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ONE RENEWABLE ENERGY RESOURCE GETS SUPPORT

FROM BOTH SIDES OF THE AISLE

By Tara Nielson

Abstract: The debate over the U.S. Department of Energy's fiscal year 2002 budget for the renewable energy Hydrogen Program demonstrates how industry, state programs, and government officials can affect policy making through the federal budget process. Funding for energy programs is controversial, as Democrats and Republicans typically disagree over the use of fossil versus renewable resources to satisfy the country's energy needs. The Hydrogen Program, which funds research and development for renewable hydrogen energy technologies, receives support from both sides of the aisle. This article explains the reasons behind the unusual circumstances of this bipartisan support and discusses ways in which the current political climate may shape Hydrogen Program funding in the future.

The U.S. energy supply has recently emerged as a focus of national attention. The State of California faced a major energy crisis during the winter of 2000/2001 and other states are taking actions to deal with shortages of electricity. The volatile costs of natural gas during the same time period led to renewed interest in energy conservation and efficiency. Concerns about energy security and potential disruption to the U.S. energy infrastructure have arisen (Edison Electric Institute, 2001). Finding solutions to solve the nation's energy supply problems is a national priority.

This article discusses the feasibility of hydrogen as a possible solution to U.S. energy needs, the Administration's policy on hydrogen, activities and funding of the U.S. Department of Energy (DOE) Hydrogen Program, industry and governmental support for hydrogen energy technologies, dynamics that affected funding levels for DOE's Hydrogen Program, and possible future scenarios for hydrogen energy.

Background

For more than 20 years, energy experts have discussed the use of hydrogen in the U.S. energy infrastructure (U.S. Department of Energy, 1999, August). Hydrogen is the most abundant element in the universe and potentially an endless source of clean, renewable energy (Abraham, 2001). A number of scientists and energy experts believe it is the long-term answer to U.S. energy needs, and that in the not-too-distant future the nation could have a hydrogen-based economy. The energy infrastructure would include hydrogen-powered fuel

cells that generate electricity for homes and businesses, and automobiles that run on hydrogen fuel (National Hydrogen Association, 2000). Using hydrogen to generate electricity does not send pollutants into the atmosphere; in fact, the only byproducts of the conversion process are water and heat. The National Renewable Energy Laboratory claims that hydrogen could some day "join electricity as the foundation for a globally sustainable energy system using renewable energy" (1995, 1).

Public and private organizations are exploring the possibilities of using hydrogen to satisfy U.S. energy needs. Shortly after his election, President George W. Bush asked Vice President Dick Cheney to convene a group to develop a National Energy Policy (NEP). In a report released on May 17, 2001, the NEP Development Group recommended that the DOE focus programs on the research and development of hydrogen technologies. Additionally, the U.S. House of Representatives passed reauthorization legislation in 2001 (H.R. 2174) for continued hydrogen research and development at the DOE. General Motors and Ford are currently developing hydrogen-powered fuel cell vehicles. The Governor of California has launched an initiative to help fund the deployment of hydrogen-powered fuel cells throughout the state to generate electricity. These events are shaping the debate between

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the Administration and Congress in establishing a fiscal year 2002 budget for energy, specifically regarding government investments in renewable energy resources.

The budget for the DOE, which funds programs for fossil and renewable energy research and development, demonstrates U.S. Government priorities on energy policy. The DOE's Office of Energy Efficiency and Renewable Energy includes a Hydrogen Program that manages national research and development of hydrogen technologies. This program relies on congressional appropriations for funding although the request originates with the president. For fiscal year 2002, President Bush's original request for funding of the Hydrogen Program (and renewable energy) reflected the Administration's initial policy directives to advance the use of fossil fuels and curtail renewable energy development. Several events, however, led the President to submit a budget amendment when the National Energy Policy was released in May 2001. Three months after the original submission to Congress, the amendment restored funding requests for several renewable energy programs, including the Hydrogen Program.

One Possible Solution to America's Energy Needs

In the next 20 years hydrogen energy systems will penetrate a number of energy markets (U.S. Department of Energy, 1999, February 4) and some experts believe that the United States may one day have a "hydrogen economy" (Freedman, 2002, 42). Under this scenario, hydrogen would replace fossil fuels as consumers' primary energy choice. Such a conversion would yield cleaner air and more efficient energy production (Freedman, 2002). The use of hydrogen in the U.S. energy infrastructure would also reduce reliance on oil imports (National Renewable Energy Laboratory, 1995). In order to achieve a hydrogen economy, however, government and industry will have to develop and expand existing technologies and policies (National Hydrogen Association, 2000).

