
# Integrating Fuel Cells and RPS Markets

## RECOMMENDATIONS AND STRATEGIES FOR ADVANCING FUEL CELLS, DISTRIBUTED GENERATION AND RPS MARKETS

**A Working Paper by**
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# Executive Summary

Many states promote technology preferences within their renewable portfolio standard (RPS) designs mandating distributed clean energy. For example, several states have designated specific allocations for photovoltaics within their RPS, including Arizona, Colorado, Nevada, New Jersey and the District of Columbia. Other states, including Delaware, Maryland and New Mexico, have established multipliers that increase the quantity of renewable energy credits (RECs) awarded to certain technologies. Connecticut, New York and Arizona have established separate mandates for distributed or customer-sited energy resources. We believe that there are significant advantages to employing these approaches to foster distributed generation and to more successfully integrate distributed technologies into current RPS markets.

The purpose of this report is to examine opportunities for improving the incentives for stationary fuel cells in the context of existing RPS programs. Because we recognize that even a leveled playing field for stationary fuel cells in the context of an RPS is likely to produce only moderately improved incentives for their further development, we also list complementary strategies and targeted incentives that would strengthen RPS-based incentives. However, many of our recommendations, if implemented, will also serve to improve the opportunities for all clean distributed energy resources within RPS markets.

Our recommendations articulate several sensible strategies for consideration by policy makers, regulators, state clean energy funds and clean energy advocates. We identify both near-term solutions that may be reasonably simple to implement and long-term actions that will require political consensus and coordination with other stakeholders and policy makers. We also identify strategies to promote mandatory policies, such as executive orders or legislative actions, which can complement RPS markets and may represent, in our view, more effective near-term strategies to accelerate the deployment of fuel cells and clean distributed generation resources.

### Recommendations

The primary recommendations are:

**(1) Incorporate fuel cells within eligible technologies for RPS compliance:** Fuel cells are a critical enabling technology in the transition to a clean energy future. In combination with hydrogen production from renewable sources, fuel cells, whether powered by a renewable fuel or natural gas, remain a key technology that can satisfy near-term demand for clean distributed energy capture, storage and conversion. Regardless of near-term fuel source, fuel cells are important for environmental and climate reasons because of their low emissions and long-term potential to act as a zero-emissions technology. These advanced

energy characteristics mean that fuel cells have a critical role to play in a sensible energy transition strategy and should be included within the suite of preferred technologies today.

(2) **Relax existing geographic and energy delivery requirements for fuel cells and clean distributed generation:** Distributed energy resources are fundamentally designed to offset existing energy demands on site. Delivery requirements and specific geographic location requirements imposed by RPS regimes often create a de facto in-state restrictions on earning RECs from distributed generation facilities, limiting the ability of these facilities to benefit from regional REC activity and market forces. In our view, smart economic development practice suggests modifying and easing these restrictions. RPS markets have been characterized by dramatic price swings in RECs; this suggests that limiting emerging technologies to state-specific markets may be creating less stable parochial markets, rather than integrated regional markets.

(3) **Fully integrate distributed generation into the systems that generate and track RECs:** At present, an asymmetry exists in the Northeastern United States between the treatment of distributed generation resources and wholesale generators. Notably, generation data flow automatically from ISO-NE's and PJM's market settlement systems into GIS and GATS for wholesale generation, whereas generation data from distributed generation sources is essentially self-reported and manually entered into GIS and GATS. This lack of automated and metered data flows limits the market opportunities for distributed generation RECs and creates uncertainty stemming from audit concerns. Reasonably simple, low-cost technical fixes such as updating software are available but have not been implemented and should be implemented now, in order to anticipate a larger-scale distributed generation market in the near future.

(4) **Develop clear, regional standards for auditing behind-the-meter resources:** At present, there is a need to conduct ex post audits of RECs created from distributed energy resources. We recommend that in the absence of reliable, automatic data verification (as suggested above), states should move expeditiously to develop common standards for the auditing of RECs created from behind-the-meter resources. Connecticut, for example, has established criteria for third party auditing. A similar consensus-based set of standards for the entire Northeast or individual regions would allow for third parties to serve as qualified REC auditors and alleviate existing uncertainties regarding RECs from distributed generation resources.

(5) **Replicate preferential regulations and rate-based incentives for fuel cell installations in other states:** Fuel cells and clean distributed generation technologies continue to be subject to unfavorable and, in many cases, discriminatory regulatory and rate-making conditions. In response, many states have successfully implemented preferential policies

such as standby charge exemptions, flexible limits for net metering and standardized interconnection standards. We believe that broadly implementing these pro-distributed generation regulations and policies will have a complementary effect on RPS markets.

**(6) Promote targeted mandates and financial incentives to complement RPS policies:** In addition to RPS policies, many states have issued executive orders and designed financial incentives that target fuel cell and clean distributed technology deployment in specific, high-value applications such as industrial applications, security or grid congestion relief. We believe that these strategies may prove more effective at driving new demand for fuel cells and clean distributed generation resources and can be complementary to RPS markets, especially when considered in combination with new federal investment tax credits.

## INTRODUCTION

During the past several years, many states have promulgated a new set of policies mandating minimum levels of clean energy sources in the mix of electricity generation. As a result, renewable portfolio standards (or RPS) have emerged as one of the tools of choice for policy makers seeking to foster the development of renewable energy sources.

