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EVALUATION OF A PROPOSAL FOR GREEN POWER PRICE INSURANCE

by Rober C. Means, LL.B., S.J.D. [1]

The nascent green power market faces a constraint: customers will sign only short-term purchase contracts, yet renewable energy project developers require long-term purchase commitments to obtain financing. This paper concludes that green power "price insurance" can address this asymmetry, offering great potential to stimulate a market at a low and acceptable level of financial risk.

[1] Robert C. Means is President of USI, Inc., an energy consultancy. From 1981 to 1984 he served the Federal Energy Regulatory Commission as Director of Regulatory Analysis. With Adam Serchuk, he is co-author of *Natural Gas: Bridge to a Renewable Energy Future*, REPP Issue Brief No. 8 (College Park, MD: REPP, 1997). He can be contacted at 74357.423@compuserve.com.

A Message from the Staff of the Renewable Energy Policy Project

Not surprisingly, every analysis of the state of renewable energy seems to include a call for finance. Entrepreneurs and environmentalists alike seek sustainable growth in the renewable energy sector, and the growth medium required by all young industries is cash. Thus, many current discussions of how to stimulate renewables, especially in the context of a restructuring electric system, focus on schemes to direct money from consumers, ratepayers, taxpayers, investors and other sources to cash-hungry firms.

Yet "finance" is a vague term, and it often corresponds to an equally indeterminate notion of renewable energy. In decades past, many analysts conceived of renewable energy as an undifferentiated commodity that, when directed into the national energy system at the behest of state regulators, reduced America's dependency on foreign oil, lowered emissions of toxic pollutants, and so on. Finance for renewable energy often consisted of government grants for R&D, tax credits based on investment, and the like — in short, a flow of cash vitally necessary to keep nascent firms from starving.

In years to come, we will need to replace this macroscopic view of renewable energy as a commodity with a more precise view: renewable energy products sold by specific firms into specific markets. These may include solar shingles, green power bundled with telecommunications, geothermal heat pumps, passive solar technologies for office buildings, and so on. The possibilities may surprise us. Convergence among utility and unregulated businesses may weave renewable energy into yet uncontemplated offerings — should some entrepreneur assume the challenge of building a market for them.

In this coming world, we will need to design financial products matched to renewable energy products. In some cases the groundwork has been laid, but in most cases the financial products are as immature as the renewable energy products they mean to serve. For example, homeowners seeking to include photovoltaic systems in their mortgages can turn to several government agencies, but the process is far clunkier than obtaining an automobile loan from a private lender.

The following paper discusses a proposed mechanism for rectifying the asymmetry between retail purchasers of green power — who generally sign only short-term contracts — and renewable energy project developers — who require assurances of a long-term market to finance their endeavors. It represents the first of a planned series of papers on financial tools crafted to meet the needs of specific renewable energy products. In coming months, we will continue this series with an analysis of an "electrofinance" product bundling renewable energy and energy efficiency purchases with electric service and retirement annuities; a proposed exploration of the measures necessary to improve finance for home photovoltaic systems; and perhaps others. We hope in this way to add to the stock of ideas available to the renewable energy community in these interesting times.

Adam Serchuk, Research Director and Executive Editor of REPP's *Special Report* series
Mary Kathryn Campbell, Publications and Outreach Manager
J. Bernard Moore, Research Associate
Roby Roberts, Executive Director
Virinder Singh, Research Associate

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Executive Summary

This paper reviews a "Proposal to Establish a Green Power Insurance Initiative" developed by representatives of the renewable energy and insurance industries, financial institutions, and the U.S. Department of Energy to encourage the creation of insurance that would reduce the price risk borne by developers and marketers of "green power": electric power generated by renewable energy.

Green power has declined dramatically in price. Worldwide, a declining price has been accompanied by rapid growth, but in the United States, green power has grown only slowly. One reason is green power's continuing price disadvantage. However, the response to green power products offered by utilities and marketers has shown that many consumers are willing to pay a premium for green power that is large enough to offset the price disadvantage of some renewable energy technologies. Under existing institutions, however, this green premium does not provide an adequate basis for expanding green generating capacity. Consumers purchase green power under contracts with terms that seldom exceed one year, but the lenders who would provide capital for new capacity require assurances extending a decade or more into the future.

The proposed insurance would bridge the gap between consumers' short-term commitments and lenders' long-term concerns. A green power marketer would pay a fixed insurance premium. In return, the insurance company would bear part of the risk of a decline in the green premium. The insurance would not cover the risk of a decline in the conventional power price to which the green premium is added.

Insurance companies might someday offer green power price insurance on their own. They are unlikely to do so now. The potential market for the insurance still is small, and limited experience with green premiums would make it difficult to assess the underwriting risk. The proposal would encourage insurance companies to offer the insurance now by partially offsetting its cost with public funds. The federal government would contribute $25 million over five years, and participating states would collectively contribute an equal amount. In return, participating insurance companies would offer price insurance on an agreed amount of green generating capacity — assumed in this paper to be 1,000 megawatts. In addition, the participating states would have a preferential claim to have insurance issued on green power generating capacity located within their borders.

Part of the federal and state contribution — $5–10 million — would cover the cost of setting up the insurance. The remainder would be available to satisfy insurance claims. The total funds available for meeting claims would consist of the premiums paid by insured marketers, the remainder of the federal and state contribution, and the insurance companies' own capital. The federal and state contribution would be used only if claims could not be met from insurance premiums. Any amount not needed for that purpose would be refunded to the federal and state governments at the end of the program. The insurance companies' capital would be the final backstop, to be drawn on if insurance premiums and federal and state contributions together proved insufficient.

The paper evaluates the price insurance proposal by addressing four questions: Is it workable? What is its relationship to renewable portfolio standards? Is it cost-effective? What would be the consequences of failure?

The proposal has certain technical requirements. The insurance companies must not satisfy their obligation by insuring capacity that would have been built without the insurance. Further, it must be possible to measure the green premium, which means that it must be possible to determine the market prices for conventional and green power. These requirements may not be perfectly satisfied: some part of the insurance companies' obligations may be satisfied by insuring "build-anyway" capacity, and insurance may be effectively unavailable for some markets because the green premium cannot be measured. However, these shortcomings are unlikely to be large enough to make the proposal unworkable.

The proposal also depends on the actions of parties that would be affected by the insurance. Insurance companies must agree to offer the insurance; green power marketers must purchase the insurance that is offered and be able to manage the remaining, uninsured portion of the risk; the insurance must induce lenders to provide capital to developers on reasonable terms. Discussions with these companies indicates a strong interest in the proposal. That interest does not guarantee that the proposal would succeed in its purpose. Nevertheless, these discussions and expressions of interest do demonstrate that the proposal is realistically grounded in the industries that it would affect.

A renewable portfolio standard (RPS) requires that a certain percentage of the power sold in a jurisdiction be generated by renewable sources, or by some specified set of such sources. Portfolio standards are directed only at the demand side of the market. They create a guaranteed demand for green power, but they do not do anything to bolster the green power supply needed to meet the demand at a reasonable cost. They may even temporarily increase its cost by creating a sudden increase in demand.

