Building a "Margin of Safety" Into Renewable Energy Procurements:

A Review of Experience with Contract Failure

CONSULTANT REPORT

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ABSTRACT

In implementing state renewables portfolio standards, utility purchasers and electricity regulators must confront the reality that signed renewable energy contracts will not always yield operational projects on the timeline given in the contracts themselves. Renewable energy projects may fail to achieve scheduled commercial operations for a variety of reasons, some of which are outside the control of both the purchasing utility and the renewable developer. If not addressed, this risk of *contract failure* could cause individual load-serving entities, or entire states, to fall short of their renewable energy targets. Based on a variety of data sources, this report summarizes potentially relevant experience with renewable energy contract failure from historical experience in California within the major investor-owned utilities' service territories; from a broad group of other North American electric utilities; and from government renewable energy contract and incentive auctions. The resulting sample is extensive, consisting of over 21,500 MW of renewable energy contracts. The report finds that contract failure rates vary considerably among utilities, across situations, and by technology. Though some of this experience is not entirely relevant to the contracting practices of today's electric utilities, the data suggest that a *minimum* overall contract failure rate of 20 to 30 percent should generally be expected for large solicitations conducted over multiple years. Failure rates much higher than these levels are supported by historical experience. Ongoing monitoring of contract failure is recommended. Moreover, as additional contracting experience is gained, it may be helpful to scrutinize the different approaches used by utility purchasers to mitigate contract failure, document early experience with those measures, and compare in some detail the approaches used in various jurisdictions.

KEYWORDS

renewable energy, power purchase agreement, contract failure, renewables portfolio standard, wind power, project status

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CHAPTER 1: INTRODUCTION

Policy Background

The California Renewables Portfolio Standard (RPS), established by Senate Bill 1078 (SB 1078, Chapter 516, Statutes of 2002, Sher) in 2002, calls for the state's investor-owned utilities (IOUs), energy service providers (ESPs), and community choice aggregators (CCAs) to meet 20 percent of their electricity load with eligible sources of renewable energy by 2017. The state's energy agencies have committed to an acceleration of the RPS such that the 20 percent goal is met seven years early, by 2010. Governor Schwarzenegger has endorsed this accelerated schedule and has set a goal of achieving a 33 percent renewable energy share by 2020 for the state as a whole; the California Energy Commission (Energy Commission) and the California Public Utilities Commission (CPUC) also support this aggressive target.

Much has already been accomplished under the state's RPS, and the state's three major IOUs – Pacific Gas and Electric Company (PG&E), Southern California Edison (SCE), and San Diego Gas and Electric (SDG&E) – have recently signed a large number of contracts for renewable energy capacity. Through interim renewable solicitations in 2002, bilateral contracts, and 2003-04 requests for offers (RFOs), these three utilities have signed contracts for roughly 1,700 – 3,000 MW of new or repowered renewables capacity, depending on the exercise of expansion options.[1] If each of these new projects achieves commercial operations, total deliveries could equate to 3.1 to 5.4 percent of the IOUs' combined 2004 electricity load.[2] All three IOUs are now proceeding with their 2005 RFOs.

Nonetheless, the state as a whole has fallen behind schedule in meeting its aggressive renewable energy targets, and few new renewable energy projects have achieved commercial operations over the last several years.[3] The recent and ongoing contracting efforts of the state's utilities may help overcome this shortfall, but it takes time for new renewables projects to be built, and concerns have been raised that some – perhaps many – of these contracts may not yield operational renewable energy projects on the timeline given in the contracts themselves.

Projects may fail to achieve scheduled commercial operations for a myriad of reasons, many of which are outside the control of the purchasing utility and some of which are outside the control of the renewable developer. If not addressed, this risk of *contract failure* could cause individual load-serving entities, and the state as a whole, to fall short of their renewable energy targets. Though a number of procurement strategies can be used to reduce the risk of contract failure, even these strategies cannot eliminate the possibility of unfulfilled contracts, and some of these strategies may have the unfortunate effect of reducing the number of renewable energy bids and raising bid prices.

