

Codes and Standards Development

Hydrogen and Fuel Cell Technical Advisory Committee

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Outline of Discussion

Codes and Standards Development

Overview

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Domestic Activities

DOE-Enabled Code Development

Martin Gresho, FP2FIRE, Inc.

International Activities

Hydrogen Fueled Vehicle Global Technical Regulation

Nha Nguyen, USDOT/NHTSA

The key challenge of the DOE Safety, Codes and Standards subprogram is to establish regulations, codes and standards needed to enable full market deployment of hydrogen and fuel cell technologies by 2020

R&D
Roadmap

Hydrogen Behavior

Unintended releases (modeling and validation)

Dispersion, diffusion, entrainment

Ignition, flammability (mechanisms, propagation)

Test Methods, Component/System Performance

Critical materials, components, systems

Test methods, protocols, validation

Certification processes, system qualification

Data, Analysis, Implementation

Handbooks, data resources

Risk assessment

Mitigation

RCS Development and Harmonization

Support completion of essential codes and standards

Facilitate uniform implementation of requirements in US

Harmonize requirements in domestic and international standards

Support and facilitate completion of Phase 1 GTR H2 vehicle systems

Education Outreach, Training

Support Hydrogen Safety Panel and lessons learned database

Conduct hands-on training and education for first responders

**Science and
Technology
Foundation:**

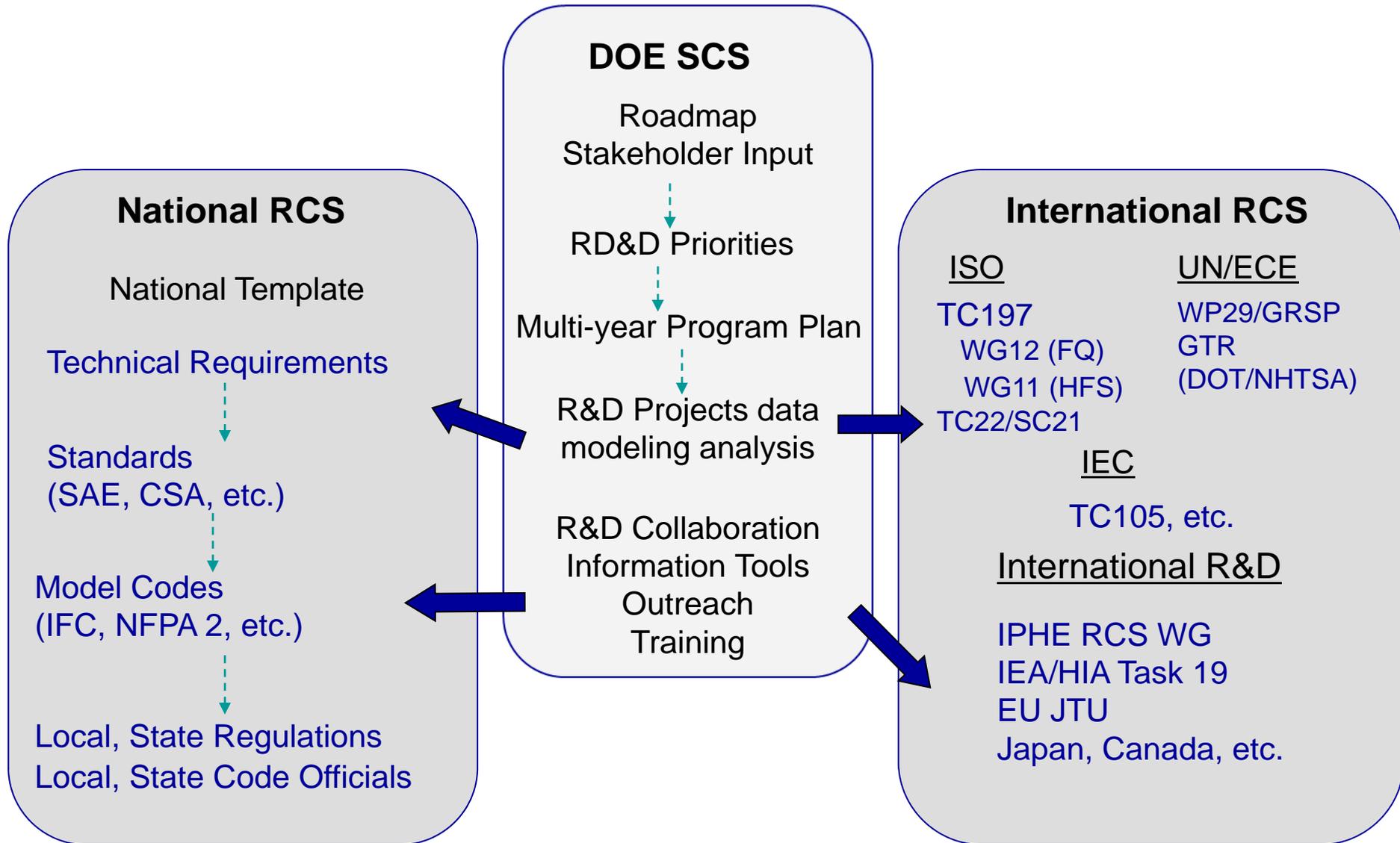
*Regulations, codes
and standards (RCS)
based on data and
scientific
understanding.*