EVALUATION OF A PROPOSAL FOR GREEN POWER PRICE INSURANCE

Green power price insurance would tend to compensate for these limitations. It would be available for all renewable technologies and, at least, in all major markets. It is designed to reduce the cost of green power, and it should add continuously to the growth of green power over at least the five years that the insurance companies would be required to offer the insurance.

The cost effectiveness of the proposal can be measured by comparing the additional green power likely to be generated as a result of the proposal with its cost to the federal and state governments. If 1,000 megawatts of green generating capacity is insured under the proposal, the cost per additional kilowatt-hour of green power is likely to be less than 0.1¢ — a tenth of a cent — even if the entire federal and state contribution is needed in order to meet insurance claims. If claims can be met entirely from insurance premiums, the cost is likely to be less than 0.01¢ per kilowatt-hour. For the participating states, the proposal offers the additional advantages of permitting them to achieve economies of scale in developing the insurance that they could not achieve on their own, and offering a cost-effective outlet for the portion of system benefits charge revenues that is dedicated to promoting renewable energy.

The proposal might fail because insurance companies declined to participate, or because marketers declined to purchase the insurance that was offered. In either case, under the terms of the proposal discussed in this paper, the federal and state contributions would be reduced accordingly. The failure would be disappointing, but not very costly to the governments involved.

The proposal also might fail even though insurance companies agreed to participate and marketers bought their insurance, if companies offered the insurance without government support, or if the capacity that was insured was built without the insurance. In these cases, federal and state funds would have been given for nothing.

This is unlikely to occur. It is very unlikely that insurance companies would offer similar insurance now or in the near future without some government support. It is likely that insurance companies would satisfy part of their obligations by insuring build-anyway capacity, but it is unlikely that so much of their obligation would be satisfied in this way that the proposal would have to be construed a failure.

The proposed price insurance might not reach all its goals. If it fails, however, this is unlikely to be costly to the participating governments. And the risk of failure is outweighed by the potential for creating an institutional basis for consumer-driven expansion of the green power market.

EVALUATION OF A PROPOSAL FOR GREEN POWER PRICE INSURANCE

by Robert C. Means, LL.B., S.J.D. [2]

PART I: INTRODUCTION

This paper reviews a "Proposal to Establish a Green Power Insurance Initiative" that was developed by representatives of the renewable energy and insurance industries, financial institutions, and the U.S. Department of Energy (DOE). Its purpose is to encourage the creation of insurance that would reduce the price risk borne by developers and marketers of "green power": electric power generated by renewable energy. (For a fuller definition of green power, see Box 1.) The text of the proposal and supporting documents can be found on the Web site of the Renewable Energy Alliance at <http://www.realliance.org/insurance>.

THE PROBLEM: RAPIDLY DECLINING COSTS AND STAGNANT MARKET SHARE

The cost of green power has declined dramatically. The decline has been greatest for wind and solar, but there also have been significant reductions in the cost of other renewable energy technologies. Worldwide, the cost decline has been matched by a rapid increase in green generating capacity. Similar growth has not occurred in the United States. Between 1990 and 1996, United States green generating capacity grew by only 1% annually. Wind and solar grew more rapidly, but from a tiny base. In 1996 they accounted for less than 0.3 % of generating capacity in the United States.[3]

For the United States, under existing policies, the future is projected to be a continuation of the recent past: declining costs but only slowly expanding capacity. Despite much lower costs, the market share of green power is expected to be about the same in 2010 as it was in 1990.

THE EXPLANATION: PRICE AND RISK

Part of the explanation for green power's failure — and for expectations of continuing failure — to expand its domestic market share is its continuing price disadvantage. If the price of conventional power had followed the upward course predicted in 1980, renewable energy today would be the cheapest source of power over a broad range of markets. Instead, the price of conventional power also has declined, albeit not as dramatically as that of green power. Conventional power's price advantage has been narrowed. Nevertheless, a buyer choosing power today solely on the basis of price would choose conventional power in most cases.

Box 1: Green Power

Green power is defined most broadly as power from renewable energy. That broad definition often is narrowed to exclude large hydroelectric power projects. Although the flowing water that is the source of hydroelectric power is a renewable energy source, large hydro projects may create environmental problems. In addition, the green power definition commonly is used to support emerging energy technologies, whereas large hydro is a well-established source of power.

This paper assumes that green power includes all renewable energy sources other than large hydro: wind, sun, the Earth's internal heat (geothermal energy), agricultural and other wastes (including methane from landfills), and crops raised for the purpose of generating energy (energy crops).

The definition of green power is to be distinguished from the question of what kind of products can be marketed to consumers as green power products. For retail sales, the Center for Resource Solutions has developed what it calls the Green-e standards for certifying green power products. To qualify, at least 50% of the power must be from renewable energy sources, and air emissions from the nonrenewable share must be no greater than the local average.

[2] The author wishes to thank those who reviewed early versions of this paper: George Burmeister, Ed Holt, David Hoog, Greg Kats, Ken Langer, Alan Miller, Robert Nordhaus, Jon Pietruszkiewicz, Karl Rábago, Roby Roberts, Adam Serchuk, Michael Tennis, Carl Weinberg, and Ryan Wiser. The final draft is the responsibility of the author and does not necessarily reflect the opinions of REPP, the REPP Board of Directors, or the reviewers.

[3] Percentages in this paragraph are calculated from U.S. Department of Energy (DOE), Energy Information Administration (EIA), *Renewable Energy Annual, 1995* and *1998* (Washington, D.C.). Hydroelectric power has been excluded. Green power is often considered to include power from small hydroelectric facilities, but the EIA does not publish separate data for small hydro.

Where the choice between green and conventional power has actually been offered, however, many consumers have not viewed it solely as a matter of price. Since 1993, a number of electric utilities have offered customers a choice between power produced by their conventional generating facilities and power generated by a renewable technology. Forty to 50 utilities now offer this choice, and 1–3% of their customers participate in the programs.[4]

In most states, these utility programs may offer the principal opportunity for consumer choice between green and conventional power over the next decade.[5] Within the past year, however, several states have offered consumers a broader choice of green and conventional power sources by unbundling their retail electric markets. California, Massachusetts, and Rhode Island unbundled their markets during 1998; Pennsylvania followed in early 1999.[6] Consumers in these states can purchase power from marketers rather than their traditional utility supplier.

The products offered by marketers include power generated entirely from conventional sources but also power generated partly or entirely from renewable energy and sold under brand names such as EarthSource 50 and Clean Choice 100.[7] California consumers have been slow to abandon their traditional utility suppliers, but about 40,000 — roughly half of those choosing to switch — chose green power during the first nine months of the program. In Pennsylvania, that number was exceeded in the program's first month, in part because the rules there, in comparison to those in place in California, make switching in general more attractive to electricity consumers.[8]

Experience with green power products offered by utilities and marketers has demonstrated that many consumers (compared with the currently very small green power market) are willing to pay a premium price for green power and that this green premium is greater than the cost disadvantage of some renewable energy technologies.[9] The basic elements for a growing market in green power thus now exist. There is a product that some consumers want and that can be produced at a price that some of those consumers are willing to pay. The potential market for the product will grow as additional states unbundle their retail electric markets.

