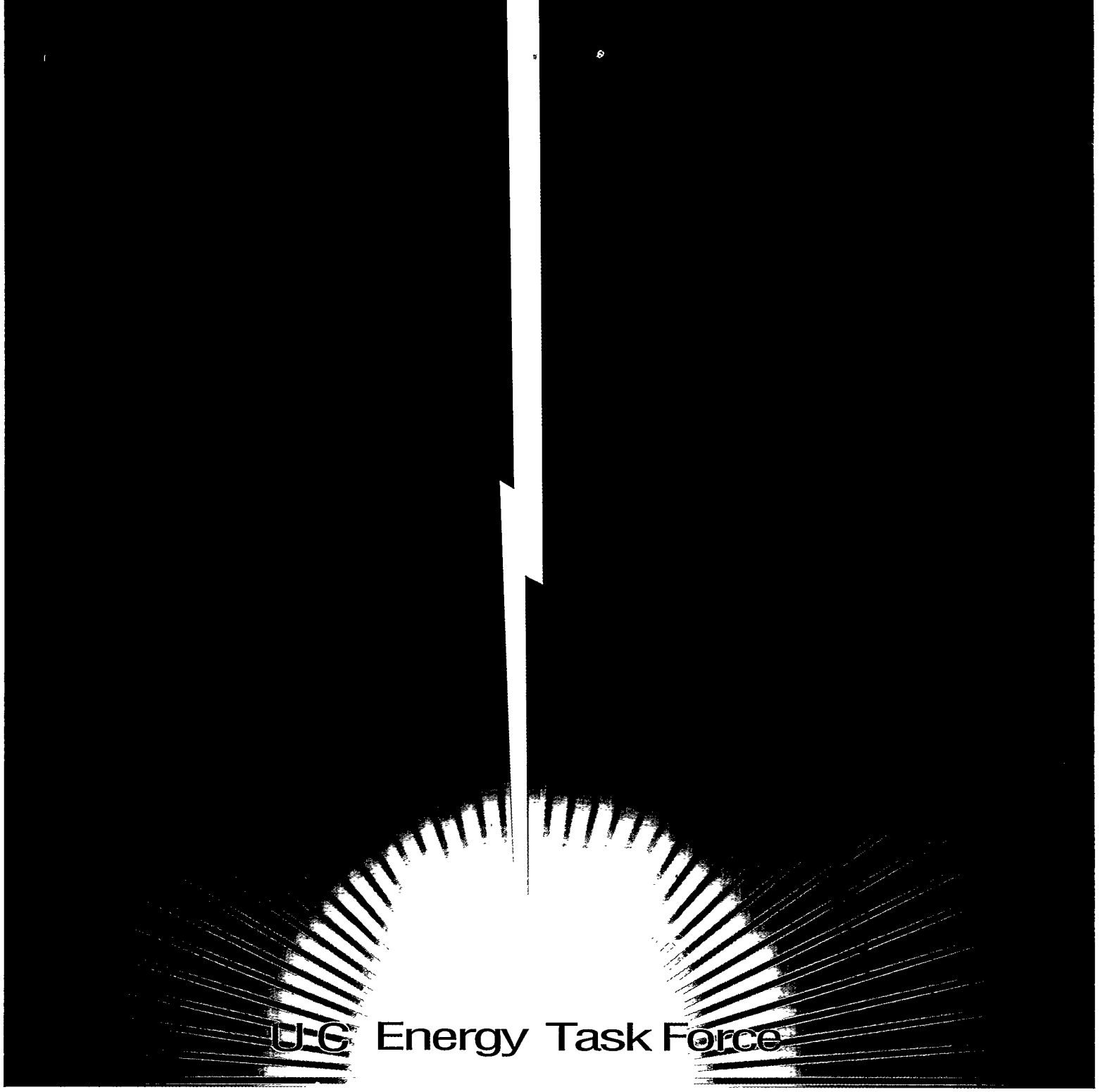

FINANCING RENEWABLE ENERGY: OBSTACLES AND SOLUTIONS

URBAN CONSORTIUM

The City of New York

PUBLIC TECHNOLOGY, INC.

BACKGROUND AND ACKNOWLEDGMENTS

Public Technology, Inc. (PTI), is the non-profit technology organization of the National League of Cities (NLC), the National Association of Counties (NACo), and the International City/County Management Association (ICMA). PTI's mission is to bring technology to local governments. Through collective research and development efforts in its member jurisdictions, PTI creates and advances technology-based products, services, and enterprises for all cities and counties.

Four active task forces, each composed of members of PTI's Urban Consortium (UC)—which represents fifty of the nation's largest and most progressive cities and urban counties—drive PTI's research and commercialization efforts. One of these task forces is the Urban Consortium Energy Task Force (UCETF), which was established a quarter of a century ago to address critical energy needs of urban America.

About The Urban Consortium Energy Task Force

The UCETF is the nation's most extensive cooperative local government program to improve energy management and technology applications in local governments. Its membership is composed of local government officials from America's large urban centers. The four major goals established by UCETF members are to:

1. Act as the premier advocate group for local governments on energy technology;
2. Improve energy efficiency, reduce costs and develop revenue from local energy assets;
3. Address the overlap between energy and environmental policy issues; and
4. Act as the implementation arm for NLC and NACo policies.

Under an annual program sponsored by the U.S. Department of Energy (USDOE), the UCETF provides funding for a number of city and county projects that propose to meet these objectives. Projects selected for each year's program are organized in thematic units, such as Transportation, Sustainable Communities, Buildings, and Technology Transfer, to assure effective management and ongoing peer-to-peer exchanges. The results of these research projects are documented in reports such as this one, and made available for broad dissemination by PTI among other local governments.

PTI Urban Consortium Energy Task Force

Mike Lindberg, *Chair*
Commissoner, Public Utilities, City of Portland, Oregon

Albuquerque, New Mexico
Austin, Texas
Chicago, Illinois
Columbus, Ohio
Denver, Colorado
Hennepin County, Minnesota
Houston, Texas
Memphis, Tennessee
Metro-Dade County, Florida
Montgomery County, Maryland
Orange County, Florida
Philadelphia, Pennsylvania
Phoenix, Arizona
Norfolk, Virginia
San Diego, California
San Francisco, California
San Jose, California
Seattle, Washington
Washington, District of Columbia

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The statements and conclusions contained herein are those of the grantees and do not necessarily represent the official position or policy of the U.S. Government in general or USDOE in particular.

FINANCING RENEWABLE ENERGY: OBSTACLES AND SOLUTIONS

A REPORT OF THE URBAN CONSORTIUM ENERGY TASK FORCE

Prepared By

The City of New York

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Marion Yuen was an important partner in this endeavor, providing assistance in assembling and leading a focus group among members of the financial community. She also gave valuable input into Chapters 4 and 5 of this document. Representatives from Consolidated Edison and other utilities, as well independent power producers provided valuable information for this report.

Finally, many firms in the business of providing money to energy projects provided information for this report. Special thanks go to Deborah Gravinese and

Michael Reddy of Toronto Dominion Bank for agreeing to host a focus group meeting among members of the financial community. Others too numerous to name representing utilities, independent power producers, and the financial community deserve thanks and appreciation. Without the assistance of all of these individuals and organizations, this work would not have been possible.

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CHAPTER I – OVERVIEW

ABSTRACT

The majority of renewable energy technology projects now being developed use long term project financing to raise capital. Occasional but memorable failed renewable energy projects make financing renewables expensive and difficult. The financial community scrutinizes renewables more closely than some conventionally fueled electric generation facilities because it perceives renewables as risky and expensive. Renewables pay for this perceived risk through higher interest charges and other more restrictive loan covenants. Risks that are not eliminated in the power sales agreement or through some other means generally result in higher project costs during financing.

In part, this situation is a product of the private placement market and project finance process in which renewable energy facilities must function. The project finance process attracts banks and institutional lenders as well as equity investors (often pension funds) who do not want to place their capital at great risk. Energy project finance exists on the basis of a secure revenue stream and a thorough understanding of electric generation technology. Renewables, like all energy projects, operating in uncertain regulatory environments are often difficult to finance.

In the uncertain regulatory environment in which renewables now operate, investors and lenders are nervous about challenges to existing contracts between independent power producers and utilities. Challenges to existing contracts could foretell challenges to contracts in the future. Investors and lenders now look to state regulatory environments as an indicator of project risk.

Renewable energy technology evolves quickly. Yet, often the information about technological evolution is not available to those who invest in the energy projects. Or, those who have invested in new renewable energy technology in the past have lost money and are nervous about doing so in the future -- even though technology may

have improved. Inadequate or unfavorable information is a barrier to the development of renewables.

Technology changes rapidly in the renewables industry. Yet because renewable energy power plants comprise a small part of most investors' or lenders' total portfolio, most of these financial institutions do not find it worthwhile to keep close track of technology developments. As a result, some information that these financial institutions have at hand is outdated or inadequate.

Some renewable energy technologies are hampered by poor performance in the past. Although renewable energy technology has improved, it now needs a track record to prove to the financial community that it works well. Through set-asides, integrated resource planning, or through competitive bids structured to account for the benefits of renewables, regulators and utilities can assure a market for renewable energy technologies and help establish that track record.

Financial institutions point to fuel supply risks as the paramount problem with some renewable energy resources. Many renewable fuels are cheap, free, or even negative cost, but their supply may be perceived as less reliable than a long term gas contract. Financial institutions feel comfortable with established gas technology accompanied by a long term supply contract with a creditworthy entity. Such contracts are not now available for most renewables.