Hydrogen is produced from natural gas or by splitting water molecules and can be used to power fuel cells or combustion engines with little or no emissions. Fuel cells are small power plants that provide electricity for end uses such as apartment complexes, businesses, and buses. Combustion engines can be designed to use

hydrogen fuel, or hydrogen blended with other fuels such as natural gas or gasoline, to power vehicles. Researchers are developing renewable energy technologies, such as solar panels, that generate electricity to extract hydrogen from water without emitting pollutants (National Renewable Energy Laboratory, 1995).

In the future, hydrogen engines and fuel cells may replace a significant number of traditional power plants or gasoline engines. The National Hydrogen Association envisions an energy infrastructure where hydrogen is used as fuel for passenger vehicles with hydrogen filling stations operating nationwide. Hydrogen would also be used to generate electricity that could be used at the point of production or connected to the transmission grid and sold by utilities. In order to achieve this, the federal government needs to maintain consistent levels of funding from year to year for research and development of hydrogen technologies that support industry activities in this field as well as provide a regulatory environment necessary to further the development of a hydrogen infrastructure.

Political and Market Feasibility of Hydrogen as a Renewable Energy Resource

Industry Activities

Industry has invested substantial resources to develop combustion engines and fuel cells to power automobiles and generate electricity.

On August 7, 2001, General Motors unveiled a stationary fuel cell that can convert natural gas, methane, or gasoline into a hydrogen fuel to generate electricity for businesses, office complexes, hospitals, and new residential subdivisions. Larry Burns, vice president for research, development, and planning at General Motors, stated that the stationary fuel cell "gets people comfortable with fuel cells before they get introduced to meet the more demanding requirements of automobiles" (General Motors, 2001).

Just two weeks later, Ford Motor Company introduced a new vehicle, the P2000 H₂ICE, which is powered by a hydrogen internal combustion engine. The company expects it to help connect today's gasoline vehicles to future hydrogen fuel cell vehicles. John Wallace, executive director of Ford's THINK Group, a new Ford enterprise that creates and markets fuel cell-

powered electric vehicles, has stated that the relatively easy to produce car provides an opportunity to advance the hydrogen infrastructure (Ford Motor Company, 2001).

Perhaps even more remarkable, oil companies are exploring the possibilities of hydrogen-powered energy sources. Shell Hydrogen, a division of Shell Oil Products Company, entered a joint venture with International Fuel Cells, a fuel cell production company, to establish HydrogenSource LLC. The new company will build and market fuel processors and hydrogen generation systems to be used in the stationary power generation and mobile application markets (Shell Hydrogen, 2001).

Federal Legislation

The first authorization for research on hydrogen-based energy systems at the Department of Energy was the Spark M. Matsunaga Hydrogen Research, Development, and Demonstration Act of 1990 (Pub. L. 101-566) (U.S. Department of Energy, 1999, February 4). The law authorized 20 million dollars in funding levels for fiscal years 1992, 1993, and 1994. In 1996 the Hydrogen Future Act (Pub. L. 104-271) provided authorizations for the Hydrogen Program for more than 150 million dollars in funding through 2001.

On June 14, 2001, Representative Ken Calvert (R-California) introduced a bill (H.R. 2174) that would reauthorize the Hydrogen Future Act of 1996 (Calvert, 2001) with appropriations for hydrogen research and development totaling 400 million dollars through fiscal year 2006 (Robert S. Walker and George E. Brown, Jr. Hydrogen Energy Act of 2001, 2001). In a press release, Congressman Calvert was quoted as saying that "the national energy strategy that will emerge from Congress will include all our energy options and hydrogen will have a place in that strategy, as the Bush Administration has acknowledged" (Calvert, 2001).

Congressman Calvert's legislation was included in Subtitle A of H.R. 4, Securing America's Future Energy Act of 2001, which was passed by the House on August 2, 2001. The bill was placed on the Senate calendar on September 4 but floor debate has been delayed. Senator Tom Harkin (D-Iowa) introduced similar hydrogen reauthorization legislation in the Senate (S. 1053).

California Initiatives

In California, the Office of the Governor, the California Air Resources Board, and the California Power Authority all committed financial support for the development of hydrogen technologies to generate electricity for the state. (Other states, such as New York and Texas, are also involved in promoting hydrogen technologies; California was the first to do so, however, and to date has the most developed programs.)