Without institutional change, however, the green power market is likely to develop slowly. The market now is supplied principally by generating facilities that were built with the assurance that utilities would purchase their power. For the green power market to grow, new generating facilities must be built. In an unbundled market, utilities cannot provide an assured outlet for the facilities' power, and under existing institutions, that assurance also cannot be provided by the marketers that have replaced the utilities. The short-term contracts under which marketers sell green power to consumers cannot support the long-term financing that green power developers need in order to raise capital on reasonable terms.

There is, therefore, a very real possibility that the construction of new generating facilities will fail to meet consumers' demand for green power — not because consumers are unwilling to pay the price needed to make green power profitable today, but because their short-tern commitments cannot support the long-term financing needed to obtain capital on reasonable terms.[10]

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[4] Center for Resource Solutions, *Summary of Accomplishments of Green-e in 1998* (no date).

[5] Ibid.

[6] Litigation delayed New Hampshire's plan to unbundle its retail market at the beginning of 1999. For current state-by-state information on retail competition, see <http://eia.doe.gov/electricity/ch_str/tab5rev.html>.

[7] California marketers currently offering products that are certified under the Green-e program are listed in Appendix A.

[8] Center for Resource Solutions, op. cit. note 4.

[9] An early study of the California green power market found green premiums ranging from a little more than 2¢ to about 3¢ per kilowatt-hour (kWh) for products generated solely from renewable sources and a proportionately smaller premium for products consisting of a mixture of green and conventional power. Ryan H. Wiser and Steven J. Pickle, *Selling Green Power in California: Product, Industry, and Market Trends* (Berkeley, CA: Ernest Orlando Lawrence Berkeley National Laboratory, May 1998).

[10] For an analysis of the potential shortfall in green generating capacity, see work paper posted at <http://realliance.org/insurance.> Demand for green power presumably would be met in the sense that, in the absence of price controls, price would rise until supply and demand were in balance. However, in the absence of some mechanism for bridging the gap between consumers' short-term commitments and lenders' long-term concerns, it is not clear that a higher price would by itself elicit much additional supply.

THE PROPOSAL

This paper evaluates a proposal to bridge the gap between short-term consumer commitments and long-term financing. The means used would be insurance that would reduce the price risk borne by green power marketers.[11] The purpose of the insurance would be to give lenders the security that they require if they are to provide financing on terms that will make green power available at a reasonable cost.

At a conceptual level, the case for the proposal is straightforward. The risk borne immediately by green power marketers, and ultimately by green power developers and their lenders, would be reduced by shifting part of the risk to insurance companies in return for payment of a fixed insurance premium. The question is whether the several sides of this bargain fit together.

- Would insurance companies offer the insurance for a premium that marketers were willing to pay?
- Would the reduction in risk achieved by the insurance be great enough to induce lenders to provide funds on reasonable terms?

These are not conceptual questions but practical questions concerning the price and risk that parties are likely to accept.

In addressing these questions, I have benefited from discussions with Department of Energy personnel who have worked for more than year with representatives of interested companies in shaping the proposal reviewed here. The paper also is based partly on information provided directly by representatives of those companies. (See Appendix B for a list of persons who have directly provided information.)

At the heart of the proposal is a bargain between participating insurance companies on one side and the federal government and several states on the other. The insurance companies would offer price insurance on an agreed amount of green generating capacity. In return, the federal and state governments would contribute to the cost of developing the insurance and would share in the underwriting risk. (See Box 2 on Page 6 for the proposal's underlying assumptions.)

For the insurance companies, the proposal offers the opportunity to develop a potentially profitable new product. For green power developers and marketers, it offers the prospect of an expanded market. For the federal and state governments, it offers a cost-effective way to promote renewable energy.

PART II: THE GREEN POWER MARKET

This section discusses the green power market that has begun to develop in states that have unbundled their retail electric market: the firms and individuals that participate in it, the transactions among them, and the price risk associated with the sale of green power. That price risk is the principal obstacle to the construction of new green power generating facilities on the basis of the retail green power market.

Four types of firms and individuals participate directly or indirectly in the green power market:

- *Lenders*, who typically provide 60–70% of the funds for constructing the green power generating facilities.
- *Developers*, who build and operate the generating facilities. A developer generally specializes in one renewable energy technology. For example, Enron Wind Corporation specializes in wind; CalEnergy specializes in geothermal.
- *Marketers*, who purchase power from developers and resell it to consumers as a green power product.
- *Consumers*, who willingly pay a premium price for green power.

The participants commonly are linked by a chain of transactions. The developer borrows money from the lender and sells power to the marketer. The marketer resells the power to consumers. Variations are possible. A developer might seek equity as well as debt financing and might sell power directly to consumers; one marketer might sell power to another, who might in turn resell the power to consumers. But the structure described here — lender to developer to marketer to consumer — will serve to illustrate the dynamics of price and price risk in the green power market.

[11] For the assumption that the price risk would be borne initially by marketers, see note 18

Box 2: Assumptions Behind the Proposal

The evaluation undertaken here assumes that the proposed insurance program would have certain effects — for example, that it would encourage a certain quantity of green capacity, that it could tolerate a certain "erosion" in demand for green power, etc. The justification for these assumptions can be found in a financial spreadsheet model developed by Princeton Economic Research, Inc., for DOE and available at <http://www.realliance.org/insurance/gp_matrix.html>.

The model considers eight scenarios. Four reflect costs for renewable energy taken from the DOE Energy Information Administration's National Energy Modeling System; the other four use cost data from a collaborative report of DOE and the Electric Power Research Institute.[12]

The scenarios vary in three respects:

- the difference in the cost of conventional and green power, or the "green premium";
- the amount the insurance policy would pay out per kilowatt-hour; and
- the installed capacity of renewable energy projects supported: 500 or 1,000 megawatts (MW).

In addition, the eight scenarios shared common assumptions concerning program design, including:

- a coverage period of 10 years, corresponding to debt payments;
- an annual insurance premium paid by green marketers of 3% of maximum annual coverage, equivalent to 0.3 mills per 1¢ of coverage;[13]
- state and federal subsidies totaling $50 million, invested in a level fashion over a five-year period; and
- a yield of 6% from investing these subsidies plus earnings from premiums paid by policyholders.

For each scenario, the model calculates the annual "erosion rate" of the green power market that a fixed amount of new capacity can support. For example, in a scenario specifying 1,000 MW of capacity, the model determines that the insurance can support 6.2% annual erosion. This can be interpreted to mean either that 6.2% of all customers decline to renew their green power contracts each year, or that the green premium falls an average of 6.2% annually. In this scenario, 1,000 MW can be supported even if 6.2% of all customers leave the program each year. At the end of 15 years, however, green marketers' claims would have completely depleted the $50-million subsidy.