Many states also are beginning to use RPS policies as a tool to advance distributed generation technologies, including fuel cells. These efforts are to be applauded—they represent early-stage efforts by states to create mandatory programs for "clean" distributed generation technologies. Of course, we recognize the reasonable concerns that states may have in supporting fuel cells: continued high technology costs, slower than anticipated market penetration, and the use of natural gas as a dominant fuel source among them.

While recognizing these concerns, fuel cells remain a critical component of strategies to transition to cleaner forms of distributed energy systems. In the near term, fuel cells can also provide important energy security benefits. For these and environmental reasons, we believe that states are wise to continue to seek opportunities to promote these advanced energy technologies in their early deployments.

To date, much of the attention given to implementation of RPS policies has focused on wind and central generation technologies. Now it is time to turn real attention to the challenges and opportunities facing distributed generation and fuel cells. And, as we have noted, many states are building these priorities into their existing RPS regimes.

But there are likely to be serious challenges if the RPS mechanism is the only policy approach to distributed generation. It is clear to most observers, for example, that the current state-by-state patchwork approach to RPS is creating an unanticipated set of challenges to building robust regional markets for renewable energy. Similarly, many of the basic market design features and treatment of behind-the-meter resources in RPS markets is limiting the potential of clean distributed resources to fully participate in and benefit from these new mandatory policies.

In this report, we suggest some changes to current operational procedures and regulatory frameworks, which we believe will encourage broader participation of fuel cells and distributed generation in RPS markets. Yet even if these challenges are successfully addressed, the RPS mechanism alone, relying as it does on supporting a least-cost approach to new technologies by providing a new revenue stream based on renewable energy credits (RECs), is unlikely to encourage significant fuel cell penetration.

If we are to pursue a more serious approach to fuel cell and clean distributed generation market penetration, other policy mechanisms should be considered to complement RPS policies and technology set-asides. These can be characterized as approaches to "strategic niche management"—targeted financial incentives for specific applications (notably energy security and critical facilities), mandates for minimum levels of distributed generation, executive orders, proactive evolution of existing interconnection protocols and tariff structures, to name just a few.

This report only begins to explore the complex challenges facing fuel cells and distributed generation technologies. We specifically propose several approaches to advance the deployment of stationary fuel cells within the context of RPS markets and similar policy mandates.

We hope that this report will serve to advance the debate in this area and can be integrated into other, ongoing discussions about RPS design and implementation.

### Opportunities for Distributed Generation

In this report, Clean Energy Group (CEG) examines the barriers and opportunities that exist for fuel cells (and other forms of distributed generation) to have a meaningful participation in newly created clean energy markets under renewable portfolio standards (RPS).

It is clear that RPS policies are driving significant additions of renewable energy resources, dominated by wind energy. In many respects, RPS policies have been tremendously successful in accelerating the deployment of larger-scale, lower-cost technologies that connect to transmission networks. However, while the price signal introduced by RPS may be spurring activity in many sectors, clean energy resources that operate primarily at the level of the distribution network and on the customer side of the meter still face significant barriers.

There is an opportunity to accommodate and encourage a vibrant market for distribution-oriented technologies with a comprehensive approach to policy-making and market design. RPS policies alone are not likely to achieve key technology diversity, economic development and energy security goals without recognizing and addressing the limitations of existing RPS markets.

Strategies and policies that complement mandatory renewable portfolio standards will likely be needed to fully realize the kind of portfolio diversity, economic development and energy security benefits that clean energy technologies promise.

Clearly, accelerating clean energy deployment is a key objective of public advocates, policy makers and state governments. Approximately 40% of the U.S. population resides in markets subject to RPS policies. Similarly, many states have created clean energy funds to promote technology innovation with incentives and subsidies. Successfully satisfying these policy objectives will require significant integration of distributed generation sources. Further, many of these technologies are intermittent and must therefore be carefully integrated into the electric system in order to also satisfy capacity requirements of the grid.

Our recommendations include both near-term and long-term solutions. Modifying or adjusting enabling legislation in order to achieve eligibility consistency, for example, is not likely a simple or straightforward process. However, regulatory commission rulings, executive orders and state clean energy fund action may present more near-term opportunities to advance these proposals. Many of our recommendations could lead to significant changes over the next few years.[1]

In this report, we offer some observations about current barriers that, we believe, could successfully be addressed through coordinated action by regulators, rate-setting bodies, state clean energy funds and power pool administrators.

### The Need For A Comprehensive Approach

A more comprehensive approach to policy-making and market design is needed to successfully couple the successes achieved by RPS policies for transmission-oriented technologies with opportunities now hampered at the distribution level.

Under current RPS market frameworks, there are certain de facto and operational procedures that create unintended barriers to a greater contribution from distributed resources to the RPS goals. In addition, real and significant barriers such as existing tariff structures and interconnection requirements present an even more daunting challenge for projects primarily suited for deployment within the distribution network. Fuel cells, in particular, but also other distributed generation projects such as community-scale wind energy projects, are unlikely to play a meaningful role in RPS markets as long as these issues related to distributed energy are not being addressed.

