

Summary of Hydrogen Roadmap Development Activities in the U.S.

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Background

The impending transition to a hydrogen-based energy system poses opportunistic challenges to the existing social and political establishments. A number of initiatives are currently under way to take advantage of these opportunities by addressing the challenges of a major technological shift and establishing buffers to limit the negative impacts of this transition on existing economic infrastructure.

The hydrogen transition is anticipated to have broad implications for nearly every sector of the economy. To minimize the potentially disruptive nature of this transition and to leverage existing assets into a foundation for future development, governments at all levels (from local to international) are establishing programs that mark the route towards a new energy system.

Commonly called “Roadmaps,” these transitional guides focus on a defined geographic area and the potential roles organizations and government may play in facilitating and accelerating the transition. Eleven states have formal documents varying in detail, orientation and time horizon that are to serve as guides to the hydrogen transition. Additionally, there is a global partnership program, regional partnerships, and a few local programs as well.

This document is prepared as an introduction to the development of hydrogen transition roadmaps. Information presented herein is compiled from the various “Roadmap” reports (Appendix A). The four main sections of this report cover: 1) Roadmap descriptions, 2) Roadmap components, 3) Roadmap development processes employed, and 4) the contents of the existing Roadmaps.

Roadmap Descriptions

States

Eleven states now have official “Roadmaps” or precursor documents. The majority of these have been written by state government agencies or consultants, usually at the behest of the state’s Energy Office or Utilities Commission, or an organization of stakeholders from within the state. The majority of plans involves public-private partnerships, have been compiled at the direction of a state agency or pursuant to a state law or executive order. Although some plans appear to be self-contained works (meaning little outside or public input) most are put together from stakeholder workshops, working group teams, and public meetings. Shown below is a table with summaries of the reviewed state “Roadmaps.”

California	<p>The "California Hydrogen Blueprint Plan" was authored by the California Environmental Protection Agency as mandated by Executive Order S-7-04. The document is an Action Plan and cost-benefit analysis for the Hydrogen Highway Network. Development of the plan was led by the Executive Order Team, with support provided by a Senior Review Committee of senior state officials; an Implementation Advisory Panel composed of leaders from industry, academia, government and non-profits; and five Topic Teams (Rollout strategy, Societal benefits, Economy, Implementation, and Public education) composed of over 200 volunteers. The plan is to be updated every two years.</p>
Florida	<p>"Florida's Accelerated Commercialization Strategy for Hydrogen Energy Technologies" was authored by the Florida Department of Environmental Protection for the Hydrogen Business Partnership, a public-private partnership. The report identifies actions and options for business and government to accelerate the commercialization of hydrogen technology. The plan's objectives include establishing Florida as an early leader in hydrogen markets and to stimulate growth in the industry. The plan provides specific milestones to be reached by 2007 and 2010.</p>
Illinois	<p>The "Hydrogen Highway: Illinois' Path to a Sustainable Economy and Environment" is a product of the Illinois Coalition and the Department of Commerce and Economic Opportunity. These two entities have joined in a public-private partnership, called Illinois 2H2. In all, the plan received input from approximately 400 citizens by conducting interviews and holding five public meetings across the state. The plan development process was kicked off at a meeting of the partnership with about 70 members of government, academia, and industry attending; this meeting identified seven essential needs. The plan development process also involved a Steering Committee and Advisory Committee.</p>
Minnesota	<p>The "Minnesota Renewable Hydrogen Initiative" is a brief plan put together by a session law passed in the 2003 Minnesota legislature. The Initiative is a public-private partnership dedicated to establishing new innovative means of generating hydrogen using renewable energy technology.</p>
New Jersey	<p>Rutgers University's Center for Energy, Economic & Environmental Policy prepared the report "New Jersey: Opportunities and Options in the Hydrogen Economy" for the N.J. Board of Public Utilities. This document is the precursor to a "Roadmap" that examines broad trends in the transition to a hydrogen energy system and provides recommendations for New Jersey to capitalize on the opportunities this transition portends.</p>
New Mexico	<p>"A New Mexico Hydrogen Cluster Opportunity Assessment" was prepared by Los Alamos National Laboratory for the New Mexico Economic Development Department. The goal of this plan is economic development achieved by locating hydrogen-related manufacturers and service companies to New Mexico. The Opportunity Assessment is part of a larger strategic plan being undertaken by HyTeP, or Hydrogen Technology Partnership (a public-private partnership). This Assessment was compiled during a day-long stakeholder workshop featuring speakers, the Governor, and topically focused working groups.</p>