Like other independent power projects, renewable energy facilities require long term power sales contracts to provide a solid revenue stream upon which to build financing. The high capital cost of renewable energy facilities needs to be amortized over many years, otherwise Many renewables are hampered by their poor performance in the past. Yet as renewable energy technology has improved, it now needs a track record to prove to the financial community that it works well. Through set-asides, integrated resource planning, or through competitive bids structured to account for the benefits of renewables, regulators and utilities can help assemble that track record.

such facilities become too expensive to finance. Because financial institutions are putting up millions of dollars, often over 15 to 20 years, they must feel that the revenue stream is secure. Without a secure revenue stream, renewable energy facilities are not financeable. Because of the recent appearance of higher regulatory risks and because the technology and fuel supply risks of renewable projects are often seen by the financial community to be higher than for non-renewable projects, a solid power sales agreement with limited revenue risk beomes an essential cornerstone of renewable project financing.

PREFACE

Unfavorable memories, imperfect information, and a capital intensive cost structure make it difficult and expensive to raise money for renewable energy resources. Developers of renewables have difficulty attracting capital even though local and national energy policy emphasizes renewables as a way to reduce pollution and increase fuel diversity. At issue in this quandary are differing perceptions of the value of renewables to utilities and to society, and the financial community's mistrust of some renewable energy technologies and the regulatory structure in which those technologies are developed.

To better understand how hard it can be to raise capital for renewable energy, one must understand who builds renewable energy facilities, to whom and how these builders sell the energy they generate, and how the builders raise money to build renewable energy facilities. To comprehend these issues, it is critical to examine the process of building, selling, and raising money in detail, while noting the areas where renewables are harder to finance than conventional energy technologies. This report provides this discussion and analysis.

After discussing the assumptions, background, and methodology underlying this report, we review the interests and priorities of the utilities and independent power producers. It is, after all, the contract between these two entities upon which the financing of renewables relies. Next we discuss how developers of renewable energy find financing, the barriers to getting that financing, and some ways to address those barriers.

CHAPTER II -- BACKGROUND AND METHODOLOGY

BACKGROUND

We began this project with a mandate to search out the barriers to renewable energy. We intended to look at a variety of issues, including long run avoided costs for electricity production, utility production cost modeling, and utility resource planning methodologies. We quickly found, however, that other researchers had already analyzed these issues with an eye to how each affects renewable energy.[1] It became clear that those reports and investigators had covered their topics well. Instead, there was another issue on which our time and energy would be well spent: the financing of renewable energy technologies. In the end, it is here that the overall adequacy of revenues to continuously cover costs and to provide for an assumed profit margin will be assessed. If appropriate risk mitigation provisions have not been made prior to the time of financing it will be reflected in the cost of capital.

It is the acceptance of the financial community -- the lenders and investors -- that determines how much renewable energy capacity utilities or developers build.[2] The acceptance by these institutions depends in turn on the regulatory and economic structure in which renewables operate. Renewables, for instance, flourished in California, where the regulatory and political structure made the economics of renewables work; they have faced difficulty in parts of the country where the politics and regulation do not favor them.[3] This report is designed, in part, to foster a policy and regulatory environment that is reassuring to the financial community. Perhaps the best way to develop this environment is to begin by helping regulators and energy

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[1] One report is particularly comprehensive in summarizing the barriers to renewables, "Investing in the Future: A Regulator's Guide to Renewables," by Jan Hamrin and Nancy Rader, commissioned by the National Association of Regulatory Utility Commissioners and published in January, 1993.

[2] The acceptance of the financial community is the critical factor once developers, utilities, and others have agreed on the need for new electric generating capacity.

[3] David Moskovitz, Renewable Energy: Barriers and Opportunities, Walls and Bridges, The World Resources Institute, July, 1992.

policy makers understand the major issues that developers of renewable energy technologies encounter when they approach the financial markets.

METHODOLOGY

Resources

We studied six resources for this report, including wind, hydro, wood, waste-to-energy, other biomass, waste-to-energy, and solar.[4] We selected these resources by eliminating from explicit consideration the resources that are not practical in New York or the east coast. However, because many people we interviewed for this report work on a national or international level, we also discuss geothermal energy. Geothermal energy resources are not available on a utility scale in the northeast United States.[5]

We focus on commercial, supply side, utility-scale applications of renewables. End use renewables, including solar photovoltaics, are an important part of the effort to integrate renewables into energy production and delivery systems, but because they are generally financed so differently and by different institutions, they should be treated in a separate analysis. Finally, we do not treat solar photovoltaics as utility scale supply side options extensively in this report; the level of technology development and the industry structure is so different from the other renewables that it should also be analyzed separately.

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[4] Waste-to-energy is included in this study because it is a resource whose fuel supply, municipal solid waste, is replenished by an indigenous flow of materials with a negative fuel cost.

[5] Geothermal resources are prevalent in Hawaii, California, Nevada, and some other parts of the Southwestern United States. Hawaii produces over 80 percent of its baseload generation from geothermal resources. ("Geothermal Status Report, William P. Short III, Independent Energy October, 1992, p. 68.)

Environmental Issues

We do not attempt to compare the emissions benefits of different renewable technologies. Instead, we take as a given that all the technologies meet some valuable policy goals -- even though they may conflict with others. Hydro resources, for instance, are non-emitting technologies, but raise questions of land and river resource use.[6] Waste-to-energy facilities conflict with some air quality goals, meet some waste management policy goals, and conflict with others. Wind turbines are non-emitting, but raise land use questions. These issues may play a big part in determining how successful renewable energy and other non-fossil technologies will be. They will also have an indirect, but critical, effect on the ability of some more controversial renewable energy projects to raise money.[7] A technology-by-technology comparison of these issues is, however, beyond the scope of this report.

Independent Energy Developers Will Use Project Finance to Raise Capital

We assume that the way independent energy developers now raise capital is the way that they will raise capital in the near future. That is, that lenders and investors will continue to decide whether to fund projects based on the projected revenues and risks of individual projects. We do not explicitly examine the effect of issuing public debt or using retained earnings to finance new construction of renewable energy facilities.[8]

This assumption is important. As the independent energy marketplace has matured it has also consolidated. A number of larger developers have gone public.[9] It is possible, therefore, that as the market matures more renewable energy facilities will

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[6] Some even question how much of a "non-emitting" resource hydro is, since the flooded lakes and streams cause methane and other emissions.

[7] The financial community may feel more nervous about the political or permitting risk of projects that could generate widespread public opposition because of air quality, water quality, visual, or land use effects.

[8] It appears that as industries and technologies mature, the way they raise money also matures. Companies operating in well known and well understood industries tend to have access to more markets -- such as the public debt markets. As the independent power industry and especially the renewable energy industry is maturing, we may be seeing this process in action.

[9] Witness, for instance, KENETECH, which made an initial public offering in 1993.

be built with money raised in the public markets or through internal rather than project based finance. The health and cost of capital of the companies supporting this internal financing will still depend on the risks and benefits discussed here. The issues, therefore, remain relevant in the context of internal finance, too.

Research Techniques

We relied on three research techniques to gather information: a review of secondary materials; extensive interviews with independent energy producers, utility representatives, and members of the financial community; and a focus group with representatives of the financial community. The purpose of these interviews and the focus group was to solicit information from a diversity of parties individually, and then in a group setting. We did not examine specific independent power renewable energy contracts or other primary source materials for this study. Our information is based on anecdotal evidence from intensive interviews with the participants in the renewable energy building, purchasing, and financing business. A list of the people and organizations who participated in these interviews or focus groups follows.

Interviewed:

Name	Organization
Donna Anderson	NYC Comptroller's Office
Tom Bispham	Bear Stearns
Jonathan Bram	CS First Boston
Aaron Breidenbaugh	Ind. Power Producers of New York
Brian Daly	Trust Company of the West
Steve Day	Barr Devlin Associates
Steve Chawieko	Adirondack Hydro
Joe Galdo	US Department of Energy
Bob Gates	Zond Corporation
Carol Goldstein	Morgan Stanley
Nelson Gonzalez	GE Capital
Deborah Gravinese	Toronto Dominion Bank

Jan Hamrin	Hansen, McOuat, Hamrin & Rohde
Jim Hicks	Hicks Morrison and Company
Michael Higgins	Prudential Power Funding
Phil Huyck	Trust Company of the West
Tom Murley	Energy Investors Fund
Joe Oates	Consolidated Edison
Daniel Packey	Nat'l. Renewable Energy Lab
Michael Reddy	Toronto Dominion Bank
Maria Richter	Morgan Stanley
Vic Sawicki	American Ref-Fuel

Context for this Report

We wrote this report shortly after the first phase of a New York State Public Service Commission proceeding that sought to define how much New York's utilities should do with renewable energy in the next decade. Arising out of a New York State Energy Plan[10] recommendation that utilities build or acquire 300 megawatts of renewable energy capacity to be on line by1998, the proceeding assembled a host of parties representing: utilities, independent power producers, energy policy, environmental policy, and economic development officials, environmental groups, consumer groups, and others. Each party's views were informed by widely diverse agendas. The debate during the proceeding ranged over a wide variety of areas including: utility overcapacity, conflicts between independent power producers and utilities, the environmental benefits of different technologies, debates over the long and short term costs and rate impact of renewables, and many utilities' concern over competitive pressures and the threat of losing large customers because of high electric rates. This proceeding mirrored the national debate about renewable energy development. It showed clearly that renewables must be viewed in the context of

[10] The New York State Energy Plan is written by the State Energy Office, the Department of Environmental Conservation, and the Public Service Commission. The plan reflects the sometimes differing priorities of each of those state agencies. These agencies solicit public comment on draft versions of the Plan.

regional economic, regulatory, and environmental issues. These debates informed the issues that we discuss in this analysis.