The possibility of contract failure was raised as a serious concern of RPS stakeholders in a report commissioned by the Energy Commission[4] and was recently reiterated in a report prepared for the CPUC.[5] To accommodate this risk, the Energy Commission's 2005 Integrated Energy Policy Report recommends that the CPUC require that the state's IOUs procure a prudent contract-risk margin, noting that a 30 percent over-procurement margin might be an appropriate starting point but that the margin should be revised over time to reflect actual experience.[6] In its report to the CPUC, the Center for Resource Solutions recommended additional clarification of the state's rules for flexible compliance and penalties in the event of contract failure and that the CPUC consider encouraging or even requiring some level over-contracting.[7]

In requiring the IOUs to submit supplements to their long-term renewable procurement plans (D.05-10-014, October 6, 2005), the CPUC decided that a margin of safety in procurements was needed to guard against the possibility of contract failure and other contingencies (for example, attrition of the baseline, load uncertainty, and so forth). The CPUC therefore required the utilities to make an initial quantification of their "margin of safety" in RPS procurement. More recently, the CPUC established the requirements for the IOUs' 2006 procurement plans (R.04-04-026, November 9, 2005), mandating that these plans include an analysis of contracting above the 1 percent incremental procurement target (IPT) and presumptively instituting a 20 percent over-contracting target for 2006. The ruling also allows the utilities to provide analytic justification for proposing a different contracting level.

The major IOUs agree that there is some risk that not all renewable energy contracts will come to fruition and that there is therefore a need for some over-procurement but generally believe that such over-procurement should be at the discretion of utility management. In its supplemental long-term renewable procurement plan, SDG&E explains that it has a strategy of trying to meet 24 percent of its load with renewable energy by 2010 to account for this risk. SCE argues that mandated over-procurement is neither necessary nor appropriate, noting in part that little data on the appropriate level of over-procurement has been provided, that any margin of safety should be utility- and project-specific, and that SCE is fully capable of applying its own acumen to analyze and account for this risk on a going-forward basis (SCE also notes that transmission is likely to be the major cause for project delay and that addressing this issue should be the top priority). Similarly, PG&E maintains that it should be allowed to use reasonable judgment in deciding how much to over-procure, arguing that more flexibility is needed and that each RFO is unique and therefore that over-procurement should be based on the design and results of each individual solicitation.[8]

Objectives

Based on a variety of data sources, including a large number of interviews, this report summarizes potentially relevant experience with renewable energy contracts and contract failure from: (1) historical experience in California within the major

IOUs' service territories; (2) other North American electric utilities; and (3) government auctions of renewable energy contracts or incentives. Though available data are somewhat spotty in places, our sample is nonetheless extensive, consisting of more than *21,500 MW* of renewable energy contracts.

The purpose of this report is to provide data and context that may help the Energy Commission, CPUC, load-serving entities, and other RPS stakeholders in further deliberations on contract failure. More specifically, the goal is to provide data that may help inform the development of appropriate over-procurement margins, as well as possible approaches to lessen the risk of contract failure. This report does not offer specific policy or procurement recommendations. Instead, we seek to impartially report the experiences of other utilities and entities in contracting for renewable energy in the hope that California's IOUs and energy agencies can learn from these experiences.

We acknowledge that this report presents data that, while informative, do not represent the last word on those matters. We place particular emphasis on data that may be relevant to the present California IOU procurement processes but recognize that each procurement and project is different, and that much of the data presented here may not be directly relevant to the solicitation approaches currently being used by the state's IOUs. Additionally, time and budget constraints required that we not dig too deep into the experiences reported here; so though we are able to offer summary information, we are not able to provide detailed reviews of the failure rates, mitigation strategies, and experiences of individual utilities. Similarly, we are unable to link specific mitigation strategies with lower failure rates, to separate the influences of solicitation design and overall market conditions on failure rates, or to provide specific recommendations on which of the mitigation approaches might be most effective. We encourage readers of this report to identify inaccuracies in the data or interpretations that are presented in the pages that follow.

The remainder of this report is organized as follows:

- **Chapter 2** describes the methodology used to collect data, the specific sources and types of data that we sought, and the categorization that we use to identify the types of, sources of, and mitigation options for contract failure.
- **Chapter 3** summarizes the results of the various data collection efforts, reporting on experience from California, from other North American utilities, and from government-run auctions for renewable energy.
- **Chapter 4** draws some limited conclusions based on the data we were able to collect.
- **Appendix A** reproduces the rough interview guide used to collect data from other North American utilities.

CHAPTER 2: METHODOLOGY

Scope and Sources of Data Collection

Any attempt to apply experiences in renewable energy contracting from outside California to the present practices of the state's IOUs is fraught with difficulty because of the unique attributes of the California market and utility RFOs. California has a long history with renewable energy, a large installed base of renewables capacity, and a wide diversity of renewable resources. It also has perhaps the most aggressive RPS policy in the nation in terms of new capacity and contracting requirements, and faces more stringent siting and permitting processes than many other jurisdictions. The specific design of recent and ongoing utility renewable energy RFOs in the state also differ, to some degree, both among themselves and with the procurement practices used elsewhere.

