FCIAC Team Report

INCENTIVE PROGRAMS FOR STATIONARY APPLICATIONS OF FUEL CELLS

I. INTRODUCTION

With the advent of retail competition in the U.S. electric industry, states are seeking various avenues to continue the "public goods" programs that were traditionally administered or funded by regulated electric utilities. Among the goals of these public goods, or public benefits programs, is support for emerging, clean energy technologies such as energy efficiency, renewable energy, and fuel cells, to replace traditional stationary power sources.

There are three primary methods by which states have sought to support early fuel cell development and deployment—mandates, direct customer incentives, and indirect incentives. Renewable Portfolio Standards (RPS) require that Retail Electric Providers (REPs) purchase a minimum percentage of renewable energy to deliver to customers. A state or institution might also simply set a goal of purchasing clean energy, as the Governor of New York did for state buildings in his state, or California's new Power Authority has done for fuel cells there. Direct incentive programs provide customers, or the installing contractor or other third party, rebates or incentive payments, generally linked in some way to the value or the cost of the installed technology.[1] The California PUC's Self-Generation Funding program is the most significant direct incentive program in the country that specifically includes fuel cells. Indirect incentive programs as used here refer to tax incentive provisions, which allow customers to reduce their tax liability associated with a particular purchase or installation. Several states have adopted a variety of clean energy tax incentives. In addition to these traditional approaches, a few states are attempting to directly link incentives to air emissions cap and trade programs so that clean energy technologies might find a market for their emissions reduction contributions.

All together, twelve states have adopted renewable energy portfolio standards, essentially mandating that utilities or retail electric providers include a specified amount of renewable energy resources in their portfolio of generation used to meet their customer load.[2] Texas adopted a renewable portfolio standard as part of its utility restructuring law in 1999, which requires that retail electric providers participating in the new retail market must each include some renewable energy in its supply portfolio. The Texas program is often referred to as a model program for other states to consider.

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[1] Some states, such as New Jersey, have both a mandate and an incentive program for fuel cells.

[2] A state by state inventory of renewable energy incentive programs, including RPS, can be found on the website of the American Wind Energy Association at: http://www.awea.org/pubs/inventory.html.

Connecticut, Massachusetts and New Jersey have adopted renewable portfolio standards that include fuel cells within the definition of renewable energy in some fashion. In the Texas RPS, fuel cells fueled by fossil fuels were not included in the definition of renewable energy, and are therefore ineligible to satisfy the RPS.

Another approach for states to promote clean energy technology is subsidizing their development and deployment through direct provision of incentive funds. The funding source of choice by many states recently has been the System Benefit Charge (SBC), which is usually collected from customers in the transmission and distribution portion of their electric bill and subsequently deposited into a fund. A proposal developed by the staff of the Public Utility Commission of Texas (PUCT) would raise funds for a production credit through the imposition of a "pollution fee" on power generators. There are several ways that states structure these financial incentives, including rebates or buy-down programs, grants, and loans. One creative program discussed below involves a state investment program.

Currently, fourteen states, as part of their restructuring legislation or other regulations, have provided for incentive funds to support renewable technologies.[3] These states include: California,[4] Connecticut, Delaware, Illinois, Massachusetts, Montana, New Jersey, New Mexico, New York, Ohio, Oregon, Pennsylvania, Rhode Island, and Wisconsin.[5] By 2012, these states will collect approximately $3.5 Billion for renewable energy programs.[6] As with RPS provisions, the definition for renewable energy varies from state to state. Several states, such as California, Connecticut, Massachusetts, New Jersey, and New York include funding for fuel cell technology under these programs. Funding support is provided on the basis that, while fuel cell technology is close to technical viability, fuel cell prices remain high. For prices to come down, companies will have to move to mass manufacturing, which requires mass markets. Incentive funds, like portfolio standards, are viewed as one avenue to stimulate mass markets and hasten commercial viability for fuel cell technology.

In addition, 19 of the 22 states formally adopting some form of utility restructuring, plus the District of Columbia, put incentive funds in place to support energy efficiency technologies. Upon our last review, the remaining states were considering programs or

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[3] See http://www.ies.ncsu.edu/dsire/summarytables/financial.cfm?&CurrentPageID=7 for an overview of state incentives for renewable energy.

[4] Although California has repealed their direct access regulation, REPs are still able to service their customers who had signed up with them prior to the repealing of direct access. The SBC monies were continued before the repealing of direct access.

[5] Arizona is excluded from this discussion because its SBC for renewables is being used solely to subsidize their RPS. Further, while regulated states also have programs promoting this technology, this paper will focus on competitive states' programs.