New York	<p>"Vision for the Hydrogen Energy Economy in New York State" is a project of the New York State Energy Research & Development Authority (NYSERDA). The Vision is designed to fit into NYSEDA's strategic plan. The document divides goals into three sectors: electric power, transportation, infrastructure, and provides specific targets for the years 2010, 2015, and 2020.</p>
Ohio	<p>Taratec Corporation authored Ohio's Fuel Cell Roadmap for the Ohio Department of Development under the guidance of a Steering Committee put together from members of the Ohio Fuel Cell Coalition. Ohio elaborates on a two-fold strategy, the first of which is to promote growth of a fuel cell cluster, and the second is to stimulate demand for fuel cells. The plan highlights what the state must do to achieve their goals and is to be evaluated every two years. Input for the plan was provided at a workshop involving about 30 people.</p>
South Carolina	<p>"The South Carolina Hydrogen Economy: Capitalizing on the State's R&D Assets" was prepared for the SC Hydrogen Coalition and the SC State Energy Office by Concurrent Technologies, Inc. The plan is designed to provide short-term actions in support of a larger strategy. The plan has a focus on collaborative initiatives between researchers, academia, and industry. In development, an Advisory Group was formed to conduct interviews with more than 30 organizations involving hundreds of people. The final report was put together in four steps: 1) examination of major trends driving the hydrogen economy transition, 2) identification and cataloging of S.C.'s hydrogen resources, 3) reviewing other states' initiatives, and 4) developing recommendations for collaborative initiatives.</p>
Texas	<p>"Accelerating the Commercialization of Fuel Cells in Texas" is an action plan put together by the State Energy Conservation Office with support from the Fuel Cell Initiative Advisory Committee. A 2001 legislative mandate (HB 2845) spurred the report's development. Led by the Fuel Cell Advisory Committee, four meetings were held over six months (Nov. 2001 - May 2002) and working teams were developed in the areas of: applications, barriers, benefits, demonstrations, education and outreach, and incentives. There was considerable involvement by state agencies and technical experts. The state established the State Agency Fuel Cell Working Group to further facilitate development, and recommendations were made to establish a public-private partnership, concrete goals, and early market opportunities.</p>
West Virginia	<p>West Virginia has not yet completed a hydrogen "Roadmap," but the state has held a hydrogen workshop and "Roadmap" planning meeting. The meeting involved about 60 people from government, industry, and academia. The outcomes of this early meeting were three strategic objectives: 1) educate stakeholders, 2) build stakeholder network, and 3) utilize the network as a base for future activities. The workshop also included small group sessions with questions posed about opportunities, potential state actions, and the efficacy of the workshop.</p>

Roadmap Components

Although "Roadmaps" vary in content, process, and conclusion there are several component parts found in most. Many roadmaps begin with a vision or statement about a

potential hydrogen/fuel cell future as it relates to the state. Visions are often broad, sweeping statements of the overall situation the state would like to create for itself. Visions are often followed by goal statements which are fairly specific and usually long-term statements about what the initiative aims to achieve. Objectives also are a common thread between many of the “Roadmaps”; objectives are similar to goals, but usually are specific to task areas, provide detailed outcomes, and generally have a shorter-term focus. The final common component among the “Roadmaps” is recommendations. Usually task-specific and oriented more towards the short-term than the long-term, recommendations, or action items, describe specific steps to be taken in pursuit of the proscribed goals.

Development Process

Organization

Development of “Roadmaps” is a fairly straightforward process with many of the states pursuing this opportunity using similar methodology. The basic methodology diagrammed below demonstrates the hierarchical nature of these projects. Several states have projects initiated by a directive issued from either the legislature in a bill, the governor in an executive order, or as part of an existing initiative.

This directive is usually charged to a Sponsoring Agency such as a State Energy Office or a state’s Dept. of Environmental Protection. The Sponsoring Agency often appoints a Steering Committee that manages development of the plan. Providing technical expertise and practical experience is an Advisory Group. The Advisory Group guides the program’s development and is composed of local leaders in the fuel cell/hydrogen area. Following the lead of the Advisory Group, the Steering Committee forms Working Groups to address specific areas.