CHAPTER III

WHO BUILDS AND WHO BUYS THE ENERGY FROM RENEWABLES

Electric utilities and independent energy producers produce, transmit, and distribute the electric energy that renewable energy sources produce. A complex system of contracts, cost measurements, and regulations weaves these two groups together. Their interaction began in 1978 when Congress passed the Public Utility Regulatory Policies Act, or PURPA.

PURPA

Congress designed PURPA to encourage small, non-utility power producers to build power plants that used either cogeneration or renewable energy resources. Through PURPA, certain small non-utility entities were guaranteed a market for their product. PURPA required utilities to interconnect with facilities that qualified under its rules and to pay them for energy at the utility's avoided cost. Congress defined avoided cost broadly as the cost that a utility would have to pay to supply. States had the authority to set avoided costs, and it is through that authority that many states -- such as New York and California -- set up comprehensive and ambitious versions of PURPA.

In one of these states, New York, the legislature established the "six-cent law," which set a floor of six cents per kilowatt hour on electricity sales to utilities. Under this law, facilities of 80 MW or less were guaranteed a base price for their product; this law allowed many facilities to secure financing. The New York State Public Service Commission also set up its "interim policy" that laid out the types of facilities with which utilities would be required to negotiate. When, during the late 1980's, avoided cost calculations began to show estimates far below six cents per kilowatt hour,[11] the legislature and regulators laid aside both the six cent law and the "interim policy" in favor of bidding requirements and guidelines. [12] Whatever its other merits, this legislative and regulatory structure set a floor price for renewable energy which is no longer available.

SURPLUS CAPACITY

PURPA, in its federal and state forms, spurred tremendous growth in non-utility power project development. Where Congress estimated that non-utility producers would build up to 12,000 MW of capacity by 1995, the non-utility producers had built over 31,000 MW of electric generating capacity by the end of 1991.[13] In New York State, non-utility generators have now built 4000 MW of generating capacity as a result of PURPA with another 2000 MW under contract or under construction.[14] Meanwhile, natural load growth has slowed, and demand side management has further reduced the demand for electricity.

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[11] Avoided costs have fallen as gas prices tumbled during the late 1980's and 1990's, and as a great deal of both IPP and utility-constructed capacity came on line during the same period. Long run avoided costs are complex and controversial. Suffice it to say, for this analysis, that when properly calculated to include such factors as the cost of upgrading existing utility plants or of the effect of early closure of some nuclear power plants, that currently posted avoided costs appear artificially low. Under the current avoided cost structure and bidding regime, however, only the lowest cost resources -- mostly gas turbines -- win power sales contracts. Renewables, with their more capital-intensive cost structure and more difficult to quantify benefits, have trouble in this area. We discuss this issue in more detail later.

[12] In addition to bidding, non-utility generators in New York are eligible to receive a five year energy-only contract. Because such contracts now pay less than 3¢ per kilowatt hour, there has been very little interest in them.

[13] Blair Swezey, The Impact of Competitive Bidding on the Market Prospects for Renewable Electric Technologies, the National Renewable Energy Laboratory, Sept. 1993, p. 1.

[14] Personal Communication, Aaron Breidenbaugh, Independent Power Producers of New York, May, 1994.

Utilities assert that they have so much capacity on line now that they cannot use their existing generating facilities efficiently. New York's situation is instructive. New York State's utilities now claim that they will not need any new generating plants until sometime beyond the year 2012 because of excess capacity. The summer peak requirement in New York, including a reserve margin, is 32,135 MW; the capacity as of late 1993 in New York was 36,076 MW.[15] The New York utilities, thus, argue that they have been required to commit to generating capacity that is close to 4000 MW in excess of their peak needs. The excess capacity situation in many areas of the country mirrors New York's.

This argument makes a number of assumptions that are the subject of heated debate. In large part, this debate focuses on the effect of plant retirements, the real cost and benefit of utility plant upgrades, the cost of new generation options, and the cost and effect of new environmental regulations. If utilities, for instance, retire some older, less reliable, or uneconomical plants soon, the "need date" for new capacity will be much sooner. Critics of the utility excess capacity argument also point out that new generating capacity is almost always cleaner and more efficient than the old power plants it replaces. This is particularly true for renewable energy resources, which either have zero emissions or use new and efficient burning technology. Energy policy makers, utilities, independent power producers, environmentalists, and others will continue to debate this issue.

In the meantime, that debate over excess capacity is important for renewables development. Utilities, concerned that they have too much generating capacity, do not want to build new generating facilities because they claim that the new renewable energy facilities will only add to the excess capacity problem. Proponents of renewables note that some renewables will displace existing utility fossil plants, producing tremendous environmental benefits, and that markets for renewable energy technologies should be developed now to assure continued access to these resources in the future.

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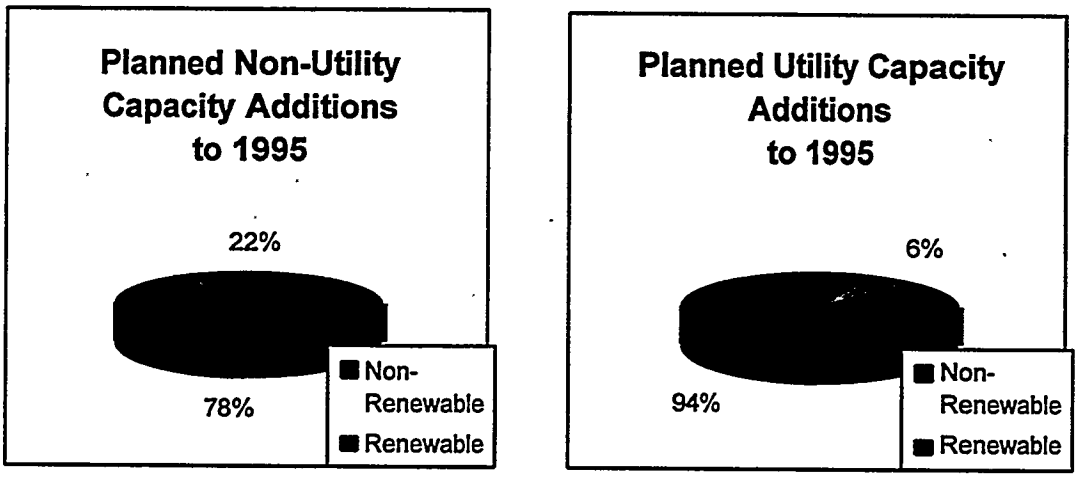
[15] Filing 6106, Vol. 2, Load and Capacity Data; New York Power Pool, 1993.

INDEPENDENT ENERGY PRODUCERS BUILD RENEWABLES

Independent power developers will likely build the majority of new renewable energy capacity. David Moskovitz, a former utility commissioner from Maine, points out that it has been the independents who have built a large percentage of the new renewable energy capacity in New York and the country, and it is the independents who appear likely to continue building these facilities. We assume, for this report, that this trend will continue. The table below shows the national break-out between utility and IPP-developed independent power resources.



Source: David Moskovitz, Renewable Energy: Barriers and Opportunities, Walls and Bridges, The World Resources Institute, July 1992, , pp. 2,3.

Twenty-two percent of the generation capacity that independent energy producers build will be fueled by renewable energy resources; only six percent of the capacity that utilities plan to build over the coming few years is from renewable energy sources. This situation reflects a number of factors that push independent energy producers to build renewables and have discouraged utilities from building them.

Tax Advantages

Independent power developers have had access to Federal tax advantages for renewable energy projects since the late 1970's. Utilities, by contrast, frequently did not have access to them. These tax advantages have included: a ten percent

investment tax credit for independent power producers investing in renewable energy projects; a five year energy tax credit; and a five year accelerated depreciation schedule. The combination of these tax incentives meant that developers actually received a tax subsidy on certain renewable energy projects until 1986.

In 1986, Congress removed many of the tax incentives for renewable energy power generation. Congress removed the business investment tax credit and reduced the 15% energy tax credit to 10% over two years, and eliminated the tax credit for wind energy.

Since 1986, a number of incentives have been added, and some have been extended to utilities under certain circumstances. The Federal Energy Policy Act of 1992 permanently extended the 10% investment tax credit for solar and geothermal projects, unless utilities build those projects. The Energy Policy Act also created a 1.5¢/kWh tax credit for wind and certain biomass projects, and made utilities eligible for the credit. The only federal tax incentive that is not now available to utilities is the 10% tax credit for solar and geothermal facilities.[16]

Experience with Technology

Independent energy producers who took advantage of these tax advantages gathered experience with renewable energy technologies that utilities never acquired. The independents, in effect, had a strong incentive to gain experience with renewables, while utilities were still rewarded through the conventional regulatory structure for investing in what regulators perceived as less risky nuclear or fossil technologies. While renewable energy project development is not restricted to independent developers, these independent power producers will play a huge part in the development of renewable energy resources in the future.

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[16] Blair Swezey, The Regulatory Outlook for Renewable Electric Generation in the US., The National Renewable Energy Laboratory. Paper presented at Advanced Workshop in Regulation and Public Utility Economics, Sixth Annual Western Conference, July 7-9, 1993, pp. 5, 8.