Business models to deploy solar photovoltaics and other strictly behind-the-meter resources can often accommodate a single commercial customer. They are therefore not as dependent on the distribution network for deployment as are fuel cells and community wind projects. Fuel cells may be deployed either behind the meter or connecting to the distribution network. In either case, addressing issues of tariff structures, interconnection and grid improvements will have benefits for all distributed energy technologies.

### National Implications

This report is based largely on interviews with key market participants and our own independent research into the successes and challenges of RPS markets in the Northeast United States. These states —Massachusetts, Connecticut, Rhode Island, New York, Pennsylvania, New Jersey, Maryland, Delaware and the District of Columbia—encompass the only multi-state, integrated marketplaces (NEPOOL and PJM), offering several years of operating history in RPS implementation and REC trading for compliance purposes.

The issues in the Midwest and Western United States will certainly have slightly different characters, but can also benefit from the early experiences in the Northeast. As such, addressing these issues proactively can take advantage of the tremendous learning-by-doing experience in the Northeast.

### Fuel Cells and Distributed Generation

This report was commissioned by the Clean Energy Group, in support of the Public Fuel Cell Alliance project, a coalition of state and federal agencies working together to accelerate the development and deployment of fuel cell and hydrogen infrastructure development. Accordingly, many of our recommendations focus on fuel cell technologies in the context of existing RPS markets.

## RECOMMENDATIONS

### A. Incorporate fuel cells within eligible technologies for RPS compliance

***Issue:***

Currently, there is little consensus among state policies regarding whether certain kinds of fuel cells powered by natural gas and other "non-renewable" fuels should be included within the suite of technologies considered eligible for RPS compliance purposes. It is understandable that states have reasonable concerns about supporting fuel cells: continued high technology costs, slower than anticipated market penetration, and the use of natural gas as a dominant fuel source among them. Yet, the disparity of approaches regarding eligibility is limiting the ability of RPS policies to promote advanced energy technologies such as fuel cells.

***Recommendation:***

Because they represent an advance energy technology that is a vital component of the transition to a clean energy future, fuel cells should be included as an eligible technology within current RPS markets.

At present, substantial differences remain across RPS policies with respect to the treatment of stationary fuel cells. Only a handful of states qualify fuel cells as eligible technologies without imposing renewable fuel constraints—in the Northeast notably Connecticut, Maine and New York. Most other states (including Massachusetts and Rhode Island) have included fuel cells operating on "renewable fuel" in their RPS as eligible resources. All states, we believe, would include fuel cells operating from fuels derived from renewable sources either implicitly or explicitly, making this requirement redundant. Yet, for the foreseeable future and in almost all such cases, more economical alternatives for conversion of "renewable fuels" exist, suggesting that the "renewable fuel" provision is largely irrelevant in most markets for present-day fuel cell technology.

The "renewable fuel" requirement therefore de facto excludes fuel cells from qualifying under most RPS programs in all but three New England states (including Maine, which, due to very broad technology eligibility, is in full compliance with its RPS and therefore has no practical impact on RPS markets in the Northeast.)

We believe that with their low emissions profile and advanced energy character, fuel cells have an important role to play in a sensible transition strategy for clean energy. In fact, of the clean energy technologies on the near-term horizon, fuel cells in combination with hydrogen are arguably the key reasonably foreseeable solution for storing energy from intermittent renewable resources with long-term potential to achieve significant scale. While there may be compelling reasons to distinguish fuel cells from other energy generating technologies, the inclusion of fuel cells in RPS markets should be addressed.

We believe that a fundamental pre-condition for the development of a viable market for Renewable Energy Certificates (RECs) for fuel cells in the relevant RPS states is to work towards a common acceptance of fuel cells (irrespective of fuel source) as qualifying resources under each state's RPS.

We recognize that accomplishing a universal inclusion of fuel cells may not appear feasible in the short-run. First, in many cases, any changes to eligibility status are likely to require legislative action. Second, many advocates are skeptical of including fuel cells within the suite of eligible technologies because of their near-term use of natural gas and long-term concerns about the potential to derive significant quantities of renewably derived hydrogen to power them in the future.

Still, for the first time the federal government, through the Energy Policy Act of 2005, included a tax credit for fuel cells regardless of fuel source, putting them on a par with solar and wind technologies as deserving of federal tax support. Hence, at least on the federal level, an understanding of the potential role of fuel cells in a transition towards an energy infrastructure based on renewable energy is beginning to manifest itself and should encourage individual states to move in the same direction by putting stationary fuel cells on equal footing with renewable energy sources currently included in the RPS.

Doing so and including fuel cells as eligible resources in the RPS, irrespective of fuel source, would allow fuel cells to participate in RPS markets throughout New England and thereby improve the expected revenue stream from REC sales for potential fuel

cell developers. It would also create more liquid REC markets throughout New England, with the corresponding positive impact on the incentives to build renewable energy resources throughout the region.

### B. Relax existing location and energy delivery requirements for fuel cells and clean distributed generation

***Issue:***

While most states may have largely similar eligibility requirements for renewable technologies, there are differences in requirements for location and/or delivery of the underlying electricity. These requirements create a de facto restriction on the ability of fuel cells and behind-the-meter resources to contribute to RPS compliance except in the specific states where the projects are located.