Working Groups are usually divided along one of two lines, along either transition function roles or a technical-related area. For example, in Texas the Fuel Cell Initiative Advisory Committee worked with five topic teams covering applications, barriers, benefits, demonstrations, and education/outreach – a very technical oriented division.¹ While, in California, the five topic teams worked in close conjunction with the Advisory Panel and were organized along transition function lines; the teams were rollout strategy, societal benefits, economy, implementation, and public education.²

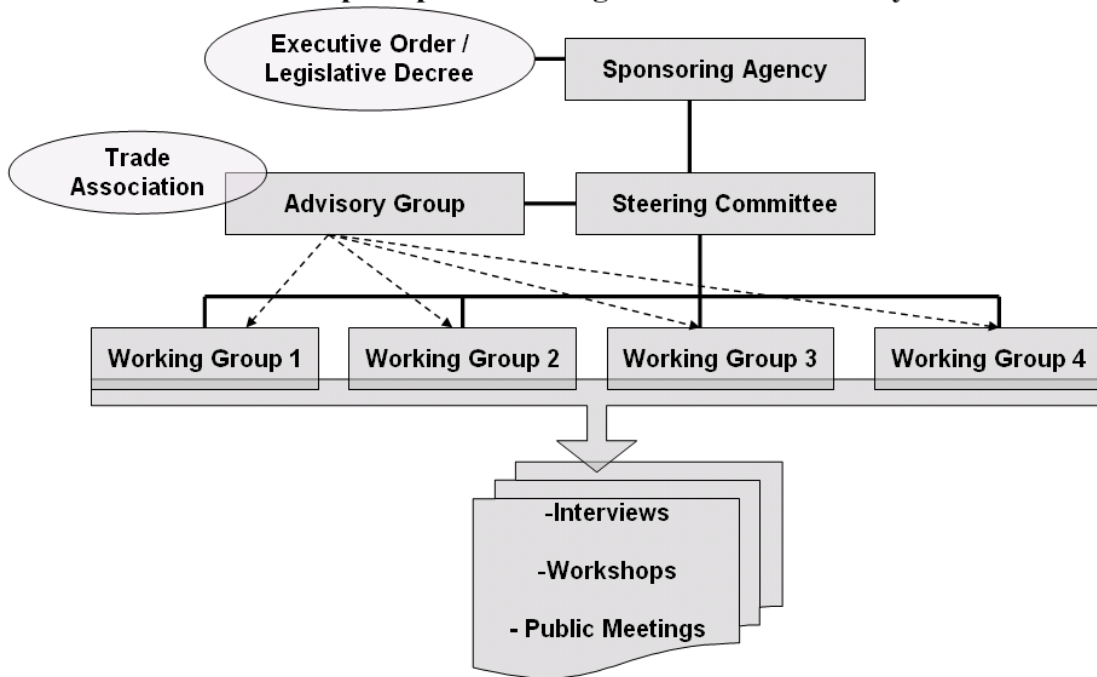
Following the model of the U.S. Department of Energy’s Hydrogen Plan³, most of the plans involve a public-private partnership between industry, academia, government and possibly non-governmental organizations. These partnerships provide the foundation of the network from which collaboration springs, and usually provide the connections to tap local knowledgeable and expertise for project leadership, Working Group participation and other vital support roles.

¹ Texas Comptroller of Public Accounts, State Energy Conservation Office. “Accelerating the Commercialization of Fuel Cells in Texas.

² California Environmental Protection Agency. “California Hydrogen Blueprint Plan. Vol. 1 Draft Final Report. March 2005.

³ U.S. Department of Energy. “National Hydrogen Energy Roadmap.” Nov. 2002

Roadmap Preparation: Organizational Hierarchy



Activities

Being largely driven by state government and targeted toward public policy activities, “Roadmap” development activities follow a basic outline. Under the direction of an Advisory Group the Working Groups often start by identifying local experts and stakeholders. These experts and stakeholders are interviewed and their perspectives and recommendations are taken back to the Advisory Group. Using information gathered from these interviews the Advisory Group re-orientes the research and pursues a workshop meeting.

At the workshop meeting a wide array of stakeholders are brought together to discuss the vision, objectives and specific goals of the plan. The purpose of the workshop is to identify specific connections or potential points of collaboration between local stakeholders. The results of the workshop are used to discern a broader strategy for the state based on the potential the participants identify. Following the interviews and workshops are often a series of public meetings, usually held in multiple places across the state.