[6] Clean Energy Funds: An Overview of State Support for Renewable Energy. *Lawrence Berkeley National Laboratory, April 2001*. Vii.

had programs limited to low income customers only.[7] And, although our focus here is on states like Texas entering retail competition in some form, it is worth noting that most states which have not adopted retail competition also require their integrated utilities to provide some form of energy efficiency customer incentive programs. Generally, these programs are administered by the states' regulated utilities through a variety of mechanisms. In most cases the utilities provide customer incentives that are tied to the cost of the new power generation which is avoided because of the conservation of energy, or reduction of peak load, or both.

Funding may be stipulated in creation of a system benefit charge, or the cost may simply be included in the regulated utility's rate base. While Texas has an SBC, its uses are limited primarily to support of low-income rates support, low-income weatherization and tax equalization related to stranded utility assets. Texas has adopted a goal for energy efficiency, however, which utilities serving areas with retail competition must attain. In order to meet this legislated goal, the PUCT approved about $70 million per year in base rates for participating utilities to "acquire" savings. The definition of energy efficiency was determined to exclude fossil fuel powered on-site generation by the PUCT, although renewable energy projects are eligible. Incentive payments for any one project are limited to a percentage of the PUCT determined avoided cost.[8]

Increasingly, states have begun to explore the use of similar incentive funds to promote clean technologies as a means to help meet the demands of the Clean Air Act. Among other measures it adopted to reduce air emissions in its 2001 session, the Texas legislature provided extra funding for building efficiency programs designed by the PUCT.[9] Fees raised to clean the air, such as pollution taxes or fees, could certainly provide a future source of revenues for incentive programs such as those considered here, while also creating incentive to reduce harmful emissions. In fact the PUCT staff has recently published a paper exploring how the state might help accelerate the adoption of fuel cells, which suggests the use of a pollution-based fee on generators. [10]

Tax credits or deductions are a common means through which states provide indirect incentives to individuals or businesses for adopting new technologies with perceived public benefits. For example 34 of the 50 states offer one or more tax incentives for installation of renewable energy devices.[11] Others offer incentives for efficiency investments. Similar incentives are a means for supporting the early commercial deployment of fuel cells as well, and some states have begun to expand their tax incentives to include fuel cells. Texas allows businesses investing in renewable energy

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[7] See: A Review and Early Assessment of Public Benefit Policies Under Electric Restructuring, Volume 2 (November, 2001) for an update of state efficiency programs under restructuring, by the American Center for an Energy Efficient Economy. (http://www.aceee.org/briefs/mktabl.htm)

[8] This is defined in PUC Substantive Rules, Section 25.181, to equal $768 per kW and 2.8 cents per kWh, but can change with time.

[9] Senate Bill 5, by Senator B. Brown, 77th Regular Session of the Texas Legislature.

[10] Fuel Cell Commercialization in Texas, David Hurlbut, Ph.D., Senior economic Analyst Public Utility Commission of Texas, Jan 9, 2002 Draft.

[11] See http://www.ies.ncsu.edu/dsire/summarytables/financial.cfm?&CurrentPageID=7 for an overview of state incentives for renewable energy.

devices a franchise tax exemption, and did provide a sales tax exemption for renewable energy technologies for years, but it has since lapsed.

The Texas Legislature in 2001 directed the TNRCC to develop a mechanism by which energy efficiency measures could be credited for their emissions reduction contributions. This ongoing effort has focused on developing a methodology whereby electrical conservation that results from the installation of devices that improve energy efficiency is credited with offsetting the generation of electricity (and the associated air pollution) from conventional fossil fueled power plants. The development of this methodology, which assigns an emissions rate for every kilowatt-hour of electricity displaced by efficiency, also enables the state to allow zero and near zero emission electrical generation technologies (such as renewables and fuel cells) to generate emission reduction credits. Texas provides a unique test bed for this innovative approach because the Texas grid is essentially isolated from the rest of the nation,[12] limiting the ability of Texas-based power plants to export their product out of state, and therefore, limiting the impact of distant markets on power generation and pollution. This approach, which is being closely watched by other states, may create a powerful new indirect incentive for fuel cell commercialization.