In many instances, the RPS legislations explicitly require that certain types of projects, particularly those located behind the meter and thus including many, if not all, stationary fuel cell applications, be located in state. For example, the Massachusetts RPS specifically states that behind-the-meter resources must be physically located in Massachusetts to be eligible. Similarly, the Rhode Island RPS requires behind-the-meter resources to be physically located in Rhode Island.

If no specific locational requirement is imposed, it is typically the case that some delivery requirement exists. For example, the Massachusetts RPS states that to qualify as an eligible RPS resource, generators not located in the ISO-NE control area need to demonstrate that the energy for which eligibility is sought is delivered into the ISO-NE control area.

Since the scheduling and matching of generation from distributed resources from outside the relevant control area poses in most cases insurmountable difficulties, deliverability requirements de facto exclude most distributed generation technologies not located within the region covered by the delivery requirement from participating in the RPS. For example, under the present Massachusetts RPS, fuel cells outside of the NEPOOL control area would likely not qualify even if the requirement to be physically located in Massachusetts were removed.

***Recommendation:***

Behind-the-meter resources are fundamentally dependent on their ability to offset existing load in order to be economically viable. In most cases, the scale of any excess power produced is modest to the point where transactional costs associated with applying for and functioning as wholesale generators (with the result of being able to demonstrate that at least some portion of DG generation is delivered to the grid) would erode any potential revenue from out-of-state REC sales and delivery.

While it is true that the "physical electrons" of a customer-sited generation source are more likely to be used at the customer site, the distinction between behind-the-meter and grid-connected generation resources is largely artificial. Any injection of generation or reduction in load will alter the physical flow of electrons over an integrated electric grid. Consequently, it is difficult to predict and measure to what extent such an injection or load reduction will result in more or fewer units of "renewable electrons" being delivered into a given state. A more sensible approach is to avoid delivery requirements inside a tightly integrated power grid such as NEPOOL, including adjacent areas, and qualify all eligible resources, taking care to avoid double counting of the renewable generation attributes. Most RPS policies in the Northeast allow for simplified provisions within the NEPOOL or PJM power markets, for example. Still, there are discrepancies when addressing behind-the-meter and distributed resources.

The present system of location requirements, combined with sometimes incongruous delivery requirements, splits the potential market for behind-the-meter resources in New England into several separate, and consequently much smaller, in-state markets.

A sensible strategy for addressing these issues would be to remove in-state location requirements for all eligible behind-the-meter resources including fuel cells and develop a harmonized standard for a delivery requirement into the region. Alternatively, it may be possible to dispose of the delivery requirement entirely and establish a viable system for avoiding double counting of resources located outside NEPOOL.

### C. Fully integrate distributed generation into the systems that generate and track RECs

***Issue:***

At present, distributed generation systems are not fully and electronically integrated into the systems used to create and track RECs. As a result, production data must be entered manually, creating both inefficiencies and introducing an element of uncertainty regarding the validity of the data and consequently eroding the value of the RECs.

This asymmetry consists because generation data from wholesale generation is more fully integrated into the systems for creating and tracking RECs—NEPOOL's GIS and PJM's GATS—than generation data from distributed generation resources. Specifically, generation data flow automatically from ISO-NE's and PJM's market settlement systems into GIS and GATS, whereas generation data is essentially self reported and manually entered into GIS and GATS from account holders of non-aggregated distributed generation resources.

The fact that metered generation data from distributed generation resources does not flow directly into GIS/GATS as it does for wholesale generators creates the need for an ex-post audit of RECs created from behind-the-meter resources. Consequently, the validity of RECs from such resources remains more uncertain until the time of completion of such an audit, lowering the market value and tradability of RECs from distributed generation.

***Recommendation:***

Our interviews with market participants have revealed that seemingly minor differences in treatment of distributed generation resources, including fuel cells and renewable generators, functioning as wholesale generators, can lead to a significant disadvantage of distributed generation in the REC market place. These same interviews have revealed potentially low-cost, easy to implement solutions that would allow electronic data to flow directly into REC generation tracking systems.

Given the relative size of distributed generation resources and wholesale generators, the likely financial impact of an audit revealing that fewer RECs were actually generated than originally entered in GIS or GATS would typically be small. We have nonetheless found some reluctance in buying distributed generation RECs because of this small financial risk and, more likely, the effort that would be needed to correct problems associated with invalidated RECs.[2]

Two measures are needed to create a more symmetric treatment of wholesale generators and distributed generation resources:

1. A software solution that would allow third-party entities to connect to the GIS and GATS databases in a manner analogous to the way market settlement systems now connect to these databases.

2. The tracking of partial RECs to facilitate direct creation of distributed generation RECs.

***Measure 1: Develop a software solution to allow third-party databases to connect directly to GIS/GATS***

Most, if not all, distributed generation resources of significant size are already metered directly (i.e. have a separate meter to control output). For any distributed generation resource participating in REC markets, meter data is typically captured by an energy services provider or by a market aggregator. The services provided typically include the installation and operation of a meter and meter-related services such as the collection, analysis and dissemination of meter data, maintenance and other services.[3] Some companies take ownership of the generation (and/or associated RECs) provided by small distributed generation resources and thus function as aggregators. Others choose not to take ownership and focus on providing services to the owners of distributed generation resources. In either case, the provider of these metering services collects, stores and reports metered data back to the owner of the generation resource and, in some cases, to other entities. However, the metered data is not provided directly to the GIS and/or GATS systems.