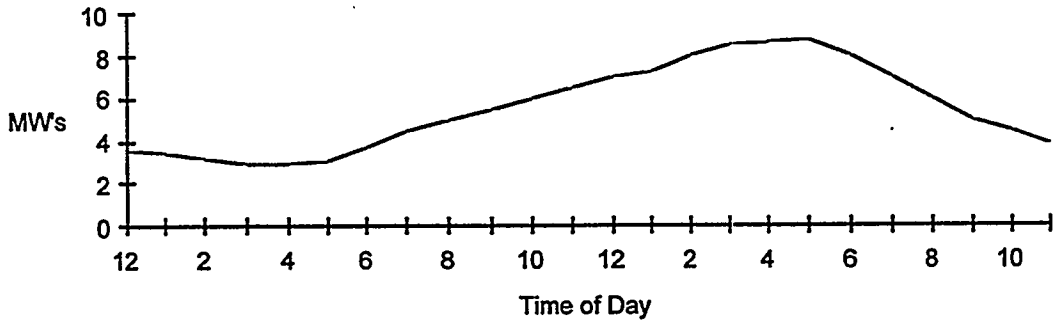
UTILITIES BUY ENERGY FROM RENEWABLES

Utilities buy energy from independent power producers, mix it with power from their own plants, and transmit and distribute the power to customers. By law, only utilities can sell power over the existing power lines directly to customers. That may change, as the Federal Energy Policy Act of 1992 opened the possibility for states to allow retail wheeling, or for non-utility producers to have access to the existing power lines and contract directly with electricity customers. However, despite efforts in a number of states, none has allowed this practice. Utilities still plan generation systems based on the assumption that they alone will deliver the energy to their customers. They are still, in fact, obligated to deliver power to customers.

As a result, utility planners analyze the demand for electricity and compare it to their ability to deliver power. They predict how many power plants of what size the utility will need where. If they predict too few plants, or if they plan for plants that they cannot use when they need them, customers do not get the power they need -- and customers have black outs or brown outs. Ultimately, it is this ability -- and requirement -- to deliver electric energy to customers that makes utility resource planners concerned about some renewable resources. A few of the issues that concern utility planners are enumerated below.

Timing of Customer Energy Requirements

Customers need more or less energy at different times of the day. At night, most utilities run only a few of their generating facilities because most people are sleeping and most factories and businesses are closed. During the day, and particularly the mid to late afternoon, utilities run most of their plants to meet the demand of businesses and homes. For "summer peaking" utilities like Consolidated Edison in New York, the peak time is during summer afternoons -- when air conditioners are running. For winter peaking utilities, the peak time is in mid winter when electric heaters are operating. Utilities build their generation, transmission, and power distribution systems to meet the greatest load that these systems will have to meet. A typical daily load curve for a summer peaking utility might look like this:



Utilities plan a certain level of generating capacity as "baseload." The baseload plants are those that run all the time. These plants on the system that is graphed above run even when customer demand is at its lowest -- even in the middle of the night. These plants are not turned off except for maintenance or if there is a forced outage. "Peaking" plants, by contrast, would be turned on during the mid to late afternoon when the "baseload" plants cannot meet demand by themselves.

Utilities need to fit renewable energy facilities into this schedule of peak and baseload needs, such that they can plan their generation, transmission, and distribution systems. A challenge that utilities now face is to integrate renewables into their systems; wind plants work when the wind blows and solar panels produce power when the sun shines -- not necessarily when utilities need the power most.[17] Utilities need reliable resource data that will allow them to plan their systems for these "intermittent" resources. Nonetheless, even the intermittent renewables should fit into utility systems when they constitute up to approximately 10% of the overall generating capacity.[18]

Ability to Dispatch Power

Utilities dispatch -- or turn power plants on and off -- to generate enough power to serve their customers. Most utility planning systems are based on the ability to turn

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[17] A number of studies are now showing that the wind blows and the sun shines at times that coincide very well with some utility peak loads. AWS Scientific, for instance, recently completed a study that showed that the Consolidated Edison's peak load coincides with the sunniest times of day. (AWS Scientific, get CITATION (????

[18] Factors Relevant to Utility Integration of Intermittent Renewable Technologies, Yih-huei Wan and Brian K. Parsons, National Renewable Energy Laboratory, August, 1993, p. vi.

different generation options on or off easily. Many renewables that are available only when, for instance, the wind blows, do not fit easily into this scheme. Utilities may need to develop new models to account for this relative lack of control.

Cost of Different Generating Options

Utilities consider the cost of operating different generating options. Typically, utilities dispatch power plants based on economic criteria: they run the cheapest plants continuously and the most expensive plants only at peak hours. Utilities must consider how to integrate renewables -- over which they often have less control -- into this system of economic dispatch.

Environmental Effects of Different Generating Options

Utilities may consider the environmental effects of different generating options. Thus, as they decide which plant to dispatch, they could consider not only the direct cost of operating that facility, but also the environmental effects of turning that facility on. Known as environmental dispatch, this is not common practice in part because not everyone agrees that such dispatch should occur and in part because environmental benefits are difficult to quantify. Such "environmental dispatch" would benefit most renewables.[19]

Location of Power Plants

Utilities consider the proximity of power plants to load centers. A plant that is far from the load center may require higher transmission costs -- perhaps new lines and higher line losses. The construction of wind farms in Quebec built to supply power to Consolidated Edison in downstate New York would not be as efficient as wind farms

[19] Environmental Externalities and Electric Regulation, Prepared by ECO Northwest under contract to the National Association of Regulatory Utility Commissioners, September, 1993, pp. 22-24.

built for the same purpose on Long Island, New York, for example. Two factors are at work: utilities pay "transmission charges," or charges to move power through one utility's electric wires to its own; the more utility systems to move this power through, the more the receiving utility pays. Second, there is some loss of power over long distances. Thus, it can be more efficient for utilities to invest in power plants that are close to them.

The Competitive Bidding Process

Utilities now generally procure contracts to build power plants through competitive auctions. These auctions are designed to meet specific needs that utilities identify by assessing the factors enumerated above. Thus, some utilities might design an auction that requires peak power only. Others might design an auction that solicits baseload power, and some utilities might solicit power plants to meet a variety of criteria to support a particular portfolio of resources.

Independent power producers bid to supply the power that utilities say they need. These bids are expensive to assemble; a bid for a 50 MW hydro project might cost as much as $250,000.[20] The bids generally must include certain basic elements including: type of power plant, cost of power, description of the interface between the utility system and the power plant, a certification from a known financial institution that the project appears financable, among other requirements. The funding to assemble these project bids generally comes from the project sponsor's own equity.

Although utilities score these bids based on a variety of criteria, the dominant criteria are price-related. In New York, for example, the most recent auction performed by Consolidated Edison scored bids based primarily on price with some consideration for other factors. Consolidated Edison selected projects in its most recent auction that had the lowest evaluated price and that appeared both technically and financially feasible.[21]

Renewables have generally not done well in utility auctions. A recent survey produced by the National Renewable Energy Laboratory showed that while approximately 40% of the facilities that qualified under PURPA used renewables, only

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[20] Pertsonal Communication, Steve Chiwieko, CFO, Adirondack Hydro Development Corporation, May, 1994.

[21] Personal Communication, Joe Oates, Consolidated Edison, January, 1994.

12% of the facilities selected through competitive bidding were based on renewables. This downturn in renewable energy project development reflects the emphasis in competitive bidding solicitations on price and operational characteristics. Increased emphasis on such benefits as fuel diversity or environmental benefits would favor renewable energy.[22]

New York State is illustrative. The bid evaluation process emphasized price levels and schedules as well as price-related operational factors (including, for instance, dispatchability) very highly. Other factors such as environmental effects and fuel diversity received much less emphasis. As a result only two percent of the generation capacity selected was based on renewable sources -- in this case wood.[23]

CONCLUSIONS

Renewables fit into a broad context of utility regulation and legislation, utility energy needs, and environmental and energy policy goals. As utilities and renewable energy developers negotiate the terms of a power sales agreement they take into account all of the issues above. One important point is evident, however: renewable energy projects now require some specialized negotiation. Because of their unique characteristics, renewables generally do not fit into the standard negotiation procedures that utilities and developers use for gas, oil, or other fossil resource contracts. The cost of negotiating the terms of power sales agreements are therefore higher for renewables than for more conventional resources. Even before reaching the financing stage, thus, utilities and some renewable energy developers must enter into more complex and expensive negotiations than are required for fossil resources.

To reduce this transaction cost, regulators should consider providing standardized terms that fit the unique characteristics of renewable energy projects. These standardized contract terms would be made available to certain resources defined as renewable and take into account issues related to dispatchability, high capital costs, and other issues. Such standardized terms could significantly reduce the transaction costs for thinly capitalized developers and begin to level the playing field between conventional and renewable energy resources.

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[22] Swezey, p. 9.

[23] Personal communication, Joe Oates, Planning Department, Consolidated Edison, December, 1994.

Within this context, and armed with a power sales contract, some building or land use permits, and other documents, renewable energy project developers approach banks, insurance companies, other institutional investors, investment bankers, and others and try to raise money for their projects. Chapter IV describes this process in detail.

CHAPTER IV -- HOW TO FINANCE RENEWABLE ENERGY PROJECTS

Non-utility developers of renewable energy are much like developers of conventionally-fueled resources; they raise money from the same organizations and negotiate long and hard over many of the same contract terms. It is important, however, to understand the structure under which most energy projects (whether renewable or conventionally fueled) are financed, who provides money for these energy projects, and the major roles and concerns of each of these organizations.