That the Texas renewable energy, RPS, and efficiency direct incentive programs today exclude fuel cells is not a reflection on the potential of fuel cells to contribute to energy reliability, efficiency, or clean air. Nor, we think, should it be taken as a reflection on the interest of the Texas leadership in fuel cells. Rather, when the state's renewable mandate and incentive programs were passed in 1999, little was publicly known about fuel cells, which were simply not on the lawmakers' radar. In the subsequent session in 2001, the legislature passed two measures relating to fuel cells directly. First, in its major clean air legislation, lawmakers included a small amount of funds for the Texas Council on Environmental Technologies (TCET) to support certification of fuel cell products.[13] And, a separate bill passed specifically charging the State Energy Conservation Office (SECO) with development of a statewide plan to accelerate the introduction of fuel cells into the Texas market.[14] Similarly, it is appropriate that Texas, like an increasing number of states, should consider expanding its existing programs to include fuel cells.

II. PORTFOLIO STANDARDS

Although a portfolio standard is in fact a mandate or requirement, many state legislatures have been persuaded that such a requirement is justified on the basis of risk management alone. Diversifying the portfolio of resources upon which electric providers draw upon is itself a hedge against system reliability problems or the variability of fuel prices. In addition, some legislatures have considered the portfolio standard simply an economic development tool to spur the initial development of their state's own renewable resources and renewable energy industry. Similarly, the Governor of New York established a renewable energy purchase goal for state buildings, and the California Power Authority has decided to purchase fuel cell capacity for state buildings. These purchase programs,

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[12] http://www.ercot.com/ElectricRestructuring/OrgInvolved.htm
[13] Senate Bill 5, ibid.
[14] House Bill 2845, by D. Danburg, 77th Regular Session of the Texas Legislature.

like an RPS, also create defined markets, an important market incentive for manufacturers.

The Texas Renewable Energy Portfolio Standard[15] was crafted by the Texas Legislature as part of its overall restructuring of Texas utilities and the introduction of retail competition for electricity. The law establishes a goal of 2000 MW of new renewable generation in the state by 2009, with intermediate goals in intervening years. It also directs the PUCT to establish a renewable credit trading program and determine the amount of credits each retail provider must retire annually, based on the proportion of the total market served. Under this program, already over 1000 MW of wind power projects have been constructed at record low prices. Fuel cells were not included in the definition of renewable energy, and are therefore ineligible to satisfy the RPS.

Below is further information about one state authority purchase program, and three states which have included fuel cells in some fashion within their portfolio standards.

A. California Power Authority

In light of the recent energy problems in California, and a desire to promote clean and renewable generation technologies, the newly formed California Power Authority (CaPA) has taken a much needed and bold approach to promote fuel cells.

> The CaPA is in the process of qualifying fuel cell companies through an RFB to satisfy their stated goals of purchasing the following volumes of fuel cells:
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> | Year | Amount |
> |---|---|
> | 2002 | 20 MW |
> | 2003 | 50 MW |
> | 2004/2005 | 300 MW |
>
> The purchases would be for state owned facilities. However, the CaPA plans to share its volume purchase pricing with municipalities to further encourage and promote fuel cell usage. The stated intent of these purchases is to foster development of an emerging industry in California through the use of fuel cells in government buildings. Without question, this will provide a substantial contribution towards commercializing stationary fuel cells.

B. Connecticut

> The state of Connecticut adopted a renewable energy portfolio standard that covered two categories or classes of resources or related technologies. Class I renewable technologies include solar, wind, fuel cells, landfill gas, or biomass projects in operation on or after 7/1/98. Class II technologies include waste-to-energy and hydro facilities. The program's first deadline was July 1, 2001, by which time utilities were to have acquired at least 0.5% of their generation from Class I renewables. As of 7/01/01 the requirement increased to 0.75%. The law

[15] Public Utilities Regulatory Act, Section 39.904, Texas Administrative Code.

provides a timetable, which increases this requirement to a full 6% of the generation portfolio by July of 2009. Fuel cells are defined in Connecticut's RPS as a renewable technology regardless of their source of fuels.

C. Massachusetts

In the case of Massachusetts, the legislature set the first goal as 1% of the generation portfolio by December 31, 2003, and increases the goal by 0.5% each year thereafter until December 31, 2009, and thereafter an additional 1.5% per year until a date to be decided by the Division of Energy Resources. The definition of renewable energy technologies eligible to help meet the standard includes solar thermal electricity, solar photovoltaics, wind, ocean thermal, wave or tidal power, landfill gas, waste-to-energy as a component of conventional municipal solid waste plant, low emission advanced biomass, naturally flowing water and hydroelectric projects, and fuel cells using renewable fuels.

D. New Jersey

The state of New Jersey adopted a definition of renewables for its portfolio standard that closely reflects the two-class system of Connecticut. It requires that retail providers include at least 0.5% of Class I renewable energy generation in their supply portfolio by September 1, 2001, and slowly increases the requirement to 4.0% by 2012. Also, as in the case of Connecticut, the New Jersey definition of renewables includes fuel cells regardless of the source of fuel used by the fuel cell.