The Air Resources Board within the California Environmental Protection Agency helped establish the California Fuel Cell Partnership which is composed of automobile companies, fuel providers, fuel cell technology developers, and government agencies. The partnership's goal is to demonstrate or introduce more than 70 fuel cell-powered cars and buses in California by 2003. In July 2001 the partnership featured fuel cell-powered cars at the Orange County Fair, including DaimlerChrysler's Nekar 4, Ford's Focus FCV, and Nissan's hydrogen-powered Xterra (California Fuel Cell Partnership, 2001).

The California Power Authority plans to add renewable energy technologies to expand the state's power generation sources in addition to its other goals (Consumer Power, 2001). S. David Freeman, chairman of the authority, voiced the state's support for hydrogen, saying that fuel cell energy is now more cost-competitive and is a viable alternative to high-cost central station power generators that have been plagued by reliability concerns (California Environmental Protection Agency, 2001). The California Power Authority has set aside 1 billion dollars for renewable energy business partnerships to set up long-term power contracts, which includes hydrogen technologies (Nissen, 2001).

Part of the California Power Authority's funding will also help subsidize projects undertaken by members of a new stationary fuel cell collaborative which aims to reduce the demand on the state's power grid and existing power plants by promoting the commercialization of fuel cells (California Environmental Protection Agency, 2001). Leaders of the collaborative hope that the funding will speed the integration of fuel cell technology into the marketplace and help resolve energy and environmental challenges the state faces.

These activities and policies demonstrate that nationwide and industry-wide support exists for hydrogen energy technologies. Thus, it is not surprising

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that these industry and government players took part in shaping DOE's Hydrogen Program budget.

Administration Support for Hydrogen and the DOE Hydrogen Program

The NEP Development Group states in the president's energy plan (released three months after the Administration submitted its original budget request to Congress) that using hydrogen to generate electricity is compatible with existing energy technologies and that it can be done efficiently and without causing damage to the environment. The group recommends that the DOE develop next-generation technologies, including those that utilize hydrogen, and focus programmatic efforts on integrating projects that involve hydrogen fuel cells (National Energy Policy Development Group, 2001). Secretary of Energy Spencer Abraham has also expressed support for hydrogen research. In a speech on July 19, 2001, in San Francisco, California, Secretary Abraham noted that hydrogen "offers the possibility of completely clean energy—its only byproduct is water...it offers an essentially limitless source of energy" (Abraham, 2001).

The NEP report and Administration statements suggest that the president supports research and development of hydrogen as a renewable energy resource. The president's initial budget request to Congress delivered in February 2001, however, reduced funding for the renewable energy program at the DOE by 36 percent. The Hydrogen Program, part of the Office of Renewable Energy, was reduced by 48 percent from fiscal year 2001 funding levels. But on May 7, 2001, the Administration submitted a budget amendment that restored funding for the Hydrogen Program to its fiscal year 2001 level (see Table 1, U.S. Department of Energy Budget Request, 2001). The reasons for this policy change are discussed later in this article.

Funding levels for the past five years show consistent support for hydrogen technology research and development. Previous allocations paid for research and development on new hydrogen-fueled vehicles, fuel cell power plants, and hydrogen production (U.S. Department of Energy, 1998; 1999, Fiscal Year; 2000). Reducing the budget in fiscal year 2002 would undermine ongoing research and development efforts and would delay the completion of these projects. It is doubtful that the DOE would have been able to meet goals recently stated by the president and the Secretary of Energy if funding levels had been reduced by half.

Although the goals and objectives section of the detailed budget justification (for the initial submission) outlined a plan to promote the development of hydrogen technologies, the funding proposals within the same document did not support this language. Imbedded in the subsequent sections were reductions that would delay the completion of milestones and terminate projects already underway, preventing the realization of many goals described in the report.

The aim of the DOE Hydrogen Program is to "facilitate the successful transition of hydrogen energy production from fossil fuel-based sources...to renewable energy-based systems" (U.S. Department of Energy, 1999, August, 3). Currently, hydrogen is extracted from fossil fuel sources such as natural gas to power fuel cells that generate electricity. This allows hydrogen systems to be introduced into the economy and become competitive with fossil fuel-based systems. Cost-competitive technologies using fossil energy will support the future introduction of renewable energy hydrogen systems that use solar panels, wind turbines, or bioenergy to produce hydrogen, and drive technological development through market forces (U.S. Department of Energy, 1999, August).