THE STRUCTURE FOR FUNDING ENERGY PROJECTS

The developers, bankers, and other lenders and investors who finance energy projects deal in the "private placement" market. That is, they negotiate with each other individually instead of issuing public debt. The private placement market is different from the public debt market, and involves investors, lenders, and borrowers with special requirements. Typically the borrowers who use the market are small (such that their projects may not justify the high fixed costs of registration etc. in the public markets,) and are raising money for projects about which there is not a great deal of information available (such that the lenders must study each project's revenues, expenses, and risks very carefully before investing).[24]

Private placement debt usually carriers a higher interest rate than public debt. Such costs can be justified for large debt issues, but are harder to justify for smaller issues. Public debt, by contrast, is expensive to issue, carriers a lower interest rate,

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[24] Mark Carey, Stephen Prowse, John Rea, Gregory Udell, The Economics of Private Placements: A New Look, A monograph from the New York University Salomon Center series: Financial Markets, Institutions & Instruments, Blackwell Publishers, Cambridge, MA1993p. 6-8.

and can be used to finance projects about which there is a great deal of information available -- through Securities and Exchange Commission or other filings, trade publications, or newspapers. Private placements also tend to be smaller than the public bond issues.[25]

Borrowers can get access to the private placement market through the "project finance" process. The process allows borrowers to raise money for large, capital intensive projects like energy projects. Project finance is also a common financing practice in other capital intensive industries like mining or shipping, or some major construction projects. The English Channel Tunnel's sponsors raised money for the gargantuan project through the project finance process.

Project finance relies on the revenues from specific projects to repay lenders and investors. It does not explicitly rely on the credit of the project's sponsors or developers but instead on the return and risk of the project itself. Project finance is also usually non-recourse, meaning that if the project cannot meet its obligations, the lenders cannot pursue the developer or sponsor's assets to pay back the project loan.[26]

Developers find project finance structures useful for a variety of reasons. For example, the credit appraisal of individual projects may be more favorable than the appraisal of the developer itself. Projects that would not be financable based on the developer's financial profile, become possible. In addition, it leaves the sponsors free to pursue several projects simultaneously -- each based on its own merits. In addition, major corporations that are capable of financing projects through other means may choose to use project finance as a way to isolate the project's debt to equity ratio effects from its own balance sheet. Other financing techniques might restrict the developer's ability to invest in multiple projects.[27]

Project financing has disadvantages. It is typically expensive. Lenders perform very careful due diligence engineering and financial reviews that keep transaction costs high. Interest rates are higher than they would be for a typical direct loan. Project financing also often involves restrictive covenants and supervision.[28]

A hypothetical example can best explain the project finance process and the cash flows involved in the process.

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[25] Ibid.

[26] Scott L. Hoffman, "A Practical Guide to Transactional Project Finance: Basic Concepts, Risk Identification, and Contractual Considerations," The Business Lawyer, Vol. 45. November 1989, p. 182.

[27] Ibid. p. 187.

[28] Ibid., p. 188, and Personal Communication, David Miller, Sithe Energies, December, 1993.

Project Finance: An Example

Windy Development Corporation (WDC), a medium size independent power producer specializing in wind energy, has responded to a large utility's -- Consolidated Public Service or CPS -- competitive bid solicitation. WDC has offered to build a wind facility to supply power below the utility's avoided cost. CPS has accepted the bid at the price that WDC offered, and the two have negotiated a 20 year power sales agreement. WDC has also received all the permits it needs to build the windpower plant, it has completed the wind resource studies, and has completed most of the engineering necessary to build the project. The engineering work has focused on identifying the size and type of wind turbines to use, based on site-specific wind speed data.

WDC has also completed a financial model showing how the project will incur expenses and generate revenue over its life. WDC now needs money to go forward. Because it does not have the internal capital to build the facility, it goes through the project finance process to raise $50 million.

WDC secures an investment banker located in midtown Manhattan to serve as a guide through the process, to help structure the deal, and to make contact with the potential lenders and investors. This investment banker will charge a fee for her work, but will be invaluable because WDC does not have the labyrinth of contacts it needs to secure the money to build the project. The investment banker takes a close look at WDC and the project and feels comfortable that WDC is a reliable project sponsor/developer and that the project will perform as well as WDC says it will. The investment banker then takes the project to a number of banks.

One large Canadian Bank, Canada Financial, is very interested in financing the project. It looks closely at the project at this point, but focuses on a few specifics.[29]

[29] In this hypothetical example, we assume that Canada Financial is the only senior lender. Other financings may have multiple senior lenders with complex agreements between them. Canada Financial, like all the companies named in this hypothetical example, is itself hypothetical.

Power Purchase Agreement

Canada Financial examines the power purchase agreement. Like all the investors and lenders involved in this project, this bank looks to the power purchase agreement as assurance that it will earn the return it expects. Generally the bank will not finance a project unless the term of the power purchase agreement is at least as long as the term of the loan. Canada Financial is typical of commercial banks in that it offers a three year "construction loan," (the three year loan used to finance construction of the project) plus a 15 year "term loan," beginning once the project is built and producing power. Other lenders like insurance companies offer longer term loans.

The Canadian bank also examines the creditworthiness of CPS to make sure that CPS will meet its obligations to buy power. The bank may also look at CPS' history -- its record of negotiating or attempting to renegotiate existing power contracts. This agreement must -- like any legal contract -- appear practical for all parties, enforceable, and unlikely to change.

Unlike cogenerators, who produce useful thermal output which is sold to a steam host, the renewable energy project produces only electrical energy. As a result, the power purchase agreement is the primary or sole source of revenue for the project, and is scrutinized in detail. The following provisions are particularly important.

Price

Canada Financial looks at the price per kilowatt hour of electricity that is established in the power purchase contract as the primary indicator of the project's ability to meet its financial obligations. Canada Financial essentially examines the risk that that the price will change substantially in the future and the ability of the price (and revenue stream) to meet the financial obligations of the project. Contracts that pay a fixed price for electricity make Canada Financial most comfortable. Contracts that pay a variable price for electricity are less attractive (and may later turn up in the financing contract in higher interest rates).

Canada Financial may also look at the price in relationship to current or future prices. A very high price for electricity could make Canada Financial nervous that utilities could challenge the contract in the future.

Term

Canada Financial looks at the power purchase agreement as the assurance the the project will have a secure and long term revenue stream. Contracts for less than the term of the loan present a very large risk that will likely keep Canada Financial and other lending institutions away.

Milestones and Security

Canada Financial looks at the milestones for completion of various tasks and the security payments that the contract requires. The bank feels comfortable only if those milestones appear reasonable and will not interfere with the ability of the project to meet its financial obligations. As with the other provisions, a difficult schedule of project milestones or large security payments will make Canada Financial view the project as riskier. Additional risks translate into higher interest rates in the financing contract.

Canada Financial would like to have complete confidence that WDC's predicted revenue stream will occur as promised. Any event that might interfere with the receipt of the predicted payments is a source of risk to Canada Financial. If certain events cqan diminish the expected revenue then WDC can take steps to ensure that either the events will not occur or that the project's economics are not adversely affected by the event. For example, if performance tests are required by the utility as a prerequisite to full payments, WDC can incorporate redundancy into the equipment design and provide a reserve against operational contingencies that would lead to the failure of a performance test. Similarly, if power revenue can vary with the utility's avoided cost WDC may need to determine a minimum rate that can be paid, negotiate a contract floor price or try to otherwise"hedge" the variability of the pricing.

In essence, WDC will need to "insure' against the events that could lead to diminished revenue. The cost of such "insurance" is not necessarily related to the cost to the utility of the event. Any remaining "uninsured" events represent risks to Canada Financial for which it will demand a higher interest rate as a risk premium. Some risks are "uninsurable" and may result in a project that Canada Financial will not finance.

The Project Will Have an Adequate Return on Investment

Canada Financial examines the power purchase contract and the risks of the project to decide if it will give the return it wants. Lenders and investors will demand a higher return for greater risk. Some other investors or lenders may even search out higher risk projects to fill in the riskier -- and higher return -- side of their portfolio. Phil Huyck of Trust Company for the West notes that his company looks at the renewable energy subordinated debt obligations that it owns as a small but important part of the higher return -- and higher risk -- part of the portfolio. A senior lender like Canada Financial is not, however, in this role.[30]

Fuel Source

The financial community requires that developers have something -- be it wind, water, or steam -- to turn the turbines in the electric plant. WDC presents its wind resource assessments to Canada Financial as proof that the wind resource is adequate. Canada Financial, in turn, gives those assessments to its independent engineer, who examines them in detail. If the engineer agrees that there is enough wind to spin the turbines, Canada Financial will continue to structure a deal. In the case of other technologies, sponsors must show that they have a long term gas contract, an adequate supply of wood or other biomass, or that the wind or water resource is adequate and dependable.

Permits

Developers must have secured all permits that can be secured before the plant begins operating. Investors or lenders will not put their money into a project without some assurance that the developer has secured all the permits necessary to build and operate the facility.

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[30] In the event of a default, subordinated debt holders have a smaller chance of getting their money back than do senior debt holders.

Developers or Sponsors Have a Financial Interest in the Project's Success

Canada Financial is considering whether to entrust millions of dollars over 15-18 years to WDC. Despite power sales contracts, secure energy supplies, and all the permits, lenders like to see that the developer has a financial incentive to keep the project running and meet the financial projections upon which the loan is proffered.