Clearly the Massachusetts RPS is a much more limiting definition from the stand point of boosting fuel cell technology. In fact, it could be argued that the current Texas RPS would itself include fuel cells using renewable fuels, even though they are not specifically mentioned. And, it would certainly seem possible for the PUCT to administratively clarify this option with little difficulty. However, it would appear to require legislation to create a portfolio standard specifically for fuel cell technology in Texas in order to have the same impact as the laws passed by Connecticut and New Jersey.

INCENTIVE FUNDS

Financial incentives have historically been used by states to encourage the purchase and installation of efficiency and renewable energy technologies. Traditionally, state programs can be classified as direct incentives, indirect incentives, or a combination of these. These approaches are generally discussed below. The subsequent section includes one example of a non-traditional program created by Connecticut -- there is no all-inclusive definition of all the options policy makers could adopt.

1. Direct Incentive Programs

A. Rebates and Buy-down Programs:

Rebates and Buy-Down Programs typically require a cost sharing arrangement whereby the customer shares a portion of the cost with the entity providing the

funds. These programs usually cap the amount of monies available per project and may require additional criteria for entities receiving the monies, such as monitoring and verification. Rebates are offered at the state, local, and utility levels to residential and business sectors. At times, rebates are coupled with low-interest loans.

Rebates and Buy-down Programs offer administrative ease; however, the rebate needs to be set at a level high enough to offset the cost sufficiently to motivate customers to participate in the program, and sufficient incentives must be provided to attract the interest and involvement of private sector companies to offer fuel cells. Rhode Island found it necessary to raise both the total amount of funding and their rebate amount to $3 per watt in 2001 after very little response was experienced with the previous program offering.

B. Grants:

Grants are usually made available to business, industry, government, utilities and schools. The programs vary in the amount of funds available, though under the state programs we reviewed, entities can receive between $500 and $1,000,000 per project. The projects can focus on research and development or the commercialization of an emerging technology. Grants are usually provided to parties that respond to Requests for Proposals for projects that meet stated program objectives.

C. Loans:

Existing loan programs offer zero to low-interest financing arrangements to residential, commercial, industrial, transportation, public and nonprofit entities purchasing fuel cells. Repayment of these loans may be determined on a project-by-project basis. These programs generally work best where the primary market barrier is not the cost effectiveness of new technology, but rather its initial capital cost. Because it is early in the development of fuel cell technology and prices are still relatively high, capital costs are a potential barrier. However, a loan program alone might be expected to motivate customer adoption only in relatively select niche markets until costs and prices come down further. A lone program coupled with other direct or indirect incentives could be expected to have broader impact.

2. Indirect or Tax Incentives

A. Personal Income Tax Incentives:

Personal income tax incentives are tax credits or deductions extended to individuals to offset the cost associated with purchasing and installing clean energy technologies. Tax credits are often capped at a certain percentage or have a defined number of years in which they may be used. Oregon homeowners and businesses can take up to $1500 off their taxes for purchase of a fuel cell. Texas does not currently have a personal or corporate income tax, so this is not an option for Texans.

B. Corporate Tax Exemptions:

Like tax incentives for individuals, corporate tax incentives allow corporations to receive credits or deductions ranging from 10% to 35% against the cost of

equipment or installation to promote adoption of clean energy equipment. Arkansas offers a business income tax credit for companies that develop or manufacture fuel cells of up to 50% of the funds invested. Texas currently offers a franchise tax exemption for renewable energy investments by companies, and although it does not apply to fuel cells currently, it could be expanded to do so.

C. Sales Tax Exemption:

Several states offer a sales tax exemption for the purchase of renewable energy technology, and a few have begun to include fuel cells under their definition of renewable energy technology. Maryland provides a sales tax exemption for fuel cells of 2 kW or more. Maine exempts from sales tax the extra cost of a fuel cell vehicle over a normal version of a vehicle (up to half the price of the vehicle if no comparable vehicle). Texas previously exempted renewable energy from sales tax, but the exemption has since lapsed. Typically this tax credit or deduction does not have a cap. Some states, however, have a credit that decreases over time or makes the tax credit contingent on the amount of money a corporation pays for fuel cell technology. This is a significant tax in Texas, and therefore, could provide a significant incentive.

D. Property Tax Exemptions.

Where fuel cells would be considered part of a property, and therefore taxable, exempting the value of the improvement from property tax is a common method to avoid making a new technology more costly than it already is. Twenty-three states, including Texas, enacted property tax exemptions for renewable energy devices.