Rather, under the present GIS/GATS system, the account holder, either the owner of the distributed generation resource or an aggregator, enters most if not all DG generation data manually into the GIS and GATS databases. While the manual entry is informed by information provided by the company metering the resource, manual entry creates the ability to deliberately misrepresent the electric power output of the units concerned, in addition to the problem of simple entry errors that come with manual data entry.

The current system for creating RECs for distributed generation resources therefore involves a number of unnecessary steps and increases the risk of data inaccuracy.

The collector of meter data should be enabled to have its metered data flow directly into GIS/GATS. While a specific study to investigate the cost of developing the necessary software patches for third-party meter data to flow directly into systems like GIS and GATS would certainly be needed, interviews with various stakeholders seem to suggest that the costs of creating the necessary interfaces would be modest—perhaps as low as $20,000 and reasonably below $100,000.

Adding this software "patch" would likely solve several problems. First, it would create an analogous process to what exists at the level of approved wholesale generators; that is instantaneous generation of RECs driven by a direct data feed from meter data. Second, a direct meter feed should void the need for quarterly audits of manually entered generation data, which in turn would lead to distributed generation-based RECs being as reliable as RECs from non-distributed generation resources.

The proposed patch would not require any changes to the existing account system within GIS/GATS, nor would it need to be a requirement for all behind-the-meter facilities and distributed generation projects. But having this flexibility would be a significant improvement. Third-party metering entities would only need to be authorized by the account holders to enter information on their behalf. Access by such third-party entities could and should likely be restricted to uploading metered data for multiple accounts into the REC Tracking System. It would likely be necessary to develop standards and control procedures to ensure that such third-party entities

meet certain standards with respect to data accuracy, etc. It would, however, be much simpler to monitor what would likely be a relatively small number of third-party meter data suppliers than to monitor the growing number of individual accounts with REC eligible DG resources.

***Measure 2: Allow the tracking of partial RECs to facilitate metering integration of distributed generation resources***

GIS/GATS should be modified to allow for the tracking of partial RECs. Typical distributed generation resources are orders of magnitude smaller than wholesale generators. Consequently, distributed generation resources generate RECs at a much lower rate than qualifying wholesale generators. Under the present system, distributed generation RECs are therefore only entered into GIS/GATS if at least an entire REC, i.e. one MWh of renewable generation has been created. This process takes place manually, i.e. without any direct link between a database capturing metered data from distributed generation resources and GIS/GATS. For any direct connection of metered data from distributed generation resources and GIS/GATS to work properly, it would be very helpful to create the capacity within GIS/GATS to track partial RECs.

This change would not require the redefinition of RECs as less than a full MWh of qualifying renewable energy. It would only require that GIS/GATS be capable of tracking, through its accounts, partial RECs. Given the typical size of behind-the-meter resources, it is likely that adding one or, at most, two decimals to the tracking systems would be sufficient (assuming monthly updating of the GIS/GATS database with metered distributed generation data).

## Metering Standards and Distributed Generation

A variety of options and standards exists to meter the energy flow from distributed generation resources. The range of meters currently in use runs from advanced bidirectional meters capable of reading interval data to much less sophisticated unidirectional meters, i.e. meters that only count the electricity generated, but not the electricity consumed by a generation resource for stand-by operation or station service. There are a number of reasons why the goal should be to measure output from all renewable distributed generation resources with advanced, bidirectional interval meters. Doing so accurately measures the net generation from all types of generation by properly adjusting for the energy consumption of the generation source itself, which, for some types of renewable generation, can represent a substantial portion of output. Also, renewable generation should only receive RECs corresponding to a unit's output net of its own electricity consumption. Advanced bidirectional meters will allow a more accurate determination of distributed generation RECs.

Finally, advanced meters allow distributed generation sources to participate in and benefit from time-sensitive rate structures whenever and wherever they already exist or once they emerge. The purchase cost of advanced metering equipment remains above the cost of simple metering equipment. Prices have come down and are likely to continue to decline as the number of units sold increases. Because advanced metering of renewable distributed generation resources also has other benefits to society not captured in market prices of electricity or RECs (such as creating invaluable information about the relative performance characteristics of alternative technologies over time and a more detailed understanding of wind and/or solar power generation potential by micro-location), it may be justified to expend public funds to provide subsidies for advanced meter installment particularly in very small-scale applications.

The sum of these two measures would modify the current system of REC generation for distributed energy resources in a way that removes much, if not al,l of the existing asymmetry between distributed generation RECs and RECs created by wholesale generators. Most importantly, the direct flow of metered data into GIS/GATS would likely remove the ex post auditing requirement for distributed generation RECs created, at least within a single control area such as NEPOOL. As a result, the higher risk currently associated with distributed generation RECs would disappear, and the corresponding market value of RECs from distributed generation would increase.

### D. Develop clear and regional standards for auditing behind-the-meter resources

***Issue:***

The process of conducting ex post audits can be alleviated by our suggestion to facilitate the automation of the interface between distributed generation meter data and GIS and GATS. However, in the interim and potentially in cases where RECs are imported from other control areas, there would be a benefit to developing clear, regional standards for auditing behind-the-meter resources.