Following the meetings, interviews, and workshop the document draft is compiled. The compilation is reviewed by the Advisory Group and commented or revised for appropriateness or to meet some other restraint. Although many states have a process similar to the one described above several choose to limit their plan’s development activities to one or two of the described activities.

Roadmap Contents

The content of the “Roadmap” plans is relatively homogenous. Most begin with an explanation of the initiative and the activities supporting its development. The broader

context of the hydrogen economy and fuel cell industry are common starting points. This background section usually covers such topics as the types of fuel cells and their basic operation, the characteristics of hydrogen as a fuel – its production, storage, and distribution – and the potential applications of this technology. After this section the “Roadmaps” tend towards more specific information as it relates to the state and their objectives.

For example, Illinois’ plan⁴ is focused on creating the transportation infrastructure necessary for the state to become a leader in implementing hydrogen technology, so the bulk of their plan relates to infrastructure development and Hydrogen Highway topics such as location, parameters, funding, usage and specific projects. In contrast to Illinois’ plan, California is also planning a Hydrogen Highway network⁵, but their plan is more detailed and has very detailed project information. California begins with an introduction to the activities and continues with an explanation of the benefits of hydrogen to energy security and diversity, the environment, economic development and education. California’s plan outlines three phases of development with short-term activities presented in the context of their long-term objectives, a description of the risks, and a fiscal analysis. The plan concludes with an action plan.

Another major difference in the content of the plans finds its roots in the objectives and overall vision of the plans. While California and Illinois are focused on establishing the infrastructure to enable the technology to gain a foothold in their states other states such as Ohio and New Mexico are more oriented toward impacting the value chain of fuel cell and hydrogen production.

New Mexico uses cluster analysis theories development by Michael Porter of the Harvard Business School to identify the potential for hydrogen commerce in its state. Its plan discusses the hydrogen economy, not from a perspective of potential uses of this technology, but rather from a perspective of developing and manufacturing the technology. New Mexico identifies the broad national context of the hydrogen economy, New Mexico’s position within the national context and assesses the competitive position of other states. The appendices in their report dig into the fuel cell and hydrogen value chains identify companies and support programs within the state and highlight the state’s assets that can be leveraged in growing this industry.⁶

Ohio⁷ employs a similar strategy to that of New Mexico by focusing on the development of the industry. Their plan begins with an overview of the national competitive environment and Ohio’s existing economic strengths. Because their strategy includes creating early market opportunities to support their industry’s growth they delve into five major market areas and the related technological and commercialization barriers.

⁴ Tynan, Christopher. “The Hydrogen Highway: Illinois’ Path to a Sustainable Economy and Environment.” The Illinois Coalition. March 2004.

⁵ See Note 2

⁶ Beser, James and Delinda Padilla. “A New Mexico Hydrogen Cluster Opportunity Assessment.” Los Alamos National Laboratory. December 2003.

⁷ Ohio Department of Development Technology Division. “Ohio’s Fuel Cell Roadmap.” September 2004.

The final third of their plan discusses what they can do as a state to achieve their goals. Initially, they describe as “overarching tenets” that include focusing on fuel cells, promoting synergy and other frame-of-mind targets. The final part calls for specific activities supporting development, existing fuel cell companies, recruiting new companies, and demonstrating technologies. The Ohio plan’s appendices cover existing programs (Third Frontier funds) and current in-state research projects.

Proposed Development Process and Organizational Hierarchy

The following section is a proposal for development of North Carolina’s Hydrogen Economy Roadmap. This section is intended to be reviewed, commented on, and modified as the initiative’s sponsors see fit.

Organization

We propose a steering committee be established with members representing key state government constituencies – as a membership base we recommend members be chosen from the N.C. Department of Commerce, the State Energy Office, and the University of North Carolina. The Steering Committee will be responsible for organizing and managing the plan’s development.

On par with the Steering Committee is the Advisory Group. The Advisory Group is composed of state leaders from stakeholder organizations, probably drawn from the ranks of the N.C. Fuel Cell Alliance. This group is inclusive of industry, academia, and government, and provides expert advice and perspectives to the Working Group members. On the ground level are the Working Groups that operate within defined topical boundaries. We propose three working groups divided along technology lines with one tasked to research hydrogen fuel issues, another directed at fuel cell component manufacturing and development, and the third targeting the use of fuel cells in the state.

