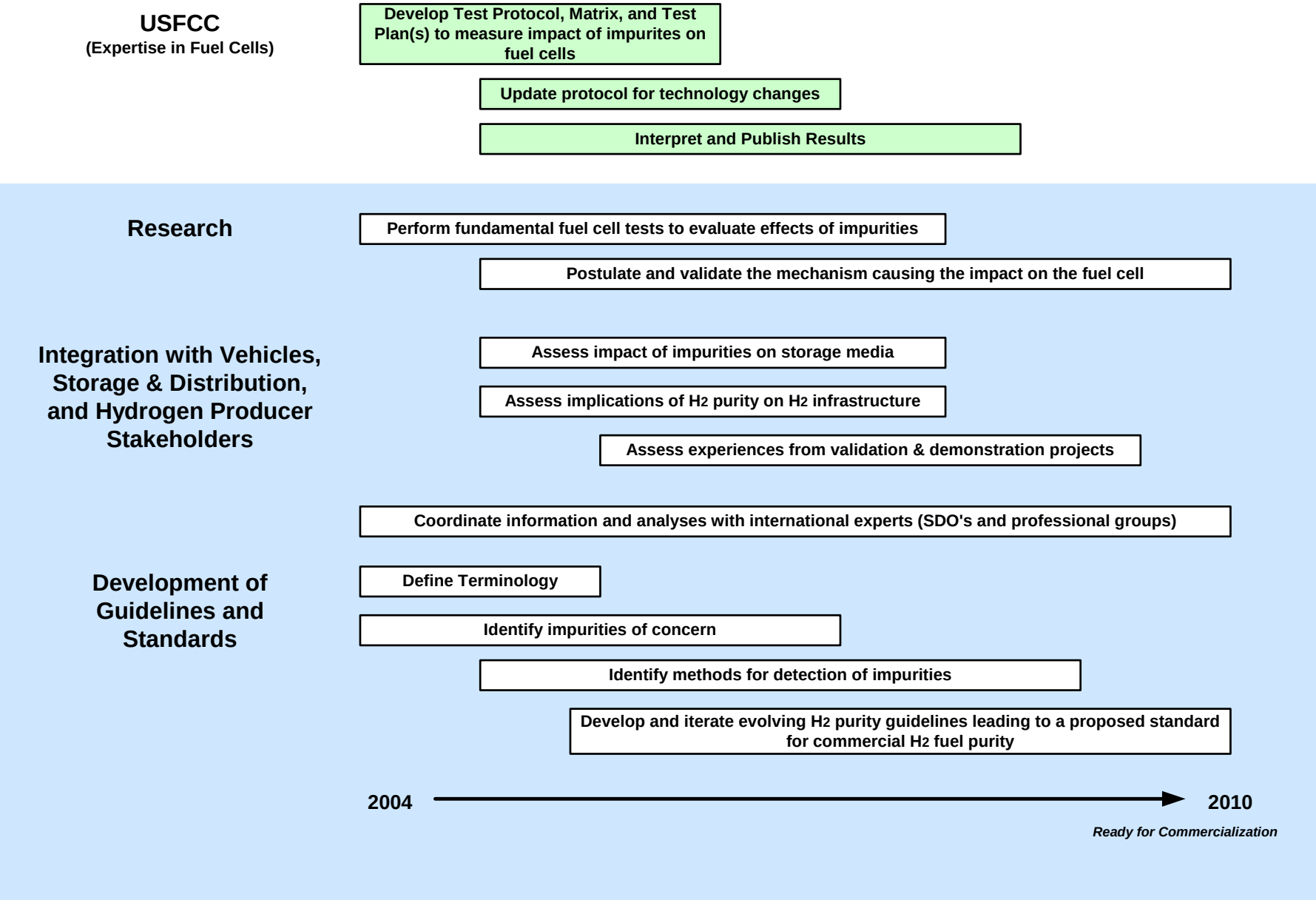
What needs to be done

USFCC believes that the key activities noted in figure 2 should be conducted.

USFCC is addressing the items in green.

USFCC hopes that other groups (trade organizations, SDO's, Government Agencies, etc.) would step to the plate and address the additional items noted in figure 2 (and address the details missed).

Figure 2 Key Activities from Perspective of USFCC



Why is USFCC involved?