Thus, if the actual erosion rate were less than 6.2%, the program either could support more than 1,000 MW of new capacity, or could support 1,000 MW while returning a surplus to the federal and state treasuries. On the other hand, if the erosion rate were higher than 6.2%, the program would be able to support less than 1,000 MW, or it could support 1,000 MW with a negative balance, presumably underwritten by the private insurance carrier.

[12] DOE and Electric Power Research Institute, *Renewable Energy Technology Characterizations*, EPRI TR-109468 (Washington, DC: December 1997).

[13] This differs from the premium assumed for this evaluation, which is 0.05 cents per annual kilowatt-hour of coverage.

The dynamics of price and price risk are heavily influenced by the capital-intensive nature of renewable energy.[14] Its capital intensity means that its cost is significantly affected by the terms on which lenders provide funds.[15] Low-cost power requires a reasonable interest rate and amortization term.

To obtain a reasonable rate of interest, the developer must offer firm assurances that principal and interest will be paid. To obtain a reasonable amortization term, the assurance must extend sufficiently far into the future. Most developers cannot themselves provide that assurance: their assets are too small. Any assurances must principally rest on expectations regarding the price at which the developer can resell its power. Those expectations largely determine the terms on which the developer can borrow money.

Some of the contracts under which developers sold green power to utilities provided the assurances needed for low-cost financing. Under retail unbundling, however, utilities may no longer purchase power. Instead, it would be purchased by power marketers. Green power marketers are unlikely to sign long-term power purchase agreements; even if they did, the assurances of future income nominally given by the agreements would not be credible to lenders.

One reason for green marketers' presumed reluctance to sign long-term purchase agreements is the nature of the contracts under which they in turn resell power to consumers. The term of the contracts rarely exceeds two years and generally is one year or less. This does not mean that most consumers abandon a marketer in a year or two. A marketer may reasonably expect to retain a consumer for several years on average, and that expectation might in turn support a power purchase agreement term as long as five years. It would not, however, support the 10-year power purchase agreement that is considered necessary in order to obtain financing on reasonable terms.[16]

A power purchase agreement of that length must be supported by revenues from new customers. Getting new customers is not the problem; if all else fails, a marketer can resell the power into the conventional power spot market — or the running market for short-term power sales. The problem is getting new customers who will pay a price that permits the marketer to meet its obligations to the developer. Existing customers may stick with a marketer out of loyalty or inertia. To gain new customers, the marketer is likely to be forced to meet the prevailing green power market price. The fundamental risk faced by the marketer is that this market price will decline.

The retail market price for green power can be thought of as having two parts: the retail price of the conventional power with which green power competes, and the retail green premium that some consumers are willing to pay because the power is green. The green power market price might decline because of a decline in either the price of conventional power or the green premium.

There is nothing exceptional about the risk of a decline in the price of conventional power. It is borne by marketers of both conventional and green power. The risk of a decline in the green premium is unique to green power, and it is that risk that would be reduced by green power price insurance.

The risk has two sources. One is uncertainty regarding the future demand for green power. That demand depends on consumer attitudes — the number of customers willing to pay a premium price for green power and the size of the premium they are willing to pay. It also depends on the rules that permit customers to choose between green and conventional power. Neither future attitudes nor future rules are certain.

The other source of risk is the continuing decline in the cost of the renewable energy technologies used to generate green power. In a market that is competitive and expanding, price generally is determined by the cost of the newest facilities.[17] If the cost of green generating facilities declines, the market price of green power will decline as well.

These factors create a price risk for green power that is greater than the one borne by developers and marketers of conventional power. The next section discusses the proposal to use insurance to reduce that risk.

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[14] See R. Wiser and E. Kahn, *Alternative Windpower Ownership Structures: Financing Terms and Project Cost* (Berkeley, CA: Lawrence Berkeley Laboratory, Energy and Environment Division, May 1996).

[15] Ibid. The authors found that the cost of wind power could be reduced by as much as 29% if developers could raise capital on the same terms as electric utilities.

[16] An assurance of an adequate flow of income for 10 years can support a loan amortization term longer than 10 years. Loan service after 10 years is of less concern to a lender because part of the loan will have been amortized by then and because the cost of competing conventional power is expected to have increased, at least in nominal terms.

[17] This will not necessarily be true if the market has excess green generating capacity. Until the excess is absorbed by growth in demand, the market price for green power may be too low for even the most efficient new generating facility to be profitable. This situation may now exist in some states where substantial amounts of green generating capacity were built on the basis of power purchase agreements with utilities.

PART III: GREEN POWER PRICE INSURANCE

For the reasons just discussed, the willingness of consumers to pay a premium for green power does not provide an adequate basis for the development of new green generating capacity — partly because the contracts under which consumers purchase green power are too short, but principally because the risk of a decline in the market price of green power is too great.

In theory, a green power marketer could protect itself against price risk by selling to consumers under long-term contracts, but a marketer that insisted on a 10-year commitment in the freewheeling world of unbundled retail electric markets would be unlikely to succeed.[18] The long-term assurances that are needed in order for green power developers to obtain loans on reasonable terms therefore depend on reducing the market price risk by other means.

Green power price insurance can offer such a means. In its rationale and essential elements, the insurance would not differ from insurance against the risks of fire or storm. The insurance would replace part of the risk — in this case, the risk of a decline in the green premium — with a fixed insurance premium.

Over the long run, offering green power price insurance may be an attractive business prospect. Insurance companies do not regard it this way today, however. The potential market for the insurance now is very small. It is limited by the market for green power itself, which can exist only where consumers are able to choose among conventional and green power products. By the end of 1999, retail unbundling will offer that choice in at least five states. Under existing legislation, the choice is expected to be offered in only about a quarter of the states by 2005.[19]

Even these figures may overstate the potential near-term size of the green market. Retail unbundling gives consumers a choice, but the market for both green and conventional marketers depends on consumers exercising that choice. In California, there are indications that green power has captured a large share — perhaps half the total — of the market among consumers who have opted to leave their incumbent utility provider for some other power marketer. But the overwhelming majority of electricity consumers in California have so far not selected any marketer, conventional or green; they are still served by their traditional utility supplier. California may not be representative; Pennsylvanians, enticed by a "shoppers' credit" for those who switch, have been quicker to do so.[20] However, it serves to point up one of the uncertainties that would confront a company contemplating the launch of a green power price insurance product.

A further uncertainty would be the underwriting risk that the company would assume. Here an analogy to life insurance may be helpful. A healthy 75-year-old male may or may not die during the next year; in this sense, the uncertainty is 100%. If one considers 10,000 such males, however, the percentage that will die over that period can be predicted within a relatively narrow range. It is this relative statistical certainty that permits life insurance companies to set their premiums. The relative certainty rests on two bases: actuarial experience that is broad-based and long, and the statistical independence of the individual insured events.