Table 1: U.S. Department of Energy Budget Totals (actual allocations) for Renewable Energy and Hydrogen (before adjustments for prior year balances, dollars in thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002 Request to Congress	Initial FY 2002 vs. FY 2001	FY 2002 Amendment
Total Renewable Energy Resources	\$266,187	\$338,655	\$380,224	\$306,054	\$373,179	\$237,477	-\$135,702 -36.4%	+\$39,176
Hydrogen Research	\$14,809	\$15,806	\$21,976	\$24,287	\$26,881	\$13,900	-\$12,981 -48.3%	+\$12,981

Sources: U.S. Department of Energy Budget Requests for Fiscal Years 1998 to 2002, and FY 2002 Budget Amendment

Various Avenues to Hydrogen Program Funding

President Bush's initial fiscal year 2002 budget request demonstrated a seeming disinterest in renewable energy and possibly a desire to "winnow out" the Hydrogen Program because it was "less promising" than other programs (Office of Management and Budget, 2001, 69). However, as noted, the president later submitted an amendment to his budget request that restored funding for the Hydrogen Program to FY 2001 levels (U.S. Department of Energy, 2001, *Fiscal year 2002 budget amendment*). (The amendment also added funding to other renewable energy programs but not at levels as significant as the Hydrogen Program.) There are several possible reasons behind the Administration's change in direction, including public pressure, a new Administration taking time to make policy adjustments, strategies regarding oil drilling in Alaska, and political dynamics between the legislative and executive branches of government.

Public Pressure

It has been suggested that the president's budget amendment was a result of an April 1, 2001, interview conducted with DOE Secretary Abraham on the Sunday morning news show *This Week*. After describing the Administration's plan to drill for oil in the Arctic National Wildlife Refuge (ANWR) and its positions on the California energy crisis and the environment, ABC News correspondent Sam Donaldson confronted the secretary about the president's cuts in renewable energy programs. The secretary responded by saying that "we're going to look at these programs which have been widely scorned and criticized of not having returned a very good investment for the taxpayers, and come back with a budget into the future that is driven by a policy that is going to make sure that America's energy needs of the next 20 years are met..." (Donaldson, 2001, 5). The secretary's responses spurred negative feedback from the public which, according to the coalition representative, pressured Secretary Abraham to refocus funds on renewable energy programs.

Transitions for a New Administration

Another possible reason that funds were restored for renewable energy is that new Administration officials were not fully acclimated to their roles and had not yet established their policy positions when the president

submitted the original budget request to Congress. It is not unusual during a change in Administration for agency heads to take time for deliberate refocusing after an initial budget request is sent to Congress. In this case, the Bush Administration had recently initiated formulation of the National Energy Policy and its policy positions had not yet been developed when the budget request was due. After looking more closely at renewable energy programs, specifically the Hydrogen Program, the secretary may have decided that more balanced funding was appropriate and would better match policies outlined in the soon-to-be-released energy plan.

Difficulties in Winning the ANWR Battle

There is a provision in the president's initial renewable energy budget request that could also explain low funding levels for renewable energy. The DOE 2002 funding highlights from the president's budget blueprint state that the initiative to strengthen solar and renewable energy technology research and development depends on increased use of fossil fuels (Office of Management and Budget, 2001). The president indicated that bidding bonuses the government receives from ANWR leasing would fund creditable research and development projects on renewable energy technologies.

The proposal to fund renewable energy projects through ANWR revenue is based on the assumption that Congress will pass legislation to allow drilling in ANWR. This issue is highly controversial, and there is no guarantee that Congress will pass legislation to authorize it. Therefore, according to the president's proposal, if ANWR legislation is not passed there would be no increased funding for renewable energy. On the assumption that it could be difficult to convince Congress to pass ANWR legislation, it is possible President Bush decided to restore some renewable energy program funding to ease potential criticism of this proposal.

Dynamics Between the Executive and Legislative Branches of Government

James Svara discusses the complementarity of politics and administration and argues that, in regular communication with the public, elected officials and agency managers need to work together for governance (2001). Svara says that since the birth of public administration as a field in the United States, there has been an expectation that agency officials will apply their "professional knowledge...in an impartial, non-partisan

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way to address public problems” (178). He goes on to state that this has changed—that government complementarity stresses interdependence. Administrators are both vehicles in carrying out policy and contributors to the political process.

Svara’s theory about public administrators is one possible explanation for why Congress appropriated more for the Hydrogen Program’s budget than was requested by President Bush. Regardless of the president’s initial recommendations for DOE’s budget, agency officials may have used their “regular communication with the public” to help save programs that were cut in the Administration’s budget submission. Public administrators in this case may have helped carry out policy through their interaction with stakeholders and public interest groups that benefit from government contracts for research and development projects and would lobby Congress to increase program funding. As a result, Members of Congress may have decided that certain programs that would have been cut by the president were worthy of more funding than the budget request provided.