Under current market rules, there is a need to conduct ex post audits of the RECs allegedly created from DG resources. At present, most RPS systems require a regular—typically quarterly—audit of the generation information entered into GIS and GATS systems from "manually entered" accounts, which includes distributed generation resources.

***Recommendation:***

Since the process of developing the required regulatory adjustments and technological fixes suggested above may take some time, we propose that, in the meantime, states expeditiously develop common standards for the auditing of RECs created from behind-the-meter resources.

In this respect, Connecticut may offer a useful model. In a recent decision, the Connecticut Department of Public Utility Control ruled that third-party private entities can be qualified to function as auditors of distributed generation RECs and, subject to certain criteria, has moved to "approve" at least one such entity, VAEIS (now known as Fat Spaniel), as a valid third-party auditor.

The criteria developed by Connecticut could serve as a basis for developing a common standard for approving entities for auditing out-of-state and other manually entered REC data. The transparency of the auditing process would be greatly enhanced if all Northeast states moved into a similar direction and, more importantly, towards a common list of criteria to approve auditors and a similar list of such approved auditors. A possible guiding principle is that of reciprocity, where approved auditors in one participating state become automatically approved in all other participating states. For this to occur, states will have to cooperate on a mutually acceptable process and criteria for approving auditors.

There are efforts underway to create a new organization known as the North American Association of Issuing Bodies (NAAIB). Whether or not the Connecticut model proves worthy of replication in other states, the establishment of any criteria to audit RECs should be designed in collaboration and alignment with the protocols established by leading market organizations such as the NAAIB.

### E. Replicate rate-based incentives and preferential regulations for fuel cell installations

***Issue:***

Even if RPS policies are optimized for participation by fuel cell and distributed generation projects, these technologies still face significant market and regulatory barriers. Fuel cells and clean distributed generation technologies continue to be subject to unfavorable and, in many cases, discriminatory regulatory conditions. In response, many states have successfully implemented preferential policies such as standby charge exemptions, real-time pricing incentives and flexible limits for net metering. In order to fully encourage fuel cell deployment, these other barriers must also be addressed proactively.

***Recommendation:***

There are opportunities to replicate these forward-looking regulations and policies in other states. Stakeholders supporting deployment of distributed generation and fuel cells can share information from state-to-state about successes and challenges experienced and work for pro-distributed generation policies. These efforts can also be directly supported by state clean energy funds with an interest and mandate to promote emerging technologies such as fuel cells. These efforts will have a positive complementary effect on RPS markets.

***Rate Structures***

Current retail electricity rates capture poorly the potential value of renewable distributed generation resources. In particular, current rate structures fail to provide proper incentives to distributed generation based on the time-pattern of power generation of any specific generation technology and also do not provide the proper locational price signals for generation resources located behind the meter.

The typical size of stationary fuel cell projects means they likely will be installed as behind-the-meter resources of commercial or small industrial electric customers. Residential stationary fuel cell applications are also possible.

The lack of comprehensive real-time pricing tariffs, particularly in the absence of net metering options, tends to hurt certain types of renewable generation more than it will hurt stationary fuel cells (PV in particular, as PV generation tends to be positively correlated with high priced hours). On the other hand, the relative lack of locational price signals behind the meter relative to the wholesale level potentially reduces the revenue stream to a fuel cell generator located behind the meter relative to a wholesale generator and hence fails to send the proper signals for a) where to locate a fuel cell, and b) how much it is worth to locate fuel cells at a specific location.

Stationary fuel cells located behind the meter are treated as load and hence subject to retail tariffs based on wholesale market prices for load, which, at present and in New England, are not as locationally differentiated as those for wholesale generation. Rather, the tariffs of local distribution utilities (and electricity, whether or not provided by the distribution utility) will be shaped by the average electricity cost in the load zone or zones in which the relevant distribution utility is located. The savings in grid-electricity consumption that result from the installation of a stationary fuel cell will, under current tariff structures, be related to the average cost of power in the relevant load zone or distribution utility service territory, even though the specific location of a fuel cell may provide benefits to the electricity system that far exceed this average cost. For example, a load reduction in a particular location in Vermont may relieve congestion into the region and thus lower the cost of electricity to all Vermont customers,

while load reduction in another part of Vermont might actually increase congestion with the opposite effect.

It is important to recognize this asymmetry in treatment of wholesale generators and behind-the-meter distributed generation resources. While providing better locational price signals for distributed generation resources should certainly be investigated, we do not propose that the structure of wholesale electricity markets in the Northeast should be altered necessarily with the goal of providing more explicit geographic price signals for behind-the-meter resources.[4] However, there is a need and justification for targeted incentives to encourage the development of stationary fuel cells in areas, where an ideal system of market prices would provide stronger direct incentives for fuel cell development. That is, targeted incentives can make up for the non-capture of the locational value of fuel cells within the fairly well-established market systems in the Northeast.

### *Permitting*

At present, significant hurdles to fuel cell development exist due to widely varying processes for permitting and interconnecting fuel cells to the existing electric infrastructure. Recognizing that a number of issues surrounding the interconnection of distributed generation resources are recurring, IEEE has developed and issued P1547: Standard for Interconnecting Distributed Resources with Electric Power Systems. This may prove a useful standard for states to adopt in order to ensure uniform and predictable regulatory environments for distributed generation.[5]

### *Stand-by Charge Exemptions*

Another hurdle facing fuel cell projects is the imposition of stand-by charges. A stand-by charge is a fee charged by an electric utility to a customer with distributed generation for "standing by" to serve the customer when the DG unit is not operating. In many cases, the effect of this additional charge is to eliminate the cost-saving benefits of having the on-site, distributed power. This can stop fuel cell projects from moving forward.