Neither base would exist now for the risk of a decline in green premiums. Experience with the premiums is narrow and short. The individual risks also are independent of one another. Factors such as a shift in public attitudes that would reduce the green premium covered by one policy would be likely to reduce the green premiums covered by other policies as well.

The green power market will grow; experience will provide a firmer basis for estimating underwriting risks. It is possible or even likely that an insurance company would someday offer green power price insurance without government support, but it is impossible to predict when that day might arrive . The purpose of the green power price insurance proposal is to make the insurance available now.

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[18] A marketer could also protect itself by purchasing its power under short-term contracts or contracts with market-responsive price clauses. Such measures would not reduce the price risk, but would shift it upstream to the developer, who would therefore be the potential purchaser of the price insurance. For this paper, it is assumed that the marketer purchases power under a long-term contract (or, at least, not at a market-responsive price). On that assumption, the marketer would purchase the insurance.

[19] The projection of green power demand underlying the proposal reviewed in this paper assumed that 14 states would unbundle their retail electric markets by the end of 2005. See DOE, *Green Power Consumer Demand: 2000-2005* (n.d.), posted at <http://www.realliance.org/insurance>.

[20] Some observers have suggested that the failure of California consumers to embrace the conventional and green power choices offered to them is due to the terms under which the California retail market was unbundled. One of those terms required utilities to give their customers a temporary 10% reduction in rates. This provision has raised the bar for a marketer seeking to attract customers from the utilities. It appears that residential consumers have been slow to abandon traditional utility suppliers in Massachusetts and Rhode Island for similar reasons. See source noted in note 4.

The Insurance Policy

In the proposal under discussion here, a green marketer would take out a price insurance policy before it entered into a power purchase agreement, and the insurance would apply to the power purchased under that agreement.[21] The insured risk would be a decline in the wholesale green premium — the difference between the wholesale market prices of green and conventional power.

For illustration, assume that the insurance would cover a 2.5¢ decline in the green premium. A decline of that magnitude would represent a nearly total elimination of the current green premium.[22] The insurance would not compensate a marketer for all of the decline. It would be subject to a deductible and would pay only part of the decline in excess of the deductible. It will be assumed here that the deductible is 0.5¢ and that the insurance would compensate the marketer for 50 % of the decline in excess of the deductible.

For the insurance, the marketer would pay a premium based on the annual amount of green power sales covered by the policy. The level of the premium would be set in negotiations with insurance companies that wished to participate in the program. It will be assumed here that the premium would be 0.05¢ per kilowatt-hour (kWh) of coverage.

To use a more specific example, say that on January 1, 2001, a marketer enters into a 10-year power purchase agreement for one-fourth of the output of a 40-megawatt wind power generating facility. At the facility's expected load factor, the marketer would be obligated to purchase 25 million kWh annually. Before the marketer committed itself to the purchase, it took out green power price insurance in that amount. At an insurance premium of 0.05¢/kWh the marketer's annual premium is $12,500.

The wholesale green premium on January 1, 2001 is 3.0¢ and it remains above 2.5¢ through 2003. Since the insurance has a 0.5¢ deductible, the marketer has no claim under the insurance for this period. During 2004, however, the premium falls to 1.0¢ — that is, 2.0¢ cents below its level when the marketer took out the insurance. The decline therefore exceeds the insurance deductible.

For the marketer to have an insurance claim, however, it must suffer a loss as a result of a decline in the green premium. In this case, the decline indeed causes the marketer a corresponding loss. To meet competition based on the new lower wholesale green power price, the marketer also reduces its resale price by 2.0¢.[23] Thus there has been a decline on the wholesale green premium that exceeds the deductible, and that decline has resulted in a loss to the marketer. The marketer therefore files a claim for $187,500 under the insurance policy to offset part of its loss:

(2.0¢ loss – 0.5¢ deductible) *X* 50% coverage *X* 25 million kWh = $187,500.

As the example illustrates, claims under the insurance depend on two events. One is a decline in the wholesale green premium; the other is an economic loss to the marketer. The marketer in the example would have had no claim if it had been able to maintain its retail sales price without losing sales. The marketer also would have had no claim if it had suffered an economic loss when there was no decline in the green premium.[24]

Commitments of the Parties

Insurance Companies

The minimum amount of insurance to be offered would be established in negotiations with the interested insurance companies. Based on the discussions that led to the proposal reviewed here, a reasonable estimate of the likely result of those negotiations is an obligation to offer insurance on 1,000 to 1,500 megawatts of green capacity. (For explanation of this point, see Box 2.) The analysis in this paper assumes an obligation of 1,000 megawatts.

The insurance companies would be required to offer the insurance during a five-year period, which is assumed to begin in 2000. The policies would remain in force for at least 10 years. From the initial offering of insurance to the expiration of the last policy, the program thus would last at least 15 years.

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[21] See note 18.

[22] See note 9.

[23] The marketer might decide to maintain its retail price at least temporarily. Its failure to meet competition would tend to result in a loss of sales that would leave the marketer with excess power under its power purchase agreements. The marketer generally could sell the excess power in the spot market, but at a lower price. Its loss then would be based on an average of its (unchanged) retail price and its (lower) spot market price.

[24] The latter might occur because there was a decline in the price of *conventional* power: although the wholesale green premium was unchanged, the market price of green power could decline because the premium was being added to a lower base. It would, of course, be possible to create insurance that protected green marketers against the risk of a decline in the wholesale price of green power, and not just against a decline in the green premium component of that price. However, the risk of a decline in the other component — the price of conventional power — is one that is borne by green and conventional marketers alike. Only the risk of a decline in the green premium is unique to green marketers, and only that risk would be insured under the proposal evaluated here.

These obligations are minimum requirements. The companies could insure additional green capacity. They also could continue to offer new insurance after 2005 and could offer insurance for terms longer than 10 years. Indeed, the companies are likely to do all of these things if the insurance is successful. For the analysis in the paper, however, it is assumed that the companies fulfill only their minimum obligations.

Federal and State Governments

Under the proposal, the federal government would contribute $5 million annually for a five-year period that would coincide with the period during which the insurance was being offered, and the participating states would collectively contribute an equal amount. The total contribution of the federal and state government thus would be $50 million.

This does not mean that the governments necessarily would have spent $50 million at the end of the program. Their contribution would be contingent on the insurance companies actually insuring the agreed amount of capacity. If the insured capacity fell short of the agreed amount, the federal and state commitment would be reduced accordingly. For instance, if the companies agreed to insure 1,000 megawatts of capacity but only 500 MW were actually insured, the commitment would be reduced by $25 million.

In addition, part of their contribution would be subject to potential refund. The governments' contribution would be divided into two parts. One would be a non-refundable fee paid to the participating insurance companies to cover part of the cost of setting up and administering the insurance. This probably would be a relatively small part of the total. For the analysis in this paper, it is assumed to be $5–10 million.

The remainder — $40–45 million — would be available to meet insurance claims. Depending on the magnitude of those claims, some or all of this part of the federal and state contribution might be refunded at the end of the program.