E. Air Emissions Credits.

In the Houston area, which is out of attainment for Federal air quality standards, the TNRCC has established a program whereby companies that are required to reduce their emissions can purchase Emission Reduction Credits (ERCs) to meet their emission reduction targets. Under current regulations, fuel cells can generate ERCs if they are used to replace an existing source of pollution, such as a heater or a boiler. The fuel cell owner would receive credit for all of the pollution that was eliminated from the displaced device and would be able to sell that credit to a third party in need of emission reductions. As discussed above, TNRCC is developing a mechanism for energy efficiency investments made under utility incentive programs, or under state and local government efficiency mandates passed by the Texas legislature, to receive credit for the clean electricity they generate. The agency has indicated that there is no reason why fuel cells couldn't be included in that program. As of this writing, a ton of NOx ERCs sells for $17,500 in the Houston/Galveston area.[16]

[16] Given the potential development of a mechanism for fuel cells to generate ERCs for the electricity they produce, it is worthwhile to project the ERC generation potential of a fuel cell. TNRCC has provided preliminary figures that average power plant peak emissions in East Texas at 1.8 lbs NOx/MWh. This means that a 1 MW fuel cell power plant, running at 95 percent capacity, will create 7.5 tons of NOx

IV. FOUR STATE INCENTIVE FUND MODELS

This section will highlight four state funds with differing approaches specifically adopted for fuel cell technology, including rebate or buy-down programs, a venture capital approach, and traditional loans and grants.

A. California

The most significant funding for fuel cells in the U.S. is the Self-Generation Program created by the California Public Utility Commission. The program is a five-year $625 million plan ($125 million annually) to provide rebates to end users who install clean generation. It is an outgrowth both of the states' original restructuring related programs and the subsequent power shortage problems. The program is available to renewables such as photovoltaics, biomass, and landfill gas, as well as fuel cells and clean natural gas generators.

The program provides tiered funding as follows:

$/kW (or %) of System Costs:	
$4,500/kW (up to 50%)	Class I Renewables (includes fuel cells operating off of landfill or biogas)
$ 2,500/kW (up to 40%)	Fuel Cells operating off of natural gas with waste heat recovery
$ 1,000/kW (up to 30%)	Micro-turbine or IC Engine with waste heat recovery

The program requires a 5-year warranty and is limited to projects of less than 1 MW.

B. Connecticut

Connecticut Clean Energy Fund (CCEF) was established by Public Act 98-28, §44. The fund's inception was January 1, 2000, and is capitalized by the following system benefit charges:

1/1/00-6/30/02: .5 mills/kWh
7/31/02-6/31/04: .75 mills/kWh
7/1/04 and continuing: 1 mill/kWh

Over the next five years, approximately $120 million will be collected for the fund.

Connecticut takes a project management approach. The fund, managed by Connecticut Innovations Inc., the state's leading investor in high technology,[17] infuses capital into technology projects at their earliest stage of commercialization. Connecticut Innovations, Inc. prefers this approach to more

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emission reductions (from the East Texas average) annually. At $17,500 a ton, the sale of these ERCs would yield over $130,000 for the owner of the project.

[17] http://www.ctcleanenergy.com/about/about.htm

traditional subsidy and buy-down or rebate incentive programs due to the belief that early capital investment in commercialization projects and active management support will help companies leverage private funds in later stages of commercialization. This methodology pushes these technologies into commercial viability versus creating market pull for the technologies.

The first year funding is approximately $6 million, with one million coming from the Connecticut Conservation and Load Management Fund. In addition to the venture fund activities, the program also solicits businesses of any size to arrange financing through the fund for the purchase and installation of fuel cell technology.

Two notable examples of the CCEF's investment in fuel cell technology include: (1) a $500,000 equity stake in Sure Power Corporation, a fuel cell manufacturer and services provider; and (2) a $500,000 convertible note in a 72 MW hybrid power plant combining biomass gasification and fuel cell technologies.[18] As a result of a recent Request for Proposals (RFPs) for commercial fuel cell demonstration projects, the fund provided $400,000 to FuelCell Energy, Inc. for a Coast Guard installation.

C. Massachusetts

The Renewable Energy Trust Fund (the Trust) was created in 1997 as part of Massachusetts' restructuring legislation.[19] Between 1998 and 2003, the Trust will collect roughly $150 million through an SBC charged to all customers, at a rate of $6 per year, to encourage and accelerate the use of clean and renewable energy technologies.

The fund is administered by the Massachusetts Technology Collaborative (MTC), a quasi-governmental agency. The MTC's strategic plan outlining the goals of the fund supports distributed generation, principally fuel cell technology.