All Parties are Experienced and Reliable

While project finance does not rely explicitly on the credit of the developer, Canada Financial still makes an important qualitative judgment about whether WDC appears ready and able to build the project and whether the project operator also has a financial incentive to keep the project working.[31] One banker noted that she liked to reflect on whether she could comfortably introduce the loan applicant to her chairman. If she did not feel comfortable with that idea, she would be less inclined to put money into the developer's project.[32]

The Regulatory Environment

Canada Financial looks at the regulatory climate in which WDC proposes to build its wind farm. In WDC's hypothetical case, Canada Financial notes among other issues that regulators appear to support the contracts that independent power producers have negotiated with utilities.

The Technology

Canada Financial hires independent engineers to examine the technology and its ability to produce power given the wind resource assessment. In this hypothetical case, WDC has selected wind turbines made by a major Dutch turbine manufacturer. Canada Financial finds that the manufacturer has turbines with a proven track record of performance in similar climates. Canada

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31 P. Nevitt, Project Financing, Euromoney Publications, (4th ed., 1983) p. 4.

32 Personal Communication, Deborah Gravinese, Toronto Dominion Bank, May, 1994.

Financial also finds that the wind resource studies appear reasonable and that the amount of wind at the site will indeed turn the turbines to produce power.

The Site Lease

Canada Financial assures itself that WDC has the rights to build on the land.

The Risks

Canada Financial takes an overall look at the project's risks, for example: Will there be significant community opposition to building the windfarm? Is the regulatory climate supportive of the project and the power purchase contract?

As Canada Financial satisfies itself that the project could meet the financial projections that WDC claims, that the wind resource studies are reasonable, that the technology will work, and that the risks of the project are not too great, Canada Financial agrees to pursue negotiations.

At this point -- signing up -- Canada Financial asks WDC to put up an initial commitment fee of between $50,000 and $100,000. As the negotiations continue, the Canada Financial asks WDC to provide copies of draft and then final engineering and construction contracts, and operation and maintenance contracts.[33]

Finally, Canada Financial is satisfied that its money is well placed in WDC's project. The two parties close their agreement. The agreement includes many points, but its key attributes try to control Canada Financial's exposure while letting WDC and its contractors make money by dictating who gets how much money at what point. Some of the key points include:

Spreads

Canada Financial expresses the interest rate on the loan as a spread over some generic but widely accepted interest rate. Often this might be LIBOR, or the London Interbank Offer Rate -- the rate at which banks can loan money to

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33 Gravinese, *supra.*

one another on the international markets. The spread will reflect the level of risk that the bank feels it is taking on -- greater risk means greater spreads.

Equity Requirements

Canada Financial asks WDC to raise 20% of the $50,000,000 financing from equity investors. The amount of equity that senior lenders require also varies with the level of risk that the bank feels it is taking on. A hydro project might only require 15% equity infusion. The amount of equity that senior lenders require also varies over time. In the mid-1980's, hydro projects needed to raise 20% of their costs from equity. By the late 1980's they needed to raise close to one-third of their requirements from equity sources. The usual equity requirement for hydro has now decreased to approximately 15%. [34]

Reserves

Canada Financial established reserve accounts to cover the risk that the wind project might have some temporary problems meeting its financial obligations. In this case, Canada Financial asked that WDC pay into the reserve accounts from a draw on the loan when the project began operation. Reserve accounts can also be filled through the revenues from the project. The greater the risks that lenders feel a project entails, the greater the reserve requirements may be.

Coverages

Canada Financial asks that the WDC wind power project maintain a certain ratio of net income to debt obligations. Falling below that ratio would serve as a warning to Canada Financial that the project was performing poorly. Consistent problems will bring Canada Financial's "workout department" to meet with WDC and restructure the loan. Again, riskier projects are required to maintain higher coverage ratios.

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[34] Personal Communication, Steve Chiwieko, Chief Financial Officer, Adirondack Hydro, New York State. January, 1994.

Distributions to Equity Investors

The loan agreement will usually dictate when and under what circumstances WDC can distribute cash to the project's equity investors.

At closing, WDC is responsible for paying a fee of approximately $500,000 (less $50-100,000 it paid at signing up), the bank's attorney's fees of approximately $600,000. (WDC felt satisfied with this amount because bank attorney's fees can range up to $1,000,000). WDC also is responsible for paying approximately $50,000 for the bank's engineers to examine the project. WDC, like many developer/sponsor, pays these up-front fees as the first draw on the loan.

WDC then has its contractors begin work on the project. At the end of every month, it draws up a report on the progress of construction. Canada Financial's engineers review the report and WDC's progress, and approve a monthly draw on the loan until the date when WDC agreed to have completed the construction. This can be up to three years. At the end of the three year construction loan period, Canada Financial will have put in $50,000,000, or 100% of the financing. WDC must now pay back the full value of the construction loan -- $50,000,000.[35]

The Term Loan[36]

WDC uses a $40,000,000 term loan from Canada Financial and $10,000,000 from its equity investors to pay back the construction loan. In essence, 80% of the 3 year construction loan is converted to a 15 year term loan. The term loan is typically 15 years for commercial banks and longer for other lenders like insurance companies. Canada Financial will now receive quarterly payments from WDC. The equity investors will receive cash distributions periodically after the plant operation and maintenance company, Canada Financial, any reserves, and the subordinated lenders have been paid. The equity investors assume the greatest risk in the project, but also receive the highest returns.

This project financing has given WDC $50,000,000 over 18 years from a combination of equity investors and a senior lender. Other project financings can be

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[35] Gravinese, *supra.*.

[36] The Term Loan is also called Take-Out Financing or the Permanent Loan.

more complicated, involving numerous lenders with varying levels of priority, and several equity investors.

Where the Money Comes From

Three types of organizations provide or arrange financing for both renewable and conventional energy projects: investment banks, lenders, and investors. Each has its own interests, its own time over which it wants to recover its money, and its own restrictions. It is worth reviewing each of these parties and their roles in the financing process.

Investment Banks

Investment banks arrange financing; they do not usually provide the money, but instead broker deals between the people who want money (the project sponsors) and the people who want to lend or invest it (the banks or other financial institutions). The investment banks earn their money from fees on the transactions they broker.

A good investment banker should look at a project with the perspective of the people who may put money into it. Therefore investment bankers need to understand the objectives, desires, and restrictions of the people who may provide project money. Investment bankers may be the first stop for a project developer. Typically, an investment banker analyzes a project, and if it looks viable, will contact the people who are likely to put money into it.

Two types of investment banks are important in the energy project finance field: boutique and large investment banks. Boutique and large investment banks are distinguished by their size and specialty. Generally boutique investment banks deal with smaller transactions. Larger investment banks deal with large transactions that generate larger fees to cover their often higher overhead costs. Many renewable energy projects, because they are smaller than gas, oil, or coal fired facilities, will be brokered by the boutique investment banks.

Commercial Banks and Other Institutional Lenders

Commercial banks loan money to project developers through departments specializing in project finance. Many foreign banks provide funding to independent power producers. Such lenders have included Banque Paribas, Swiss Bank Corp., Canadian Imperial Bank of Commerce, Toronto Dominion Bank, and others. Prudential Power Funding, a unit of the Prudential Insurance Company, and GE Capital, a unit of General Electric, are also major players in the project finance lending area.[37]

Project finance bank lenders typically lend for approximately 15 years, the institutional lenders such GE Capital or Prudential Power Funding may lend for a longer term. Each approaches prospective projects from a similar viewpoint -- an assessment of the risks and benefits of the project.

Subordinated Lenders

Subordinated lenders are a hybrid of equity investors and senior lenders. Subordinated lenders -- such as, for instance, the pension management firm Trust Company for the West -- invest in projects and will be paid after the senior lenders but before equity investors if the project defaults. Their investment is at greater risk than the senior lenders', but they also receive a higher return on their money. Firms like Trust Company for the West use subordinated loans to fill out the riskier -- and higher return -- portion of their portfolio.[38] Because they are lenders and not equity investors, though, they will be paid before the equity investors in the event of default.

Equity Investors

Equity investors typically provide 10% to 25% of the project's costs and assume the greatest risk because they are last in line to be paid. At the same time, they are compensated for taking the financial risk; pre-tax equity rates range as high as 25%.[39] Equity investors approach project finance from a very different perspective from lenders. Equity investors look carefully at the tax benefits of investing in energy

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[37] Independent Energy, Financial Rankings from March 1992 and 1993, Milaca, MN. Also based on discussions with developers and members of the financial community.

[38] Personal Communication, Phil Huyck, Vice President, Trust Company for the West, December, 1993.

[39] Chiwieko, *supra*.

projects. Thus the tax credits, tax deductions, and accelerated depreciation schedules from the 1970's and 1980's that accrue to renewable energy projects interest the equity investors. The restrictions that the 1986 Federal tax reforms placed on those tax advantages had a profoundly negative effect on the amount of equity available for renewable energy facilities.[40]

Fuel suppliers, equipment vendors, or contractors may supply the project equity. Often motivated by the desire to spur the market for their product, these investors are frequent participants in project finance.[41] Another group, Energy Investors Fund, has used money from utility subsidiaries, insurance companies, and pension funds to establish a $300,000,000 equity investment fund for energy projects. This group places particular emphasis on alternative energy projects. One independent power producer -- Caithness -- that specializes in geothermal projects has raised equity from wealthy individuals. Caithness specializes in "green" products and projects, and secures money from people who are looking to invest in environmentally beneficial projects.[42]

CONCLUSIONS

Project finance lets independent energy project developers raise capital for large energy projects where other financing techniques would not work. Project finance and the private placement market are useful for medium size firms operating in the complex energy marketplace. Developers pay a price for raising money through project finance: interest rates are usually higher than in the public markets, private placements generally carry more restrictive covenants and lenders and investors scrutinize projects in detail.