The total funds available for meeting claims would consist of three layers:

- The first would be the insurance premiums paid by marketers. At a premium of 0.05¢ per kWh, these premiums might total some $25 million over the life of the program — comparable to the contribution of the federal government or the aggregate contribution of the participating states.[25]
- The second layer would consist of $40–45 million from the funds that had been paid in by the federal and state governments. This would be drawn on to the extent that claims could not be satisfied from insurance premiums. To the extent it had not been drawn on by the end of the program, it would be refunded to the federal and state governments.
- The third layer would be the capital of the participating insurance companies. This would be used to satisfy claims that could not be satisfied from the first two layers. The insurance companies' theoretical exposure for claims runs to hundreds of millions of dollars.[26] The likelihood that they would be required to pay more than a small fraction of that amount is very small. However, an insurance policy must be backed by funds sufficient to pay unlikely claims as well as likely ones. The insurance companies' capital would provide the funds needed for this purpose and would make it possible to place a strict upper limit on the contribution of the federal and state governments.

Participating States' Preference

Half of the $50 million would be committed by several states. In return for its commitment, a state would have a preferential claim on a pro rata share of the insurance. If the agreed capacity to be insured was 1,000 megawatts, a state that committed $5 million to the program — $1 million annually — would have a preferential claim to insurance on 100 megawatts of green power capacity located within its borders.

PART IV: EVALUATION OF THE PROPOSAL

To evaluate this proposal, four questions need to be addressed: Is the proposal workable? What is its relationship to proposed renewable portfolio standards? Is the proposal a cost-effective way to encourage the growth of green power? What would be the consequences of failure?

The last question merits emphasis. Policy initiatives by definition break new ground, and in most cases their success depends on the not entirely predictable reaction of affected parties. Complete success rarely is assured, and failure is almost always a possibility. All these things are true of the green power price insurance proposal. As discussed below, a major attraction of the proposal is that it offers a strong possibility of encouraging the growth of green power in a highly cost-

[25] This assumes that the premium would be paid on annual green power sales of 4.8 billion kWh over a 10-year period. For the basis for the latter assumption, see Appendix C.

[26] The maximum payout of 1¢ per kWh on annual sales of 4.8 billion kWh would be $48 million per year.

effective way. However, a further attraction is that its cost to the federal government and the participating states is closely linked to its success. A failure or limited success would be disappointing, but would be unlikely to cost very much.

QUESTION 1: IS THE PROPOSAL WORKABLE?

Technical Requirements

The insurance program has two important technical requirements. First, there must be a means to measure changes in the wholesale green premium that is verifiable and that adequately captures the price risk borne by green power marketers. Second, the required insurance coverage must not be dissipated on generating capacity that would have been built without the insurance.

Green power price insurance depends on measuring changes in the wholesale green premium. It therefore depends on measuring the wholesale prices of green and conventional power. One alternative for measuring prices would be to use published spot market prices. Such prices exist for conventional power, and the Automatic Power Exchange (APX) now offers spot prices for California green power. APX currently is expanding its operations to other states and also plans to provide separate price quotations for different renewable energy technologies.

Published spot prices offer the advantages of objectivity and public accessibility. There are two questions. First, will the prices continue to be available? The answer is very probably yes. A green power spot market performs a useful role in reducing transaction costs and price risks. In one form or another, it is likely to continue. The second and more difficult question is, would changes in the spread between spot market prices of conventional and green power adequately capture the price risk borne by green power marketers? This question ultimately can be answered only by the marketers themselves, and the answer may not be the same for every green power market. The green power market may be disaggregated by geography, technology, and consumer preference.[27] Changes in published spot prices might adequately represent the price risk in some markets but not in others.[28]

Where published spot prices do not adequately capture the risk, either some alternative must be found or the price risk in those markets will be effectively uninsurable. Probably the strongest assurance that an alternative will be found for major markets is that without its resolution, the insurance companies would have no product to sell.[29] There may be a greater risk that no satisfactory alternative would be developed for some smaller markets.

The Energy Information Agency projects that 1240 megawatts of green generating capacity will be added between 2000 and 2005 under existing policies.[30] Insuring this "build-anyway" capacity would add nothing to the supply of green power.

The issue is not, it should be emphasized, whether the companies should be permitted to insure capacity that might be built without the insurance. Clearly they should. The issue is whether insuring that capacity should satisfy the companies' obligations under their bargain with the federal and state governments. Ideally, the answer would simply be "no." To make that answer completely effective, however, would require precisely identifying the build-anyway capacity. That is not a realistic possibility. A more realistic goal is to identify it with sufficient accuracy that insuring it does not satisfy a large share of the insurance companies' obligation.

A major step toward that goal would be to exclude capacity built in response to state or federal mandates. This is capacity from which a utility is required to purchase power, or will at least be permitted to recover the cost of the power through its general rates. Such capacity is projected to make up most of the green generating capacity built under existing policies.[31]

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[27] The market price of green power in two states may differ by the cost of moving power from one state to the other. Market prices may also differ because of the different characteristics of the power produced by different technologies. In general, the market price will be higher for dispatchable green power — those forms that can supply energy on demand — than for intermittent varieties such as solar or wind. A price difference may also emerge based on consumer preference for one form over another. For example, if consumers prefer solar power to power generated from municipal solid waste, solar power will enjoy a price advantage.

[28] The fact that no price index is published for a particular state does not necessarily mean that changes in a published price cannot adequately measure the price risk in that state. Suppose, for example, that an index is published for Massachusetts but not for New Hampshire. The green premium in the two states may be different. However, if there are green power sales between the two states, their green power market prices will be linked, and New Hampshire marketers may consider that changes in the Massachusetts price adequately measures the New Hampshire price risk.

[29] The alternative is likely to involve information from actual power purchase agreements. For such information to be used, problems of confidentiality would have to be resolved.

[30] DOE, *Annual Energy Outlook 1998,* Table A-17, p. 122.

[31] See Gregory Kats and Kenneth Langer, *Green Power Finance Initiative: Executive Summary* (draft) (August 26, 1998). The authors state that mandated capacity accounts for "the bulk" of the capacity projected to be added between 2000 and 2005 under existing conditions.

Additional "build-anyway" projects can be excluded by the premium that is charged for the green power price insurance. Almost by definition, build-anyway capacity would generally be the least risky capacity. For the problem at hand, this fact is a two-edged sword. It means that the capacity would be the most attractive market for the insurance companies, since its relatively low risk reduces the likelihood that they would be required to dip into their own capital to meet claims. But it also means that the projects' developers are likely to see less need for the insurance. A realistic premium thus would tend to exclude projects that have little need for the insurance. It is of course not certain at this point what a realistic insurance premium would be. As noted earlier, that is one of the reasons that government support is needed. The practical point to be made, therefore, is that in the negotiations with insurance companies, the federal and state governments should be at least as concerned with not setting the insurance premium too low as with not setting it too high.[32]

Even with exclusion of mandated projects and a realistic insurance premium, some part of the insurance companies' obligations may be satisfied by build-anyway capacity. But the part satisfied in this way is unlikely to be large enough to affect the conclusion that the price insurance is a cost-effective way to encourage the development of green power.[33]

Basic Assumptions

The green power price insurance proposal rests on assumptions regarding the actions of the firms and individuals involved in the green power market:

- Insurance companies will agree to offer insurance on at least 1,000 megawatts of green power generating capacity;
- green power marketers will purchase the insurance that is offered and will be able to manage the remaining, uninsured portion of the risk; and,
- based on the insurance, lenders will provide developers with capital on reasonable terms.