Each Working Group will conduct interviews, participate in the workshop and be represented at the various public meetings. The Groups will be asked to address several questions within their topic. Some proposed questions are:

How can existing industries benefit from this technology area?

What new industries may arise from development in this area?

What can be done to accelerate these benefits and new business establishments?

How can fuel cells and hydrogen technology strategies become incorporated into North Carolina’s existing development priorities as an extension of existing initiatives?

What resources/initiatives currently exist within the state that can be leveraged for development?

How can this topic be integrated into educational curricula at the secondary, community college and university level?

What should be done to prepare the workforce? Who should do it, and by when?

What is needed to increase the public awareness of the technology’s potential?

What current threats to the state's environmental and economic health can be mitigated, at least partly, by fuel cells or hydrogen technology?

What should be done to establish and/or solidify support for fuel cells and hydrogen technology among state leaders?

The Working Groups will report to the Advisory Group their findings periodically and will receive feedback as necessary.

The final stage of development involves the integration of the generated comments into an overarching strategy and the specific action item recommendations. These documents are reviewed by the Advisory Group and buy-in is sought from stakeholders across the state. We also propose a statewide event of considerable prominence to publicize the final plan.

Appendices

Texas

1-1 AN ACT

1-2 relating to the creation of an initiative to promote the

1-3 commercialization of fuel cell technologies.

1-4 BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF

TEXAS:

1-5 SECTION 1. DEFINITION. In this Act, "energy office"

means

1-6 the State Energy Conservation Office.

1-7 SECTION 2. FUEL CELL COMMERCIALIZATION INITIATIVE.

(a) The

1-8 energy office shall develop a statewide plan for the

coordinated

1-9 acceleration of the commercialization of fuel cell

generation in

1-10 this state. The plan must explore and draw conclusions

about the

1-11 availability and efficacy of alternative mechanisms that

might be

1-12 created in cooperation with the private sector, utilities,

and

1-13 other agencies to accelerate the commercial availability

and

1-14 economic viability of fuel cells for use in this state.

The plan

1-15 must consider, at a minimum, the use of:

1-16 (1) funds available to the energy office or

additional

1-17 funding from other state, federal, or private sources for

programs

1-18 of research and development, particularly incentives for

commercial

1-19 installation of cells by residential, commercial, or

industrial

1-20 utility customers;

1-21 (2) utility-administered incentive funds,

consistent

1-22 with programs established under Chapter 39, Utilities Code;

1-23 (3) market mechanisms that might be created to

assure

1-24 that clean emerging technologies may be compensated for
their

2-1 contribution to the reduction of harmful emissions; and

2-2 (4) tax or other economic incentives.

2-3 (b) In developing the plan and proposed rules,
guidelines,

2-4 and operating procedures, the energy office shall seek the

2-5 assistance and support of, as appropriate, the Texas
Natural

2-6 Resource Conservation Commission, the Public Utility
Commission of

2-7 Texas, and other state or local agencies. The plan must
consider

2-8 the impact of the use of fuel cell technologies in areas of
the

2-9 state that the energy office determines:

2-10 (1) are designated as nonattainment areas
under

2-11 Section 107(d) of the federal Clean Air Act (42 U.S.C.
Section

2-12 7407); or

2-13 (2) have a high probability of being so
designated in

2-14 the near future.

2-15 (c) Not later than September 15, 2002, the energy
office

2-16 shall issue to the House Energy Resources Committee and the
Senate

2-17 Business and Commerce Committee a report of its findings
and

2-18 recommendations for development of the fuel cell
commercialization

2-19 initiative, including:

2-20 (1) the state of the industry or of specific

2-21 components of the industry;

2-22 (2) alternative programs to accelerate the
commercial

2-23 availability of fuel cells, including similar efforts by
other

2-24 states;

2-25 (3) programs considered to encourage the
industry to

2-26 locate manufacturing, system integration, or related
component
2-27 parts or services in this state; and
3-1 (4) program recommendations, including how
proposed
3-2 programs would work, the impact anticipated on industry
3-3 development, program costs and sources of funding, and
proposed
3-4 measures of performance.
3-5 (d) The energy office shall appoint a fuel cell
initiative
3-6 advisory committee to advise the energy office regarding
3-7 development of the plan and to assist the energy office in
meeting
3-8 the goals of this Act. The energy office shall appoint to
the
3-9 advisory committee representatives of:
3-10 (1) the fuel cell industry;
3-11 (2) energy services providers;
3-12 (3) electric transmission and distribution
utilities;
3-13 (4) retail providers of electric energy;
3-14 (5) small electric energy consumers;
3-15 (6) electric cooperatives; and
3-16 (7) municipally owned electric utilities.
3-17 SECTION 3. EFFECTIVE DATE. This Act takes effect
September
3-18 1, 2001.