Recent Events that May Affect Future Renewable Energy Budgets

There are other events that may affect future funding for the Hydrogen Program and renewable energy budgets in addition to the initiatives in California, industry activities, and congressional authorizations.

Shifts in Party Power

The Senate’s shift in power from Republican rule to a Democratic majority in 2001 may affect the ability of the House and Senate to come to agreement on energy policy. Oil drilling in ANWR and reductions in the renewable energy budget may cause stalemate in negotiations between a Republican-led House and Democratic-led Senate. Before Senator James Jeffords (I-Vermont) left the Republican Party, the president’s budget had stronger support as did his National Energy Policy. Republicans had confidence that Congress would approve funding to support drilling in ANWR and Democrats arguing against the renewable energy budget cuts did not have the power to restore funding

levels. When power shifted in the Senate, ANWR drilling did not appear imminent and there are now stronger arguments to invest more heavily in renewable energy research and development. For example, the Sense of the Senate remarks in the House Budget Resolution for fiscal year 2002 included comments regarding the importance of renewable energy and argued that 450 million dollars should be added to the budget (House Report 107-60).

National Energy Security Concerns

Recent efforts to increase domestic supplies of energy and to protect the energy infrastructure against disruption may also affect budget outcomes. Continued reliance on fossil fuels is of concern to many Americans, and renewable energy advocates claim that with enhanced funding clean energy alternatives can become more cost-effective and ease U.S. dependence on foreign oil. In addition, renewable energy technologies are usually distributed, meaning they are smaller than central-station energy plants and usually located close to the customer. This “distributedness” allows end users to avoid using the national transmission infrastructure for the majority of their power and protects them from outages caused from grid reliability problems.

Policy Dynamics and the Hydrogen Budget

Whether the president influenced Congress’ decision or vice-versa (with the involvement of others), the Hydrogen Program received increased funding in congressional appropriations for fiscal year 2002 (Public Law 107-66). Thirty-one million dollars was appropriated for hydrogen activities, with several earmarks for fuel cell technology demonstrations (House Report 107-258). Overall, renewable energy resources were appropriated 396 million dollars (about 100 million dollars over President Bush’s amended budget request). The reasons behind increased funding for renewable energy and hydrogen research and development are not clear but may be related to the following:

- Public pressure on the Administration to consider the environment and dependence on foreign oil in its energy policy

Before Senator James Jeffords left the Republican Party, the president’s budget had stronger support

- The election of President Bush and changes in priorities regarding energy supply policies
- Difficulties in passing legislation that would allow for oil drilling in the Artic National Wildlife Refuge
- Dynamics between the executive and legislative branches of the federal government

President Bush's support for increasing domestic supplies of fossil fuels has dominated national energy policy. The NEP released in May 2001 stresses the importance of a balanced energy policy which would include fossil and renewable energy development but with one program's funding directly depending on the other program's acceptance. The congressional budget conference for fiscal year 2002, however, does not account for the president's proposal to fund renewable energy through money raised by oil drilling in ANWR. Clearly the Administration and Congress were not in agreement on this issue and behind-the-scenes deals were likely made in order to satisfy both sides.

As mentioned previously, hydrogen is currently extracted from fossil fuels, and it is hoped that further research will allow hydrogen to be created with renewable energy sources. In order to achieve that goal, fossil energy will be the test-bed for hydrogen research and will serve as the bridge that connects the energy industry to a future of increased reliance on hydrogen-fueled vehicles and power plants. Therefore, it is possible that the oil, coal, and natural gas industries lobbied for increased funding of hydrogen research, as they would benefit from cost-shared projects with the Department of Energy to continue research and development programs. If this is the case, the close relationships that these industries have with the Administration may have helped increase the budget for the Hydrogen Program.

The United States is focused on increasing domestic supply of energy resources in order to ease reliance on foreign imports of fossil fuels. In addition, there is concern over the fragility of the national energy infrastructure and fear of outside forces disrupting transmission lines and power plants. These challenges could have caused Congress to increase renewable energy funding.

Increasing U.S. energy supplies can mean two things: drilling for more oil and natural gas within U.S. territories in order to obtain cheaper fuels that are already part of our existing energy infrastructure or

investing in renewable energy technologies that could displace a large part of our fossil fuel imports by generating electricity with solar panels, wind turbines, or bioenergy. By appropriating funds for renewable energy at increased levels over the president's request, Congress could have been addressing America's energy supply challenges by trying to reach a balance on energy policy.

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