These assumptions are supported by the process the has shaped the proposal. That process has involved a year of discussions with representatives of the companies that would be directly or indirectly interested in the insurance. In those discussions, a number of companies have stated a strong interest in participating by offering insurance or buying it.[34]

Those expressions of interest do not guarantee that insurance companies will sign on to a specific proposal, or that marketers will buy the policies that the companies offer. Companies on both sides will, as one party put it, have to "crunch the numbers." What the discussions and expressions of interest do indicate is that the proposal is realistically grounded in the industries that it would affect.

Question 2: What is the Proposal's Relationship to Renewable Portfolio Standards?

A renewable portfolio standard (RPS) requires that a certain percentage of the power sold in a jurisdiction be generated by renewable sources, or by some specified set of such sources. Standards setting various percentages and applying to various kinds of renewable energy have been adopted by six states,[35] although in all cases with an effective date set some time in the future. An RPS also is included in some, but not all, proposed federal electric restructuring legislation.

By themselves, these portfolio standards have two significant limitations. One is their coverage. The existing standards cover only a few states, and where they do exist, they do not cover all renewable technologies. A federal RPS would have broader coverage, but there is no assurance that federal restructuring legislation will be adopted or, if it is adopted, that it will include an RPS.

The second limitation is that an RPS is directed only at the demand side of the market. It establishes a demand for green power. It does not do anything to bring forth the supply of green power needed to meet that demand at a reasonable cost.

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[32] One implication of this point should be noted. The insurance premium set in those negotiations would be a floor as well as a ceiling. It is possible that insurance companies will consider that there are prospects that would not pay the agreed insurance premium because they are low risk but could profitably be insured at a lower premium for the same reason. The companies should be free to pursue those prospects by offering a reduced premium. However, counting the insurance sold at the lower premium against the companies' obligations would run the risk of directing more of the insurance to capacity that would have been built without it.

[33] See note 31. For purposes of the calculation of the cost effectiveness of the proposed price insurance in Appendix C, it is assumed that 25% of the projected "build-anyway" capacity (310 megawatts) would take insurance that would count against the insurance companies' obligations. That appears to be a conservative assumption, but even a significantly higher one — say 30 or 40% — would not affect the basic conclusion.

[34] Industry participants in the discussions and companies indicating an interest in offering or buying the insurance are listed in Appendix D.

[35] Arizona, Connecticut, Maine, Massachusetts, Nevada, and New Jersey.

This problem may be aggravated by the discontinuous nature of the demand created by an RPS. Immediately before an RPS goes into effect, demand for green power rests on consumer preferences; it then rises immediately to the level established by the RPS.

Green power price insurance would tend to compensate for these limitations. It would be available for all renewable technologies and at least in all major markets. It is designed to reduce the cost of green power, and it should add continuously to the growth of green power over at least the five years that the insurance companies would be required to offer the insurance.[36]

Question 3: Is the Proposal Cost Effective?

In General

The cost effectiveness of the proposal can be measured by comparing the additional amount of green power likely to be generated with the amount of federal and state funds expended. It is assumed here that least 1,000 MW of green generating capacity would be insured and that 310 megawatts of that is build-anyway capacity. On these assumptions, the program would result in the construction of 690 MW of additional green generating capacity. At a projected 55% load factor, that additional capacity would generate 67 billion kilowatt-hours of green power over a 20-year period — green power that would not have been produced without the insurance . (The load factor is calculated from projected capacity and power production in documents supporting this proposal, posted at <http://www.realliance.org/insurance>; other assumptions and their bases are set out in Appendix C.)

As discussed earlier, it is assumed $5–10 million of the $50 million contribution of the federal and state governments is paid to the insurance companies as a fee and that the remaining $40–45 million is held by the insurance companies to meet insurance claims in excess of premiums. All of the latter amount would be refunded to the federal and state governments if claims could be satisfied from the premiums on the insurance.

The total long-run cost of the program to the federal and state governments thus would be between $5 million and $50 million. At the upper end of this range, the cost would be equal to less than 0.1¢ for each additional kilowatt-hour of green power generated as a result of the program; at the lower end, it would be equal to less than 0.01¢ per kilowatt hour.[37]

These amounts are small because federal and state funds would cover only a small part of the cost of the green power. Most of the cost — perhaps 99 % — would be borne by consumers who wished to purchase green power and were willing to pay a premium price for it. The federal and state contribution is critical; without it, there probably would be no insurance until some unknown future time, and without the insurance, much of the capacity probably would not be built. But its role is that of a catalyst, not a major source of funds.

For Participating States

As already noted, the amount of in-state green power capacity preferentially insured would be proportional to a state's share of the total commitment. The above calculation of the overall ratio of benefits to costs therefore would be approximately applicable to each participating state.[38]

There are, in addition, two arguments for the proposal's cost effectiveness that are relevant to the participating states in particular. The first is that the program would permit a state to achieve economies of scale in developing the insurance that it could not achieve on its own. The second reason relates to the system benefits charge — a charge levied on all electric sales by some states that are unbundling their retail electric markets.

The system benefits charge is used to fund activities that previously were supported through utility regulation. In some cases, those activities include discounted rates for poor customers and funding for energy conservation programs. They also can include promoting renewable energy.

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[36] Under a renewable portfolio standard (RPS), the additional amount paid by each consumer is small — much smaller than the green premium paid by consumers who purchase green power in an unbundled retail market. However, this is because under an RPS, the additional cost of the green power is spread over all of the electricity consumers in the jurisdiction. It is not because the total cost of the green power is lower. Note that proponents of the insurance proposal hope that the companies would find it profitable to continue to offer the insurance after their obligation had been satisfied.

[37] The cost per kWh is calculated in Appendix C.

[38] The ratio for an individual state might differ from the overall ratio because a higher or lower percentage of the insured capacity in the state would have been constructed in any event, or because its load factor was higher or lower than the overall average.

The system benefits charge therefore poses the question of cost effectiveness in a concrete form: How can the state achieve the largest impact on renewable energy with the funds that the charge generates for that purpose? Under that criterion, participation in the price insurance program should rank at or near the top of the list of alternatives available to a state.

Question 4: What Would be the Consequences of Failure?

The proposal might fail in various ways. Most obviously, it might fail because little or no capacity was insured. This might occur because insurance companies declined to participate in the program, or because marketers declined to purchase the insurance that was offered. In either case, under the terms of the proposal discussed here, the contribution of the federal and state governments would be reduced accordingly.