*Commercialization
Decision*

*Enabling the growth of
early markets by
establishing essential
regulations, codes and
standards (RCS)
validated by scientific
research and testing
and developed through
consensus of all major
stakeholders.*

Multi-year
Program Plan

R&D-RCS Integration



National Codes and Standards Template

National Template: Vehicle Systems & Refueling Facilities

STANDARDS DEVELOPMENT ORGANIZATIONS

— LEAD STANDARDS DEVELOPMENT ORGANIZATIONS (SDOs)

Interface

Vehicles

CONTROLLING AUTHORITIES

DOT/NHTS (crashworthiness)
EPA (emissions)

General FC Vehicle Safety:

SAE

Fuel Cell Vehicle Systems:

SAE

Fuel System Components:

SP

Containers:

SAE

Reformers:

SAE

Emissions:

SAE

Recycling:

SAE

Service/Repair:

SAE

National Template: Stationary & Portable Systems

STANDARDS DEVELOPMENT ORGANIZATIONS

— LEAD STANDARDS DEVELOPMENT ORGANIZATIONS (SDOs)

Hydrogen Generator

CONTROLLING AUTHORITIES:

EPA (emissions)
DOT/PHMSA (pipeline)
OSHA, State and Local Gov't
(zoning, building permits)

Electrolyzers:

UL SP

Reformers:

UL SP API

Perform. Test Procedures:

ASME SP

Chemical Hydrides:

UL SP NFPA

Portable Fuel Cells

CONTROLLING AUTHORITIES:

CPSC, DOT/PHMSA,
OSHA, EPA (methanol)
State and Local Government
(zoning, building permits)

Handheld Systems:

UL SP

Portable Systems:

SP UL G

Handheld Fuel Containers:

UL SP G

Portable Fuel Containers:

G SP ASME

H₂ Fuel Specifications:

G SAE

Perform. Test Procedures:

gti ASME SP

Stationary Fuel Cells

CONTROLLING AUTHORITIES:

OSHA, State and
Local Government
(zoning, building permits)

H₂ ICES:

UL SP

H₂ Fueled Turbines:

API SP UL ASME

FC Systems:

SP ASME UL

FC Installation:

NFPA

FC Performance

Test Procedures:

ASME SP gti

Interface

Installation Piping:

ASME SP G NFPA

Storage:

ASME G SP API NFPA

Compressors Safety Cert.:

SP UL

Comp. Design, Perf. & Safety:

API

Sensors/Detectors:

UL SP NFPA

Fuel specifications:

G SAE API

Weights/Measures:

NIST API ASME

Dispensers:

NFPA SAE SP UL API

Non-vehicle Dispensing:

G

Codes for Built Environ.:

NFPA G

Interconnection:

NFPA UL NFPA

International Coordination and Harmonization

Standards/Codes

International Activities

ISO TC197: WG11, WG12, WG14
ISO TC22/SC21
ISO TC58
IEC TC 105

National Organizations

US: ANSI Canada: CSI
Japan: JIS China: SAC
India: BIS

Organizations--Other

Japan: JARI, ENNA
US: SAE, CSA, NFPA, etc.
India: ARAI

Coordination/Harmonization

DOE/DOT Workshops
EC FCH/JTU General
Assembly
JHFC (Japan)
IPHE RCS Working Group

Regulations

International Activities

UN/ECE: Global Technical Regulations

National Organizations/Regulations

US: DOT/NHTSA FMVSS
EU: ECE Regulation
Japan: Road Transportation Vehicle Law
High Pressure Gas Safety Law
China: AQSIQ, MIIT
India: OISD, PESO

Research, Testing, Validation

International Activities

IEA-HIA: Task 19
ICHS-International Association
EC: HFC JTU

National Activities

US: DOE Safety, Codes and Standards
Germany: H2 Mobility
France: Hydrogen Horizon
Japan: JHFC
China: MOST

Summary

- Domestic Codes and Standards Development
 - Key SDOs working collaboratively under national template
 - Primary building and fire codes in place (with regular revision cycle)
 - Component standards development and certification underway
- International Standards Development
 - Key standards under development or revision through ISO and IEC
 - Harmonization of testing and certification procedures in key market countries underway
- International Regulations
 - UNECE Global Technical Regulations for hydrogen fueled vehicle systems (Phase 1) nearing completion