Stand-by rates can compromise the economics of adopting distributed generation projects and, as a result, are effectively in conflict with state clean energy funds that actively support the deployment of DG. Several states, including Rhode Island, Massachusetts, New York, California and Connecticut, have exempted "clean" distributed generation from stand-by rates. In fact, legislation passed in Connecticut last year included provisions for expedited distributed generation siting and exempts customer-sided distributed generation from these stand-by charges.[6]

Proactively implementing measures to provide fuel cell projects (and other clean distributed generation) protection from what are effectively discriminatory practices will significantly help to promote new fuel cell projects.

### *Net Metering*

Finally, net metering rules have successfully provided opportunities for solar and smaller-scale behind the meter resources to be successfully deployed. Extending net metering caps to encompass projects up to 2 megawatts would provide a significant boost to proposed and upcoming fuel cell projects that might be located behind-the-meter.

In California, for example, new legislation passed in 2005 removed a repeal date for utility tariffs applying to net metered fuel cells. California's net metering law also provides protection from standby charges.[7]

### F. Promote targeted mandates and financial incentives

***Issue:***

Fuel cells, similar to many emerging energy technologies, have a difficult time competing in established, lower-cost electricity markets. A key challenge is finding applications where the attributes of the technology can provide benefits that grid-delivered commodity electricity cannot. Many potential markets have been identified for stationary fuel cells, including security applications and grid-congestion relief. However, RPS markets and REC-based revenue streams do not distinguish the application into which the technologies are deployed. As a result, RPS regimes alone are unlikely to foster a high degree of technology diversity.

Fuel cells can and likely should play a role in the future energy mix of the United States, whether as a transition technology towards a future hydrogen economy, or as a provider of power of the highest quality in certain geographic areas. RPS markets can be structured to encourage and facilitate fuel cell participation, but targeted incentives and mandates complementary to RPS policies should be developed simultaneously.

***Recommendation:***

A sensible means of promoting fuel cells is to provide specific subsidies that can target specific, high-value applications of the technology. Rather than relying solely upon across-the-board subsidies for fuel cells, a more promising avenue is to investigate and demonstrate the specific areas that stationary fuel cells are or would be the preferred alternative among competing renewable technologies if locational, time-of-day related, power safety and power quality issues were properly taken into account. This is particularly true for the use of fuel cells in security-related applications.

Several states have implemented innovative strategies to promote fuel cells in specific applications and with targeted incentives.

#### Connecticut

In 2005, the Connecticut Clean Energy Fund announced the On-Site Renewable Distributed Generation Program to support installations at commercial, industrial and institutional buildings. Most of the support in this $21 million program will target photovoltaics and fuel cell projects, favoring those projects with the potential to reduce federally mandated congestion charges; $9 million is specifically reserved for fuel cells under this solicitation.

Also in 2005, the Connecticut legislature passed a bill (HB 7501) requiring electricity providers to acquire 1% of their supply from energy efficiency and cogeneration projects of less than 65 MW starting in 2007. The requirement rises to 4% in 2010. The law also establishes a 5.5-cent per kWh penalty for noncompliance.

As part of the implementing procedures, the Department of Public Utility Control is directed to establish a program for providing capital subsidies ranging from $200-500 per kW. There are also provisions for expedited siting for distributed generation projects and exemptions for customer-sided DG projects from stand-by charges. (The exemptions require that the installed system's capacity be lower than the peak load and also that the resources be available to the system during peak periods.)

#### Michigan

In Michigan, the Public Service Commission recently approved a Detroit Edison request to include fuel cells and Stirling engines in their net metering tariffs.

### New York

In New York, the Public Service Commission established an RPS in 2004, increasing the target for renewable generation to 25% by 2013. The RPS designated a "customer-sited" tier. Under the plan, 2% of incremental load (or approximately 12 million MWh) is to be customer sited.

### Washington

Washington State passed legislation (HB 2172) requiring state buildings with uninterruptible power demands to consider fuel cells as an option. In California, proponents (particularly the California Stationary Fuel Cell Collaborative) have proposed a similar requirement that new capital projects include a consideration of fuel cells in their budgeting process.

### California

California has an existing executive order (S-20-04) that requires state buildings to reduce grid purchases of electricity by 20% by 2015. This order provides a very targeted incentive for state facilities to promote distributed generation projects as a means to achieve the order.

Many other states have implemented or are considering similar measures. This report is not intended to provide comprehensive state-by-state analysis, but rather to highlight these directives as examples of the kinds of complementary policies and directives that can drive the adoption of fuel cells and clean distributed generation.

In the absence of a system that is granular enough to discover value, incentives can be used to mimic a market that is designed with the right pricing structures. Realistically, reforming the tariff and pricing systems is a long process. However, that should not discourage the advancement of sensible actions today. There are interim steps, such as incentives targeted to high-value applications, that can help mimic a more optimal tariff structure.