Renewable energy facilities face greater scrutiny, more restrictive covenants, and higher interest rates than do conventionally fueled facilities. The next chapter discusses how the project finance process interacts with renewable energy development.

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[40] Personal Communication, Blair Swezey, National Renewable Energy Laboratory, April, 1994.
[41] Hoffman, p. 192.
[42] Personal Communication, Hiram A. Bingham, Vice Chairman, Caithness Resources, Inc., January, 1994.

CHAPTER V -- BARRIERS TO RAISING CAPITAL FOR RENEWABLES

Like most non-utility independent power funding, renewable energy projects rely almost exclusively on project finance to raise capital. The heightened scrutiny that the project finance process brings to conventional energy projects is even more intense for renewable energy projects. It is critical to understand why the financial community subjects renewables to this intense scrutiny and how this scrutiny and perceived risk affects the financial terms that renewable projects are proffered.

It is important to note, however, that renewable energy technologies are not all alike and therefore face different perceptions of risk. Hydro, for example, is a mature technology that does not face much of a perception of technological risk as many other technologies. Some biomass technologies have developed quickly, not so much in the way that the facilities burn biomass, but in the sometimes exotic types of biomass the facilities attempt to burn. This can create a fuel risk issue. Wind and solar plants are new and rapidly changing technologies that face issues of their own. Although the degree to which the various technologies experience the barriers discussed below will be different, it is nonetheless possible to generalize about the issues that these renewable energy technologies face. They encounter many of the same barriers and often face the same restrictions when they try to raise capital.

INSTITUTIONAL MEMORY

One large wind project developer, Zond Corporation, noted that during the 1980's, the *real* risk of renewable energy facilities was greater than the *perceived* risk. Now, however, the opposite is true, and the *perceived* risk is greater than the *real* risk.[43] One subordinated lender and pension fund manager with a long history of involvement in the renewable energy field noted that "the universe of participants in the renewable energy finance industry is not particularly happy.[44] The real and perceived risks of investing in renewables vary from one technology to another. Certain experiences stand out, however.

A representative from Prudential Capital reported an "institutional hangover" from the early days when his company invested in wind technology that did not perform as promised.[45] Another former Prudential employee noted the same issue, saying that Prudential Power had invested in wind energy technology earlier than most. Turbine technology and wind resource assessment technology were not developed enough at the time. As a result, lenders financed some wind projects that did not produce enough revenue to cover their costs.[46]

GE Capital is similarly leery about investing in geothermal projects without proven resources, having recently put money into one project that went bad.[47] GE Capital's unfavorable experience has tainted the outlook of other investors considering putting money into renewable energy projects, making it harder to raise money for such projects.[48]

Even hydro-electric projects -- the most mature and well-understood of the renewables -- are not immune to this somewhat more cynical attitude towards renewable energy projects. The recent multi-year drought in California clearly showed the fallibility of even the best hydrological studies. Similarly, the failure of the Luz

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[43] Personal Communication, Bob Gates, Zond Corporation, November, 1993.

[44] Personal Communication, Phil Huyck, Senior Vice President, Trust Company for the West, November, 1993.

[45] Personal Communication, Michael Higgins, Vice President, Prudential Power Funding, February, 1994.

[46] Personal Communication, Pamela Flynn, NationsBank, formerly of Prudential Power Funding, April, 1994.

[47] Personal Communication, Nelson Gonzalez, GE Capital, Vice President for North and South America Project Finance, February, 1994.

[48] Bingham, *supra*..

Corporation as well as losses and loan write-offs resulting from that, have made it difficult to finance solar thermal facilities.[49]

The vast majority of renewable and other power projects have few problems. One lender noted that probably only 1-2 percent of all projects go into default. Developers, utilities, and the financial community have learned to control much of the risk of power projects. The 1-2 percent of all projects that are problematic, however, are the projects that many credit committees remember best.

Memories of renewable energy projects gone bad do more to hurt the chances of renewable energy than most other factors. As one senior vice president of Toronto Dominion bank observed, "You create a monument to the failed investment that [credit committees] remember...make one bad deal and..., the next one that comes along won't easily get financed."[50] Although renewable energy technologies have improved since the time of many of these failed investments, investors who lost millions of dollars on renewables are reluctant to invest in those technologies again.

A DEARTH OF GOOD INFORMATION

One characteristic of project finance is that -- because of the intense attention given to each deal and project -- it deals well with information-intensive projects. Project finance is thus ideally suited for the energy field, with its complex regulations, its long run avoided cost and bidding rules, and its sometimes complex technologies. Many renewable energy technologies change rapidly, however. Where, for instance, wind turbines were once inappropriate because wind speeds were too low, new turbines now produce power at the low wind speeds. Solar thermal and solar photovoltaic technologies can now produce power much more efficiently and cheaply than they could even five to ten years ago. The economics and the technical capabilities of renewable energy technologies change more rapidly than the perception of the economics and technical capabilities.

One vice president in the energy project finance area from Toronto Dominion Bank observed that project finance relies to some extent on gut feeling -- a balancing of risks. Often, it relies as much on a subjective feel for the technology and the developer

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[49] Huyck, *supra.*

[50] Personal Communication, Michael Reddy, Sr. Vice President, Toronto Dominion Bank, February, 1994.

as it does on an objective assessment.[51] A vice president from Trust Company for the West pointed out, however, that investors or lenders frequently do not have good information on which to base their risk assessment.[52]

This rapidly changing technology means that the financial community does not have the internal know-how to assess many renewable energy projects. It even appears that the lenders and investors cannot find the independent engineering experts they need to help them analyze and monitor renewable energy projects.

This shortage of independent experts compounds the information problem. A subordinated lender observed that he knew of only two independent experts in wind technology[53] while another investor noted that, "US Windpower's new turbine technology, for instance, may be very good. But find the independent engineer who knows and understands it well enough to say it will work as well as the company says it will." Another investor said that he knew of only one good independent expert in geothermal energy.

Yet, as Toronto Dominion bank observed, "The amount of work required to follow new technology is too great ... Because the number of projects is relatively small, it is not worthwhile for investors or lenders to hire a wind, geothermal, solar energy or other new technology expert." Renewables face a "chicken-and-egg" problem. There are too few of them around to make it worthwhile for investors and lenders to get up-to-date information, but until more reliable information is available on a larger number of projects, developers will continue to have difficulty raising money. As one lender pointed out, "The day lenders become more comfortable about renewables is when independent engineers have a greater body of experience and are able to give better advice because more deals have been financed."[54]

THE ENERGY MARKETPLACE

Renewable energy projects operate in the context of the larger energy marketplace, replete with its issues related to long run avoided costs, the sanctity of contract, and low margins. With the other barriers that renewables face, it is important

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[51] Gravinese, *supra.*

[52] Personal Communication, Brian Daly, Assistant Vice President, Trust Company for the West, February, 1994.

[53] Daly, *supra.*

[54] Reddy, *supra.*

to consider the effect that this uncertainty in the marketplace has on renewable energy facilities, particularly the sanctity of contract.

Sanctity of Contract

A Morgan Stanley investment banker points out that project finance is based on the sanctity of the contract and a thorough understanding of the technology.[55] To the extent that a contract disappears or materially changes, lenders and investors have a non-recourse financing without a revenue stream to support it. The idea that utilities could sever a contract -- and the revenue stream upon which the financing is built -- is disturbing to the financial community. Lenders and investors expressed particular concern over some New York utilities' attempts to re-open negotiations on existing contracts. One lender expressed the concern by saying that "if there is one issue...in the industry right now that impedes the potential development whether it is renewable or otherwise, it is the assault on the sanctity of contract... These [project] financings rely on the predictability of cash flow and if you remove that predictability, you cast a significant cloud over it."[56]

The unfavorable memories, the lack of up-to-date information, and the general marketplace issues hamper a careful analysis of the risks of renewables. Banks, institutional lenders, and investors need good information around which to structure financing packages. Without good information, these financial institutions will either refuse to put money into a project, or will charge high interest rates and impose restrictive covenants as compensation for the risk they are assuming. The evaluation of risks associated with the power sales agreement is common to traditional and renewable energy projects, but, as discussin the previous chapter, can create problems that are more acute for renewables. Outside of the power sales agreement, the risks that the financial community sees as particularly relevant fall into two categories: fuel risks and technology risks.

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[55] Goldstein, *supra.*

[56] Reddy, *supra.*

FUEL RISKS

Much of the risks of renewable energy is related to fuel. The market views renewable fuels as less dependable, more awkward, and more expensive than gas delivered on a long term contract by pipeline to a power plant. Broadly, the financial community evaluates the predictability and consistency of resources, the reliability of resource supplies, and any additional costs of renewable energy facilities.

Predictability and Consistency of Resources

The market tries to predict and account for the chance of a major interruption in fuel supply. The recent drought in California left it cynical about the dependability of hydro. Wind speeds in California's Altamont Pass that have been up to 35 percent below average have increased concerns about wind availability. Similarly, contracts for wood supply tend to be short-term, offering less comfort to lenders.

In contrast, the marketplace is familiar and comfortable with long-term natural gas contracts with well-known, credit-worthy suppliers such as AMOCO, ENRON or EXXON. With such arrangements, explained one investor, "Your cash flows are locked in -- the power sales contract provides revenues and a long term gas contract locks in the outflows." Interestingly, the market appears not to credit the possibility of a major gas supply interruption as much as that of wind, biomass, or water supply interruptions.