We sought information on renewable energy contract failure from as many potentially relevant experiences as possible, recognizing that some of these are more germane than others. Data that we collected can be categorized as follows:

1. **California IOU Experience:** This includes historical experience with Qualifying Facilities (QF) in the state, the Energy Commission's production incentive auctions, and early experience from the three major IOUs' recent renewables contracting efforts. Data were obtained from a variety of publicly available reports and regulatory filings, as well as brief interviews with PG&E and SCE.[9]
2. **Other North American Utility Experience:** We interviewed 25 other electric utilities known to be active in renewable energy contracting. Utilities were selected based on known activity, geographic and commercial diversity, and ease of contact. This group included IOUs from other states, publicly owned utilities (POUs) from across the country (including California), federal power agencies, and a government utility in Canada. Data were obtained primarily from telephone interviews with utility staff or employees, but were augmented with public documents in several cases. Where not unduly difficult, we also sought publicly available data to confirm interview responses. Information was typically obtained about the utilities' contracting efforts in the 1999 to 2004 timeframe because more recent contracts will not have had a chance to fail, and earlier contracts are fewer in number and potentially less relevant. Nonetheless, we did identify a source of information on earlier contracts, and we do report data from that source. See Table 1 for a list of utilities (and other entities) that we interviewed.
3. **Government Contract Tenders and Incentive Auctions:** Though somewhat less relevant, we collected data from government entities in the United Kingdom, Ireland, and France that have run tenders for long-term renewable energy contracts. We also collected information on certain solicitations administered by state renewable energy funds that have offered incentive funding to renewable

energy projects, including those in New York, Pennsylvania, New Jersey, and Massachusetts. Data were collected from public reports and from e-mail and telephone contacts with the organizations administering the programs.

Table 1. Other North American Utilities Surveyed	
Utility	**Type**
California and Nevada	
Sacramento Municipal Utility District (SMUD)	POU
Los Angeles Department of Water and Power (LADWP)	POU
Sierra Pacific/Nevada Power	IOU
Midwest/Mountain West	
We Energies	IOU
Alliant	IOU
Mid-American	IOU
Wisconsin Public Service	IOU
Xcel Energy	IOU
Great River Energy	POU
East/Southeast	
New England Power Company	IOU
Jacksonville Electric Authority (JEA)	POU
Texas	
TXU	IOU
Reliant	IOU
CPS Energy (San Antonio)	POU
Austin Energy	POU
Southwest	
Arizona Public Service (APS)	IOU
Public Service Company of New Mexico (PNM)	IOU
Tuscon Electric Power (TEP)	IOU
Salt River Project (SRP)	POU
Pacific Northwest	
PacifiCorp	IOU
Bonneville Power Administration (BPA)	Government
Portland General Electric (PGE)	IOU
Hawaii	
Hawaiian Electric Company (HECO)	IOU
Kauai Island Utility	POU
Canada	
Province of Ontario, Ministry of Energy	Government

Comment: CPS Energy and TXU are the official names of these companies. They are not acronyms. (CPS was, but no longer is) I put San Antonio in parenthesis to make it more obvious.

Type of Data Sought

The data collection focused on information about renewable energy contracts, or power purchase agreements (PPAs). Regardless of the approach to data collection (whether via telephone interviews or public reports), we generally sought four basic types of information:

1) motivation and context for the renewable energy contracting effort;
2) renewable energy project and contract status, and contract failure rates, by resource type and by failure type;
3) reasons for contract failure; and
4) approaches used to reduce the risk of contract failure.

The interviews with North American utilities followed a loose interview guide that allowed us to systematically collect, aggregate, and present these data (see Appendix A).[10] Where public reports and filings were used, however, we were often unable to assemble comprehensive information on each of these issues and instead sometimes rely on qualitative and selective descriptions.

Categorizing Project Status and Types of Contract Failure

For the purpose of data collection and presentation (and as reflected in the interview guide presented in Appendix A), it is important to classify project status and define different types of contract failure. Five different types of project status are used here:

- Currently on-line and performing as expected (Online)
- Not currently on-line, but still on schedule to come on-line (Scheduled)
- Currently on-line but not performing to contract terms (Default)
- Significantly delayed, but may still come on-line at some point (Delayed)[11]
- Contract canceled altogether (Canceled)

In defining contract failure, the first two categories (Online and Scheduled) are typically considered *successful* contracts. Note that this approach may overestimate project success rates (and underestimate failure rates) in that some scheduled projects may face unforeseen difficulties.