The particular initiative promoting fuel cell technology is called the Premium Power Program, which explores and promotes the use of fuel cells as sources of highly reliable power. As of December 31, 2001, the Trust had awarded a total of $354,000 for planning grants, and $1.9 million for the installation of fuel cell-based systems.[20]

D. New Jersey

New Jersey's SBC fund was also established through their restructuring act. Like Texas, New Jersey has both an SBC and an RPS. As mentioned previously, beginning on September 1, 2001, the percentage of renewable energy that retail

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[18] Clean Energy Funds: An Overview of State Support for Renewable Energy. *Lawrence Berkeley National Laboratory, April 2001*. pg. 59

[19] Chapter 25 §20C

[20] The Renewable Energy Trust Fund: Progress, Challenges and Opportunities; Massachusetts Technology Collaborative, February 2002.

providers must include in their portfolio ramps up to 4 percent by 2012 for Class I renewable technologies, including fuel cells.[21] In addition, the state has a separate SBC program, a portion of which goes to fund renewable development. These monies are not used to subsidize their RPS program. The SBC is funded at roughly $215 million per year with the following portions supporting renewable development:[22]

2001 - $115 million
2002 - $119.3 million
2003 - $124 million

(The fourth year funds are to be determined after the rate cap is lifted.)

Of these SBC monies, at least 25% must be spent on supporting Class I renewable technologies, which include fuel cells, whether or not powered by renewable fuels.

The SBC fund, administered by the New Jersey Board of Public Utilities (BPU), is structured into two programs:

a. A Customer-Sited Distributed Generation Program to be administered by the utilities during the first year (2001) with BPU oversight. The program is structured as a rebate or buy-down program and all Class I renewable technologies are eligible for funding according to the following schedule:

System Size	**Incentive ($/Watt)**
Small (0-10 kW)	$5
Medium (10-100 kW)	$4
Large (>100 kW)	$3
Maximum buy-down as % of installed cost	60%

[23]

b. A Grid-Supply Program, which includes a market development program. The program is administered by the BPU, in consultation with the New Jersey Department of Environmental Protection, and includes production incentives, risk mitigation through loans and grants, and below market

[21] Class I Renewables include: solar, PV, wind, fuel cells, geothermal, wave or tidal, methane gas from landfills or biomass facility (provided it is cultivated and harvested in a sustainable manner)
[22] http://www.bpu.state.nj.us/wwwroot/energy/EO99050348ORD.pdf, p. 64
[23] http://www.njcleanenergy.com/main/clean_energy4_incent.html

financing[24] for renewable technologies. The board considers technology and cost when making awards.[25]

V. FEDERAL INITIATIVES

The DOE has a robust program promoting fuel cell technology as part of a larger program of $85.7 million in research awards to cutting-edge energy efficiency and clean energy science and technology. Fuel cells and hydrogen technology are among the most promising areas of the department's research and development work, according to Secretary of Energy Spencer Abraham.[26] The fuel cell research will be primarily focused on overcoming technical barriers to introducing fuel cells to the public.

The DOE's National Energy Technology Lab (NETL) also has monies for both stationary and mobile fuel cell development through the Solid State Energy Conversions Alliance (SECA). SECA has issued solicitations for 3 kW to 10 kW solid-oxide fuel cell systems for stationary, mobile and military applications. The goal is to stimulate mass production such that solid oxide fuel cells have a factory cost of $400 per kW by 2010.[27]

As part of this solicitation, Siemens Westinghouse Power Corporation was awarded funding to develop the first megawatt-scale solid-oxide fuel cell. Cummins was awarded monies in August 2001 to build a 10 kW solid-oxide fuel cell.[28]

The Department of Defense has a program of incentive payments to buy-down the cost of fuel cells which is targeted primarily to federal facilities. There are currently, however, no broad, consumer-based, market incentive programs enacted at the federal level for fuel cells. Perhaps most interesting for the purposes of this report, which is focused on the potential for state initiatives, there are opportunities for states to partner with the DOE on specific projects with industry through a program called National Industrial Competitiveness through Energy, Environment and Economics (NICE3). The FY '02 budget is approximately $150 million. NICE3 offers competitive solicitations to which industry replies through their state.[29] States and industry are eligible to receive up to $525,000 in a one-time grant.[30]

VI. POLICY OPTIONS

Clearly there are a number of program approaches that Texas could consider for supporting the more rapid commercialization of fuel cells in Texas. As was noted above, the federal government programs tend to be focused on supporting the development of the technology by working with the technology companies through 'technology-push'

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[24] http://www.bpu.state.nj.us/wwwroot/energy/EO99050348ORD.pdf Final Order & Decision in the Matter of the petition of the Filings of the Comprehensive Resource Analysis of Energy Programs pursuant to Section 12 of the Electric Discount and Energy Competition Act of 1999.