House

President of the Senate

Speaker of the

on May

in

non-record

I certify that H.B. No. 2845 was passed by the House
4, 2001, by a non-record vote; and that the House concurred
Senate amendments to H.B. No. 2845 on May 25, 2001, by a
vote.

House

Chief Clerk of the

Senate, with

I certify that H.B. No. 2845 was passed by the
amendments, on May 18, 2001, by a viva-voce vote.

Senate

Secretary of the

APPROVED: _____

Date

Governor

<http://www.capitol.state.tx.us/tlo/77R/billtext/HB02845F.HTM>

California

EXECUTIVE ORDER S-7-04

By the

Governor of the State of California

WHEREAS, hydrogen, a non-carbon energy carrier which can be made from clean renewable energy, is ideally suited to address global, regional and local energy and environmental challenges; and

WHEREAS, the State of California is a world leader in renewable energy production,

efficiency and conservation, clean air and emission controls, environmental goals and

planning, as well as creating, promoting and commercializing new technologies and industries; and

WHEREAS, hydrogen-powered vehicles and infrastructure can lead to energy independence; offer zero or near-zero smog-forming emissions; reduce health problems

due to motor vehicle-related air pollution; reduce water pollution from oil and gasoline

leaks; lower global warming pollution; improve fuel economy; quieter and smoother operation; as well as provide economic and workforce benefits to help California meet

current and future energy needs; and

WHEREAS, the economic feasibility of a hydrogen infrastructure is enhanced by building hydrogen energy stations that power vehicles as well as supply electricity for

California's power needs; and

WHEREAS, air pollution can cause or aggravate a wide range of serious health problems

including cancer, birth defects, respiratory illnesses such as asthma and emphysema, heart and blood ailments, nervous system toxicity and early death; and

WHEREAS, children are more acutely affected by air pollution and have a higher incidence of harm from dirty air; and

WHEREAS, health problems caused by air pollution result in direct and indirect costs of

hundreds of billions of dollars per year in California; and

WHEREAS, even after years of improvements in vehicle emissions technologies and effective emissions regulation, California has some of the worst air quality in the country;

and

WHEREAS, much of the State of California does not meet state or federal health-based

air quality standards, is at risk of not meeting federal air quality "attainment" status and

may thereby lose billions of dollars in federal funds; and

WHEREAS, California is committed to Environmental Justice to ensure a clean and sustainable environment for all Californians; and

WHEREAS, the California Legislature has taken a leadership role to address petroleum

dependence by passing AB 2076, which resulted in a report by the California Energy Commission (CEC) and the Air Resources Board (ARB) that found: California's oil refining capacity has not been able to keep up with growing demand for fossil fuel; the

state faces a future of increasing petroleum dependence, supply disruptions, and rapid and

frequent price volatility; without major efforts to reduce petroleum dependence, meeting

future petroleum needs would require that California accept major expansion of refining

capacity, delivery infrastructure and increased dependence on foreign energy supplies;

and

WHEREAS, California is the home to the California Fuel Cell Partnership, a unique collaborative of eight auto manufacturers, four energy supply companies, two fuel cell

technology companies, and seven government agencies, seeking to advance practical environmental transportation solutions with new fuel cell vehicle and hydrogen infrastructure technologies. The California Fuel Cell Partnership is the first public private

partnership to test fuel cell vehicles under real day-to-day driving conditions; and

WHEREAS, California is also the home of the California Stationary Fuel Cell

Collaborative, a public-private organization that includes 16 government agencies, two

public electric utilities, the University of California, as well as major fuel cell technology

companies, end users, energy supply companies, local government agencies and municipalities, research institutions, and developers; and

WHEREAS, state government organizations have been leading both research and commercial advances in energy and transportation technologies; and

WHEREAS, local governments and regional government agencies also are taking a leadership role to advance hydrogen and fuel cell vehicle technologies; and

WHEREAS, many of California's prestigious universities, national laboratories, and research institutions are leaders in advancing hydrogen, fuel cells, renewable energy, advanced vehicle systems and infrastructure technology through commercialization strategies and partnerships; and