In the end, targeted incentives may provide the most direct method of supporting fuel cell technologies and projects. This conclusion is based on several observations. First, specific technology set-asides within RPS regimes have complex implementation challenges. Second, there is a related risk of increased complexity as set-asides are established for each preferred technology, working against the technology-neutral ambition of most RPS policies. Under a distributed generation set-aside, for example, fuel cells may still have trouble competing against other distributed generation technologies based on current economics. Third, as we have noted before, there remains a lack of consensus regarding the status of fuel cells within the suite of "renewable" energy technologies. This could lead to resistance to include fuel cells within RPS policies that could be alleviated by these separate, but complementary, targeted incentives and mandates.

## A PROPOSED FRAMEWORK FOR ACTION

**Balancing regulatory stability and RPS enhancements.** It is important to find a balance between efforts to improve the incentives for fuel cells with the added regulatory uncertainty that these, and future changes, to legislation might represent.

There is a substantial degree of regulatory risk that is, at present, hampering the development of renewable resources, including fuel cells. That is, there is a risk that the RPS may become a continually moving target and hence expected revenue streams from renewable energy very risky and uncertain. Any efforts to improve the incentives for fuel cells or to improve the RPS system in other ways can further contribute to this regulatory uncertainty if not implemented in a proactive manner.

We therefore propose that rather than making changes "one-at–a-time," states should make an effort to carefully analyze the experience with current RPS and REC systems, solicit input from various stakeholders about possible improvements, then commit to a set of improvements through a well-defined and comprehensive approach that makes future changes easier to predict.

### RPS Implementation Framework

Concurrent with this examination, CEG has invited representatives from the Northeast states involved with RPS policies, including key state administrators and regulators, state clean energy program officials, regional ISO officials, and expert consultants to participate in discussions intended to examine specific challenges, hurdles and potential solutions to the successful implementation of RPS standards within the Northeast states and across the region. We believe this may provide a forum for joint action on many RPS implementation issues.

While RPS policies, both in Northeastern states and nationwide, have created enormous new opportunities for clean energy technologies, the patchwork approach of each state going it alone also has created RPS implementation challenges. For example, the lack of compatibility between state RPS policies hinders the ability to create a robust regional REC market, to promote efficient siting decisions, and to provide a stable regulatory system across the region to facilitate investment decisions. However, to date, there has been little systematic discussion among states about how to best capture these opportunities collectively and resolve inconsistencies between state RPS policies.

### New Opportunities

The findings in this report highlight several areas where there may be opportunities to seek harmonization between the various RPS policies and fuel cell deployment. Some solutions might be achieved only with new legislative action. But others might be addressed with regulatory approaches. Still others might be achieved with innovative new interstate agreements.

Going forward, any solutions and new strategies will be based on a greater shared understanding between the state funds, regulators, system operators and the private sector about fuel cells, RPS markets and REC trading.

A process to work toward this goal would include:

- Educating policy makers about the barriers (in many cases, unintended) of the current RPS policy patchwork

- Pursuing near-term opportunities to promote fuel cell deployment through rulemaking and regulatory actions
- Identifying working models from states with successful programs that effectively support fuel cells
- Establishing a consensus among key stakeholders to pursue long-term policy opportunities to support fuel cells

We hope that this report will serve to advance the debate in this area.

## ENDNOTES

1 The challenges of successful implementation of RPS policies and the fostering of increased liquidity in REC markets is a priority of the Clean Energy States Alliance, Clean Energy Group and other advocates of clean energy technologies. In previous reports and workshops, we have examined specific elements of eligibility, tracking, location and delivery requirements. We have not replicated those findings in this report.

Rather, this report is intended to build on these earlier investigations and discussions to identify specific recommendations that can advance opportunities for fuel cell deployment. As such, we hope that these recommendations can be incorporated into ongoing multi-state dialogues regarding RPS implementation and can serve to stimulate action-oriented discussions in other venues.

Many of these materials, including the report "Northeast RPS Compliance Markets: An Examination of Opportunities to Advance REC Trading" can be found on the Clean Energy States Alliance website at *www.cleanenergystates.org*.

2 For example, if such RECs had been sold to another entity, liquidated damages might result. Given the typical small scale of DG RECs, the legal effort of enforcing liquidated damages may far outweigh the benefits of doing so.

3 A local example of such a company is VAEIS, recently acquired by Fat Spaniel.

4 For example by either increasing the number of LMPs within a load zone, or by providing tariffs that pay rates based on the nearest wholesale generator rather than the zonal price in a specific load zone.

5 These proposed regulations are available for review at *http://grouper.ieee.org/groups/scc21/1547/1547_index.html*.

6 The full text of this legislation (HB 7501) is available for review at *http://www.cga.ct.gov*.

7 The full text of this legislation (AB 67) is available from www.leginfo.ca.gov. More information regarding standby charges is available from *www.dsireusa.org*.

**Clean Energy Group** (CEG) is a nonprofit organization established in January 1998 to increase the use of cleaner energy technologies in the U.S. and abroad through creative financing, business partnerships, public policy and advocacy.

CEG works with state and nonprofit officials from around the U.S. that are responsible for over $4 billion in new clean energy funds. CEG manages the Clean Energy States Alliance (CESA), a nonprofit organization assisting these funds in multi-state strategies. CEG also works with public officials in Europe interested in trans-Atlantic efforts to build clean energy markets.

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