[25] The BPU has not yet developed the implementation plans for this program.

[26] http://www.energy.gov/HQPress/releases01/junpr/pr01105.htm

[27] http://www.fetc.doe.gov/business/solicit/

[28] http://www.netl.doe.gov/scng/

[29] http://www.oit.doe.gov/nice3/nice3.shtml

[30] The federal programs listed are not intended to be an exhaustive list of the funds, but rather an overview of some of the funding available.

programs. Although the Connecticut program includes this kind of approach, most state programs supporting clean energy technology, including efficiency and renewables, have focused on stimulating the market for the technology, or are 'market-pull' programs. Either a portfolio standard or incentive approach can be considered a market-pull program. One benefit of the market-pull approach is that it does not put the state in the position of choosing the technology to support. That is, state programs generally provide financial incentives to customers who invest in clean energy technologies meeting certain program requirements based on some public benefit. The intended result is to create a market for clean energy technologies such as fuel cells, and generate public benefits. Technology companies or service companies compete in the market to gain the customer's participation. This seems an appropriate role for the state and the market.

Incentive funds can be collected in a number of ways and can be administered through a number of mechanisms, as demonstrated by the approaches taken by the various states. A portfolio standard clearly has the benefit of including in its creation a method of funding, while other incentive funds must separately identify funds. Incentive programs operated by the state or utilities have the advantage of being able to target smaller-scale installations of distributed technologies more easily. Tax incentives provide ease of administration. If tax incentives work to accelerate a new product market beyond where it would otherwise have been, their cost can be considered negligible. On the other hand, tax incentives may have a variable effect, as their value may vary according to the tax status or position of the entity to which they apply. Tax credits are only valuable to companies that have income taxes they need to reduce. Texas has very few taxes and a low overall tax burden, reducing the value of this tool to the state.

Consideration of potential program models for Texas must consider the existing programs' structures for related clean energy technologies and the larger context. This is true both for a portfolio standard, direct incentive programs and potential tax incentives.

Discussion of Program Options for Texas

- **Creation of a Fuel Cell Portfolio Standard:**

  Texas adopted what is recognized as the most successful renewable energy portfolio standard in the 50 states. An attempt to pry open this program to include fuel cells at this time might be expected to stir opposition from the renewable energy industry, clean energy advocates and consumers, and possibly legislators and regulators who are proud of the program as it is, and so might not be a practical option. However, an additional portfolio requirement, specifically for fuel cells, could have widespread support among some of those same parties. And, if a portfolio standard is adopted to fairly apply to all market entrants, as the renewable standard was, it should not disadvantage any market participant relative to any other.

  A fuel cell portfolio standard has the advantage that a state appropriation for such a program is not necessary. Individual retail electric providers must find the means through which to purchase power from fuel cells, either through bilateral contracts

with individual producers or aggregators, from their own customers, or through market purchases.

The RPS approach has the disadvantage that most fuel cells are not destined for the wholesale market, but rather for smaller-scale on-site applications, particularly because their efficiency is greatly increased by the use of waste heat on site. These small installations would have to be aggregated to meet a portfolio standard, and it is not clear that a market mechanism exists to provide this aggregation. Manufacturers of some of the larger fuel cells could team with independent power producers, however, to build larger fuel cell installations for the wholesale market. Relying upon individual REPs to develop separate incentive programs to encourage their own customers to install on-site generation would be a difficult approach to implement. As an alternative, REPs could possibly buy fuel cell generation credits from third parties if a credit-trading program were authorized, or one developed independently. REP purchase of fuel cells directly would not be allowed under current law, which precludes REPs from themselves owning generation capacity.

A final consideration with respect to this approach is that the Texas RPS has been swept by wind power developers who have driven costs to below 3 cents per kWh. If this is what the market will pay for energy to meet the RPS goal, it may be an insufficient incentive to motivate installation of fuel cells, which are still several times more expensive. This would suggest that the best approach may be to create a separate RPS for clean, on-site generation, with a separate goal, so that the market could establish a separate price structure more appropriate to fuel cells. Solar thermal and solar photovoltaic proponents have proposed a similar measure for their clean, on-site technologies, and perhaps a combined Class II, clean energy technology RPS could incorporate both fuel cells and solar. If this were adopted, however, a minimum goal for fuel cells should also be specified to ensure one technology does not again dominate the program.