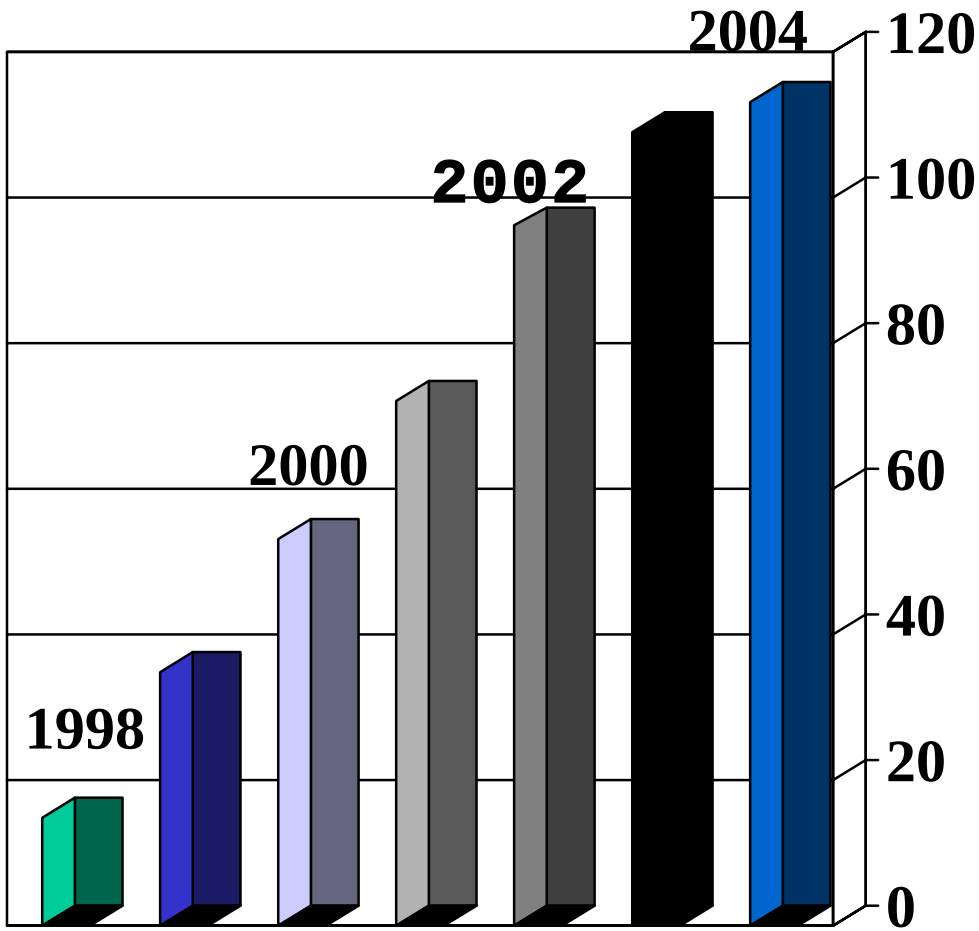
USFCC is a trade organization.

Formed in 1998, the U.S. Fuel Cell Council is organized as a nonprofit industry association (501(c)(6)) open to anyone who shares our goal of fuel cell commercialization in the United States.

The Council provides its members an opportunity to develop policies, and conduct education and outreach activities for the fuel cell industry, and also gives every member the chance to benefit from one-on-one interaction with colleagues and opinion leaders important to the industry.

We (and others) believe that our membership has the expertise and critical mass to speak for the fuel cell industry on issues such as “how to determine what hydrogen impurities are actually contaminants”.

USFCC membership



113 Membership

- 44 Executive
- 60 Associate
- 9 Gov’t organizations
- 3 Subscribers

USFCC membership (cont.)

Development of Fuel Cell Products
FuelCell Energy, Inc.
Heliocentris
Plug Power Inc.
IdaTech
UTC Fuel Cells
DaimlerChrysler
Caterpillar Electric Power Group
Concurrent Technologies Corporation
Siemens Westinghouse
Nissan Technical Center N.A., Inc.
Nuvera Fuel Cells
Ballard Power Systems
Umicore Autocat USA, Inc.
Columbian Chemicals Company
ReliOn
De Nora North America, Inc.
Dow Corning Corporation
Freudenberg-NOK General Partnership
National Fuel Cell Research Center
MTI Micro Fuel Cells
Global Thermoelectric
Proton Energy Systems, Inc.
Ceramic Fuel Cells Limited
Teledyne Energy Systems, Inc.
Smart Fuel Cell, GmbH
Fuel Cell Technologies, Ltd.
General Electric Hybrid Power Generation Systems
Habco, Inc.
HyRadix, Inc.
Neah Power Systems, Inc.
ElectroChem, Inc.
General Motors
Toyota Motor North America
Ztek
UltraCell Inc.
Franklin Fuel Cells Inc.
Renew Power, Inc.
Hydrogenics Corporation
Motorola Labs