Reliability of Resources and Additional Costs

Lenders and investors look for assurance that fuel supply is not only secure but also adequate to consistently generate power. They also assess whether the fuels require special handling or pre-processing that could be expensive or problematic and if the fuels could interfere with the facilities' operation. One equity investor from the Boston-based Energy Investor's Fund compared two deals his company had recently completed: one, a 34 MW wood-fired plant cost $60 million ($1.765 million per MW)

and the other, a 218 MW gas-fired facility, cost $220 million ($0.991 million per MW). The price difference, he said, could largely be attributed to the cost of solid fuel handling systems.

TECHNOLOGY RISKS

Technology risks color the way in which the financial community views many renewable energy projects. A representative from Morgan Stanley, a large New York investment bank with an active energy project finance department pointed out that, "Project finance is not in the business of funding new and untried technologies. That is the role of the venture capitalists."[57] A representative from one large institutional lender, GE Capital noted that he did not feel comfortable financing "serial numbers 001-009," of a technology. The lender said that he would rather wait until someone else has tested and proven the technology before investing his own funds.[58] A representative from Prudential Power noted that his company had invested in wind technology too early, at a time when "spare parts were not available, micro-siting was not done well, and the technology was not where it needed to be."

One investment banker, the managing director of Hicks and Morrison, cited the experience of a wind developer who won a power sales contract based on new, proprietary technology. This developer, however, was only able to obtain project financing only after agreeing to substitute his technology with a European technology with a longer track record.[59]

Even existing technologies that may have been proved overseas can face difficulties in obtaining finance. One project developer used a technology with a long record outside the United States. To cover for uncertainties from a less familiar track record, the senior lender required a substantial equity infusion from the manufacturer as well as strong guarantees from the manufacturer.[60]

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[57]Personal Communication, Carol Goldstein, Vice President, Morgan Stanley, February, 1994.

[58] Gonzalez, *supra*.

[59] Personal Communication, Jim Hicks, December 1993.

[60] Murley *supra*.

CONSIDERATION OF ZERO FUEL PRICE FOR RENEWABLES

Many proponents of renewable energy point to the fact that some technologies -- including wind, solar, and hydro -- have a zero fuel cost, as an attractive and low risk characteristic of renewable energy. These proponents argue that the wind, water, or sunlight will always be free, and are therefore a less risky investment than a gas, oil, or coal fired facility. Such conventionally fueled facilities are subject to the vagaries of politics, international boundary disputes, and wars.

The investors and lenders who provide the funds for renewable energy projects, however, conclude that the risk that renewable "fuels" -- be they water, wind, or sun -- will not be available is indeed greater than the risks of a long term gas contract. The financial community structures its deals to have a predictable cash flow with as little risk to its investment as possible. The fact that fuel prices are nil is less important than the risk that the fuel might not be available or that the technology might break down. One lender pointed out that there is indeed an opportunity cost when, in the case of wind farms, the wind is not blowing -- an asset is not producing the revenue that it could.[61]

Long term contracts for fossil fuels are deemed more reliable than an unenforceable long term contract with nature for sun, water, or wind. As a result, most renewable energy facilities in fact pay a premium over the interest rate that a gas or other conventionally fueled facility would pay.

FINANCING CONTRACT TERMS

In consideration of fuel and technology risks as well as the difficulty in obtaining reliable information, investors and lenders generally demand higher reserves, coverage, equity infusion and spreads for renewables. Although specifics vary among projects and technologies, one can nevertheless make some generalizations about the differences between renewables and conventionally-fueled facilities.

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[61] Reddy, *supra.*

Reserves

Lenders and investors often require renewable energy project developers to set aside reserves to insure against the risks of renewable energy resources, particularly the possibility of interrupted supply. "Where we might look for a $1 million reserve for renewables to compensate for fuel risks, we might not look for any fuel reserve for gas price risk because gas has a locked-in long-term contract," stated one equity investor.[62] Such a reserve ensures that the project could continue to operate despite unexpected increases in fuel prices from one short-term contract to the next. However, Prudential Power Funding sees reserves as "a two edged sword," preferring to focus on the need for renewable energy facilities to have higher net income to debt service coverage ratios.[63]

Coverage

While coverages have increased across the independent power industry, one investment banker pointed out that higher coverages are necessary to compensate primarily for fuel risks in renewable projects.[64] Prudential estimated that where coverage for a typical gas-fired facility five or six years ago was in the neighborhood of 1.2, it now approaches 1.4 for lenders. These ratios, while higher than a few years ago, are still lower than those for renewable energy projects which face coverage ratios of up to 2.5.[65]

Higher Equity Requirements

Equity requirements vary across the industry and depend on a variety of issues, including the richness of the power sales contract and the strength of fuel supply agreements. Recently, gas-fired facilities have tended to have an equity requirement of approximately 15%. However, reflecting the uncertainty of the fuel supply for some renewables as well as other risks, lenders will require many renewables to raise as much as 25% in equity. The higher cost of equity,

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[62] Murley, *supra.*

[63] Higgins, *supra.*

[64] Personal Communication, Jonathon Bram, Vice President, CS First Boston, February, 1994.

[65] *Ibid.*

relative to debt, contributes to the generally higher cost of financing renewable energy projects.

Spreads

The higher coverage requirements and higher equity requirements of renewable energy facilities make financing more expensive. Some observers in the field have noted that developers of renewable energy facilities often pay a premium rate for financing. One investment banker estimated that it is not uncommon for developers of renewable energy facilities to pay at least an additional point or more than do developers of natural gas or other facilities.[66]

Renewable energy facilities cost more to finance than conventional facilities. In large part, they cost more because bad experiences with the technology color the financial community's perception of the risk of investing in renewables. These bad experiences have centered largely on fuel, political, and technology risks. The financial community is concerned that the wind, biomass, sunlight, or water that is necessary to produce electricity will not be consistently available. The financial community also places a risk premium on new technology -- and many renewable energy technologies are still new.

[66] Hicks, *supra.*

CHAPTER VI -- CONCLUSIONS AND RECOMMENDATIONS

INFORMATION

Renewable energy technology evolves quickly. Yet frequently this rapid evolution makes renewables difficult and expensive to finance. Often the information about technological evolution is not available to those who invest in the energy projects. Or those who have invested in new renewable energy technology in the past have lost money and are nervous about doing so in the future -- even though technology may have improved. Inadequate or unfavorable information is a barrier to the development of renewables.

Four broad categories of information deficits create this financing problem: information about the sponsor companies, information about the technology, information about the fuel supply, and information about regulation.

Information About Sponsoring Companies

Independent energy producers are often privately held, thinly capitalized entities without the assured revenue stream and long track record that many utilities possess. There is frequently not good public information available about these companies. As a result, they raise money through the private placement market and the project finance process where investors and lenders analyze each project based on its own merits rather than analyzing the activities and reputation of the energy company's portfolio of projects. Project finance generally implies high interest rates and more intense project-by-project scrutiny than would happen under internal finance.

Information About Technology

Technology changes rapidly in the renewables industry. Yet because renewable energy power plants comprise a small part of most investors or lenders' total portfolio, most of these financial institutions do not find it worthwhile to keep close track of technology developments. As a result, some information that these financial institutions have at hand is outdated or inadequate.

Information About Fuel Supply

Financial institutions point to fuel supply risks as the paramount problem with renewable energy. Many renewable fuels are cheap, but their supply is less reliable than a long term gas contract. Financial institutions feel comfortable with established gas technology accompanied by a long term supply contract with a creditworthy entity. Such contracts are not now available for most renewables.

Information About Regulation

Financial institutions point to the inconsistent and changing treatment of contracts as a major deterrent to investment. Because many renewables are closer to the edge of economic viability than, for instance, gas turbines, they require a very long term certain contract. Gas or other fossil fuel contracts may be able to tolerate greater volatility in contract terms or prices while still remaining viable projects; some renewables may not have the same flexibility.

IMPLICATIONS

Renewables are a viable and valuable resource with a host of benefits, ranging from the fuel diversity that they promote to their environmental benefits. Many are also new technologies that bear burdens of high initial capital costs; the risk of investing in renewables, to judge by the perceptions in the financial community, remains greater than the risk of investing in conventional facilities. As a result, the project finance market is nervous about many renewable energy technologies. Regulators, utilities, and other energy policy makers can do a great deal to allay the concerns of the financial markets.

Long Term Secure Contracts

Renewable energy facilities require long term power sales contracts to provide a solid revenue stream upon which to build financing. The high capital cost of renewable energy facilities needs to be amortized over many years, or such facilities are too expensive to finance. Because financial institutions are putting up millions of dollars over 15 to 20 years, they must also feel that the revenue stream is secure. Without a secure revenue stream, renewable energy facilities are not financeable.

Establish a Track Record

Many renewables are hampered by their poor performance in the past. Yet as renewable energy technology has improved, it now needs a track record to prove to the financial community that it works well. Through set-asides, integrated resource planning, or through competitive bids structured to account for the benefits of renewables, regulators and utilities can help assemble that track record.

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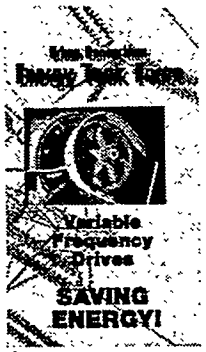

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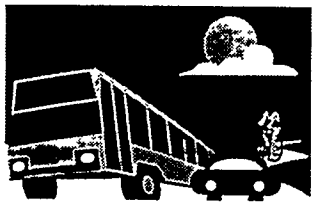

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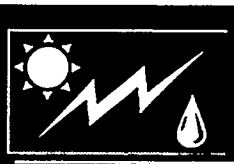

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- Save Money

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