- **Expansion of the State's Energy Efficiency Goal to include Fuel Cells:**

The PUCT has adopted eight templates for energy efficiency incentive programs. Utilities in the state can choose from these templates in order to meet their energy efficiency goal, which amounts to about 110 MW of energy efficiency annually. Utilities have budgets approved by the PUCT to implement these programs. The programs are administered by the wires companies, not the retail providers -- largely by Demand-Side Management staff that have implemented similar programs over the last 20 years.

Expanding the utility-administered energy efficiency incentive programs would have the benefit that such programs are aimed at increasing the market for new technologies by influencing retail customer choices. They are focused on marketing new technologies to customers through market-neutral formats. It would be relatively easy for these programs to include fuel cells as an eligible technology. Customers and consumer and environmental advocates would likely find this a good fit, and the

installing contractors would likely find this a welcome expansion of potential services to sell, rather than an infringement on their programs.

The PUCT determined that traditional on-site generation is not an eligible technology under the existing program because the law requires that the programs save both energy and costs for the customers. However, the PUCT has allowed fuel switching to gas appliances and determined that photovoltaic systems are eligible, so there is some room for interpretation. The PUCT could conceivably expand the definition of efficiency measures to include fuel cells on the basis that they are more efficient than centralized generation, but the incentive might be limited to recognize only the increased efficiency, to remain consistent among technologies. Because incentives are limited to a percentage of avoided costs, however, it is not likely this would be sufficient to motivate customers to choose fuel cells. In addition, it should be noted that the state's efficiency programs under the restructured environment are just getting under way, and will not be up to full steam until 2003. Even when the programs are fully funded, they will still operate at a level far below that in most comparable states. Funds for each year's programs go very quickly now. So, an expansion of the program to include fuel cells might also appropriately be accompanied by an increase in overall funding and would have to include differentiated incentive levels for clean generation. This suggests the need for additional legislation to launch such a program. Actual funding for such program expansion could be approved by the PUCT during the true-up rate cases planned for 2004, or in subsequent rate cases. Alternatively, funding for a fuel cell incentive program could legislatively be included in those costs for which affiliated REPs are allowed to adjust rates.

- **Creation of a New Direct Incentive Program:**

Another approach to development of a direct incentive program may be creation of a new fund, focused on demonstration or deployment of fuel cells, perhaps operated by the PUCT, distribution utilities, SECO, or even TNRCC's Fuel Cell Partnership. If considered an economic development program, like the portfolio standard, this approach would have the flexibility to designate incentive levels designed specifically to motivate fuel cell installations without regard to competing technologies' pricing or avoided cost considerations. It has the drawback of having to identify a source of funding in a slow economy when state budgets are expected to be tight already and new funds hard to find. However, as discussed earlier, there is growing concern about the quality of the air in the state's metropolitan areas, and fuel cells are a clear alternative to help resolve that problem in the long run. The PUCT staff has proposed a pollution tax or fee as a source of funding for an ongoing production incentive program on the basis that such a fee would not only be a source of needed revenue, but also an incentive to reduce emissions generally.

- **Adoption of a Fuel Cell Franchise Tax Exemption:**

Texas already exempts renewable energy devices from the state's business franchise tax. Adding fuel cells to the franchise tax exemption would require legislation. A franchise tax exemption for fuel cells should be a relatively easy measure to gain

support for, however, as there is no current income in the state budget from fuel cell installations presently. The industry is so new that any new installations would be new economic activity, and arguably have only positive impact on the state and its budget. It is also true, however, that a franchise tax exemption alone would not likely be sufficient to generate a market for fuel cells, or attract manufactures to locate here, and would have to be viewed as a component of a larger commercialization or economic development strategy.

- **Adoption of a Fuel Cell Property Tax Exemption:**

Adoption of a fuel cell property tax exemption is a possible option, again as part of a larger strategy. And, it should be easy for legislators to support for the same reasons as were discussed above. However, because the state portion of local property taxes is relatively small, this would have less effect than in other states with a more significant state property tax.

- **Adoption of a Fuel Cell Sales Tax Exemption:**

As is the case for the franchise or property tax exemptions discussed above, a sales tax exemption would require legislation, but should be easy for legislators to support because fuel cells are not yet generating measurable state sales tax revenues. It would be a case of foregoing potential income to help kick-start a new industry with tremendous economic potential for the state. Like the franchise tax exemption, however, the sales tax exemption would not be sufficient to generate sales of fuel cells this early in the industry's history, and would have to be a component of a larger commercialization strategy. On the other hand, this might be the most important tax exemption to adopt, as it would have the most significant impact in terms of cost reduction, relative to the franchise tax or the state property tax, both of which are smaller in proportion.