Educational Institutions
University of South Carolina
University of Houston
Breakthrough Technolgies Institute
Kettering University
Worcester Polytechnic Institute

Associations
Methanol Institute
NextEnergy Corporation
Houston Advanced Research Center
World Fuel Cell Council
Cooperative Research Network (NRECA)
SOCA
Renewable Fuels Association
National Joint Apprenticeship & Training Committee

Hydrogen/Fuel Providers
MesoFuel, Inc.
ConocoPhilllips Company
Stuart Energy USA
ChevronTexaco Energy Technology Systems

Government Agency
California Air Resources Board
Office of Navy Research
South Coast Air Quality Management District
U.S. Army CERL
U.S. Department of Energy
Delaware Fuel Cell Consortium
Ohio Department of Development - Technology Division

Utilities
Bonneville Power Administration
American Electric Power

Research
Argonne National Laboratory
TIAX, LLC
RIT

Other
Connecticut Clean Energy Fund
Updike, Kelly & Spellacy, P.C.
Underwriters Laboratories, Inc.
CSA International
US EPA

USFCC membership (cont.)

Suppliers to the Fuel Cell Industry

SGL TECHNIC Inc.
Donaldson Company, Inc.
DuPont Fuel Cells
Parker Hannifin Corporation
Tenneco Automotive
Engelhard Corporation
Graftech, Inc.
Johnson Matthey, Inc.
Dana Corporation
3M
Porvair Fuel Cell Technologies
Energy Conversion Devices, Inc.
Asbury Graphite Mills
Methanex, Inc.
Gore Fuel Cell Technologies
Syntroleum Corporation
Panasonic Technologies, Inc.
Sud-Chemie, Inc.
Mott Corporaiton
Entegris, Inc.
Bulk Molding Compounds, Inc.
Delphi Corporation
Ticona/Celanese
Air Products and Chemicals, Inc.
Morgan Fuel Cell
Exergy, Inc.
Ion Power, Inc.
QuestAir Technologies, Inc.
Millennium Cell, Inc.
NexTech Materials, Ltd.
Atofina Chemicals, Inc.
Foamex
H.C. Starck, Inc.
Ogura Industrial Corp.
Superior Graphite Company
SOFCo-EFS Holdings LLC
ATMI GmbH
Cabot Superior MicroPowders, Corporation
BIC Corporation
PolyFuel, Inc.
Hoku Scientific, Inc.
FEV Engine Technology, Inc.
Gas Technology Institute
The Gillette Company
Energizer Battery Manufacturing, Inc.

What is USFCC doing?

USFCC is leveraging the expertise of the membership to address questions on the effects of impurities on fuel cells.

- Transportation working group
- Materials and Components working group

USFCC is working with other groups on this question.

- SDO's and organizations
  - SAE, CSA, CaFCP, NEDO/JARI etc
- IPHE MOU partners
  - Fuel Cells Canada, World Fuel Cell Council, FCCCJ, Fuel Cells Europe.

USFCC is working with DOE/NREL to develop a program to evaluate the effects of various impurities on fuel cells.

USFCC has been actively engaged with NEDO/JARI on the progress on this task in Japan.

How is USFCC doing this?

Transportation working group is working with DOE/NREL to develop a program to evaluate the effects of various impurities on fuel cells.

Transportation working group is generating a series of documents to give investigators guidance in:

- Test data to be collected
- Impurities to be tested
- Generation of test plans

Materials & Components working group is generating a series of documents on suggested test methods.

- Single Cell Testing Protocol
- Test Station Verification Procedure
- Etc.

USFCC Goals

- To support the generation of valid commercial hydrogen quality specifications.
- To represent all of our members vested interest.
- To interest stakeholders not presently involved in this effort.
- And invite other parties not presently engaged but interested in supporting this effort to contact USFCC.

How to contact USFCC

US Fuel Cell Council

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