There also is another kind of potential, "invisible" failure. In this case, insurance companies participate and marketers buy their insurance. The federal and state governments therefore make their agreed contribution. Despite this activity, however, the proposal, in fact, accomplishes nothing. Companies would have offered similar insurance without the government support, or the capacity that was insured would have been built without the insurance. The proposal in fact would have accomplished nothing.

This kind of invisible failure is the downside of the proposal because it involves the contribution of federal and state funds in return for nothing. It is unlikely to occur, however. Insurance companies have said that they would not offer the green power price insurance at this time without some government support. They give plausible reasons for that position. However, the strongest reason for accepting the companies' statements is that to reject them would imply that the companies are acting collusively to stay out of a profitable market in order to obtain government support under a program that has not yet been adopted — a far-fetched supposition.

On the other hand, it is likely that insurance companies would satisfy some part of their obligations by insuring capacity that would have been built without the insurance. The question is whether so much of their obligation would be satisfied in this way that the proposal would have to be counted a failure. As discussed earlier, that seems unlikely if mandated capacity is excluded and a reasonable premium is charged.

The proposed price insurance might not reach all its goals. If it fails, however, this is unlikely to be costly to the participating governments. And the risk of failure is outweighed by the potential for creating an institutional basis for consumer-driven expansion of the green power market.

Appendix A: Marketers Currently Offering Green Power Products in California

The following organizations were reported to be offering renewable-energy-based products at the beginning of 1999. Not all the listed organizations had received Green-e certification.

Automated Power Exchange
Bonneville Power Administration
Clean n' Green
Commonwealth Energy Corp.
Eagle Power
Edison Enterprises
Enron
Foresight Energy Company
Friendly Power and Gas
Green Mountain
Energy Resources
International Energy Ventures Inc.
Keystone Energy Services
New West Energy
Omni Electric Company
PowerSource
PacifiCorp
Powercom Energy &
Communications Access Inc.
PGE Energy
Sacramento Municipal Utility District

Appendix B. Industry Representatives Provided Information for this Paper

The following individuals provided information directly for this research. This list does not include individuals who providing information for the Green Power Price Insurance proposal.

- John Corcoran, Hedge Financial Products
- Jan Hamrin, Center for Resource Solutions
- David Hoog, Cigna Insurance
- Curt Maloy, Worldlink Insurance
- Peter Mandelstam, President; Arcadia Windpower
- Eric Miller, Foresight Energy Company
- Jan Pepper, Automated Power Exchange
- Michael Tennis, Allenergy
- Jonathan Weisgall, California Energy Company

Appendix C. Cost Effectiveness of the Green Power Price Insurance Proposal

The bases for the calculation of the cost-effectiveness of the proposal are set out in the following table:

	Factor	Assumption	Basis
1	Insured capacity (MW)	1,000	Assumed terms of agreement with participating insurance companies
2	Load factor of capacity	55%	DOE projection
3	Annual green power (kWh)	4.8 billion	Calculated from 1 and 2
4	Insured capacity not needing insurance (MW)	310	See text discussion
5	Capacity added by insurance (MW)	690	Calculated from 1 and 4
6	Annual additional green power (kWh)	3.3 billion	Calculated from 5
7	Useful economic life of generating facilities	20 years	Conservative assumption for useful economic life.[a]
8	Additional green power in 20 years (kWh)	67 billion	Calculated from 6 and 7
9	Maximum total cost to governments	$50 million	Green power price insurance proposal
10	Maximum cost per additional green kWh	$0.0007	Calculated from 8 and 9
11	Minimum total cost to governments	$5 million	Green power price insurance proposal
12	Minimum cost per additional green kWh	$0.00007	Calculated from 8 and 11

[a] The 20-year assumption in fact embodies two assumptions about the impact of the proposal: that the average economic life of the insured facilities would be at least 20 years (a conservative assumption), and that the facilities will continue to be additional capacity over the 20-year period. The issue involved in the second assumption is whether the additional capacity built as a result of the insurance program is merely "borrowed" from future construction. Suppose that capacity that would have been built in, say, six years was instead built now as a result of the availability of green power price insurance. The insurance then would add to green generating capacity but would do so only for a six-year period and not for the full economic life of the facilities. The analysis in this paper assumes that the construction is not borrowed from the future in this sense. For at least 20 years, the insurance is assumed to shift the growth of green generating capacity to a higher trend line.

Appendix D. Companies Participating in Discussions Leading to Proposal and Companies Interested in Offering or Buying the Proposed Insurance

According to information supplied by Gregory Kats and Kenneth Langer of the U.S. Department of Energy, the companies listed below have indicated a strong interest in offering or purchasing green power insurance.

Green Power Marketers indicating interest in buying the insurance

- Edison Source: CA
- Foresight Energy Company: CA
- Dynergy: CA
- Green Mountain Energy Resources: VT
- Pacificorp: CA
- ReGen Technologies: MA

Manufacturers and Project Developers indicating interest in the insurance program as a way to secure long-term competitive financing

Solar

- EPV: NJ
- Siemens Solar Industries: CA
- Solarex: MD
- Spire Corporation: MA

Wind

- Cannon: CA
- Zond (Enron): CA
- SeaWest: CA

Geothermal

- CalEnergy: NE
- Calpine: CA
- Davenport Resources: NY

Biomass

- Wheelabrator Environmental Systems: CA
- NRG: MN
- Ogden: CA
- WMX: IL

Insurance Underwriters and Brokers indicating interest in developing and underwriting the insurance

- Cigna Property and Casualty: PA
- CNA Commercial Insurance: NY
- Swiss Reinsurance America Corporation: NY
- Hedge Financial Products: NY
- Energy Insurance Brokers: CA
- Worldlink Insurance: CA
- TradeWind Insurance Brokers: CA

States with green power markets, indicating interest in assessing the program for possible participation

- California
- Massachusetts
- New Jersey
- Pennsylvania

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The Environmental Imperative: A Driving Force in the Development and Deployment of Renewable Energy Technologies, by Irving Mintzer, Alan Miller and Adam Serchuk, April 1996.

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Expanding Markets for Photovoltaics: What To Do Next - Special Report, by Adam Serchuk and Virinder Singh, December 1998.

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Renewable Energy, Insurance and an Integrated Consumer Financial Product, by Joel Gordes. Under electric restructuring many believe the bundling of services to be innovative. This paper examines bundling property-casualty insurance, a retirement annuity and electrical service into a single billing wherein any savings from reduced electricity bills pay for a PV system. This could spur investment in PV production and other market-driven climate change mitigation strategies.

Project Siting: Comparative Case Studies and Lessons Learned, by Robert Kahn and John Grattan. This paper examines case studies of renewable energy project siting, and provides lessons for project planners, renewables advocates, local environmental advocates, and local planners who need to balance access to good renewable resources with local environmental and aesthetic concerns.

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