WHEREAS, several studies have estimated that hundreds of thousands of manufacturing

and support services jobs will be created when fuel cells gain market shares in the power

and vehicle markets, and California is poised to receive many of these jobs and related

investment and export opportunities because of its educated workforce and robust automotive and fuel sectors; and

WHEREAS, auto manufacturers have publicly announced their intention to commercially

market "tens of thousands" of hydrogen and fuel cell vehicles within this decade, providing that a hydrogen infrastructure is available; and

WHEREAS, California has one of the nation's largest public fleets and the largest private

sector vehicle market in the United States and has set a precedent of pushing for vehicle

emissions reductions and clean vehicle technologies; and

WHEREAS, California's commitment to clean energy surpasses that of any other state,

and California offers the best opportunity to hasten the commercialization of hydrogen

and fuel cell technologies.

NOW, THEREFORE, I, ARNOLD SCHWARZENEGGER, Governor of the State of California, by virtue of the power vested in me by the Constitution and statutes of the State of California, do hereby issue this order effective immediately:

IT IS ORDERED that the State of California is committed to achieving a clean energy

and transportation future based on the rapid commercialization of hydrogen and fuel cell

technologies; and

BE IT FURTHER ORDERED that California's 21 interstate freeways shall be designated

as the "California Hydrogen Highway Network" and the California Environmental

Protection Agency and all other relevant state agencies including but not limited to State

and Consumer Services; Department of Finance; Business, Transportation and Housing;

Education; Health and Human Services; and Resources, shall work with state legislators

and key stakeholders, including local and regional government organizations, educators,

energy providers, automakers, fuel cell products suppliers, financing entities, nongovernmental

organizations, and community based organizations including those

representing Environmental Justice communities to implement this Executive Order, plan

and build a network of hydrogen fueling stations along these roadways and in the urban

centers that they connect, so that by 2010, every Californian will have access to hydrogen

fuel, with a significant and increasing percentage produced from clean, renewable sources; and

BE IT FURTHER ORDERED that the California Environmental Protection Agency, in

concert with the State Legislature, and in consultation with the California Energy

Resources Conservation and Development Commission and other relevant state and local

agencies, develop a California Hydrogen Economy Blueprint Plan for the rapid transition

to a hydrogen economy in California due January 1, 2005, and to be updated bi-annually

thereafter containing recommendations to the Governor and the State Legislature and shall include, but not be limited to, the following:

- ° Accelerating progress in hydrogen use, including public incentives and financing mechanisms such as general obligation bonds, or revenue bonds with repayment mechanisms; joint power agreements, procurement agreements, competitive master contracts, and partnerships with public and private entities; a review of immediate financing opportunities via the California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA).

- ° Promoting environmental benefits (including global climate change) and economic development opportunities resulting from increased utilization of hydrogen for stationary and mobile applications; policy strategies to ensure hydrogen generation results in the lowest possible emissions of greenhouse gases and other air pollutants.

BE IT FURTHER ORDERED that the State of California will commit to achieving the

following by 2010:

- ° The state will commit to negotiate with auto makers and fuel cell manufacturers to ensure that hydrogen-powered cars, buses, trucks, and generators become commercially available for purchase by California consumers, businesses and agencies including state, regional and local; and

- ° California's state vehicle fleet shall include an increasing number of clean, hydrogen-powered vehicles when possible to be purchased during the normal course of fleet replacement; and

- ° Safety standards, building codes and emergency response procedures for hydrogen fueling installations and operation of hydrogen-powered vehicles shall be in place and permit agencies, building inspectors and emergency responders shall receive appropriate training; and

- ° Appropriate incentives shall be provided to encourage the purchase of hydrogen powered vehicles and to encourage the development of renewable sources of energy for hydrogen production; and

I FURTHER DIRECT that as soon as hereafter possible, this order shall be filed with the Office of the Secretary of State and that widespread publicity and notice be given to this order.

IN WITNESS WHEREOF I have here unto set my hand and caused the Great Seal of

the State of California to be affixed this the twentieth day of April 2004.

/s/ Arnold Schwarzenegger

Governor of California

Minnesota

Minnesota Session Laws 2003, Special Edition, Chapter 11

Sec. 2. [216B.013] [HYDROGEN ENERGY ECONOMY GOAL.]

It is a goal of this state that Minnesota move to hydrogen as an increasing source of energy for its electrical power, heating, and transportation needs.