The next three categories (Default, Delayed, and Canceled) are considered *failed* contracts, but they represent distinctly different types of contract failure with very different ramifications for the purchasing utility. Canceled projects never result in deliveries, while delayed projects may ultimately yield deliveries, and projects in default may simply be delivering less than that which was contracted. Because of these important distinctions, where possible we report data on all three types of contract failure. We were unable to track, due to lack of data, past delays in projects that are currently on-line.

Categorizing the Causes of Contract Failure

Where possible, we also sought information on the causes of contract failure. Systematic information on the causes of contract failure was consistently collected only through our utility interviews, though qualitative information on this subject is reported elsewhere as well. Recognizing that projects (and their contracts) can fail for more than one reason, we allowed utilities to identify multiple causes.

Although we allowed for other responses, in the interviews we specifically asked which of the following failure causes were more significant:

- **Failure to site or permit the project** (Site and Permit): This may include local opposition to the project, failure to obtain site control (leases or ownership) of the project location, or failure to obtain appropriate permits.
- **Interconnection or transmission problems** (Transmission): Many developers underestimate the complexity, cost, or time required to address transmission and interconnection issues.
- **Financial failure of generator/developer** (Developer Finance): A developer may be unable to obtain financing for a project or may need to walk away from a project because the cost of financing has increased or because of the bankruptcy or other financial problems of the developer.
- **Lack of credit-worthy purchaser** (Utility Finance): In some instances, the utility (or other entity) responsible for purchasing power from the project may not be creditworthy, making project financing more difficult and costly, and putting the project at risk of failure.
- **Availability and/or cost of resource** (Resource Availability): Lack of verified resource availability can yield contract failures, as can an escalation in the expected cost of the fuel supply.
- **Increases in capital costs** (Capital Costs Increase): Recent wind turbine price increases are often mentioned as a prime contributor to contract failure. Other technologies can also suffer from increased capital costs after contract signature.
- **Technology issues** (Technology): This category covers any sort of technology issue that can lead to contract failure.
- **Project delay results in loss of subsidy** (Subsidy Issues): The on again/off again nature of the Production Tax Credit (PTC) for the past few years has made the availability of subsidies a serious problem for the wind industry. A delay could mean loss of subsidies, leading to contract cancellation.

Of course, in many cases these failure categories can interact with each other. A developer could have a delay brought on by transmission issues (or permitting), for example, resulting in not being able to secure a turbine order as scheduled. Turbine prices may then rise, leading to project cancellation due to price increases.

Categorizing Mitigation Strategies

One would expect that the degree of contract failure would be heavily influenced by the procurement strategies of the purchasing party. If that party uses extreme measures to ensure project success, then success rates will increase and failure rates will fall.

The final step of our data collection was therefore to describe, qualitatively at least, the approaches used to lessen contract failure. Though we again allowed for other responses, the strategies that we pre-identified for data collection purposes are listed below:

- **Strict pre-conditions for proposal submission** (Strict Pre-Conditions): The purchasing party could impose strict pre-conditions for proposal submission in order to ensure that only viable projects bid. These could include (for example) a demonstration of complete site control, wind turbine availability, having all permits in hand, or use of a technology with a proven track record.
- **Proposal submission fees** (Submission Fees): These are fees required upon proposal submission, or upon selection for the short list. Similar to pre-conditions, the purpose is typically to ensure that only serious proposals are submitted.
- **Request for qualifications** (RFQ Process): An RFQ process, like submission fees and pre-conditions, is intended to ensure serious bidders. The RFQ imposes an additional step on developers, as they must first demonstrate their qualifications before being allowed to bid.
- **Due diligence**: Due diligence involves evaluating projects on non-economic terms, and can range from a cursory review of an application to an extremely in-depth evaluation of the likelihood of a project meeting its obligations if offered a contract.
- **Waiting list**: By keeping a few proposals in reserve as "backups" in case one of the signed contracts fails, the use of a waiting list can lessen the effects of contract failure.
- **Pre-operation milestones with deposit** (Pre-operation Milestones): The purchasing party may impose deposit requirements on the developer upon contract signature or at some other point, with the deposit forfeited if the project fails to achieve certain pre-operation milestones (for example, obtaining permits, ordering major capital equipment, construction start, and so forth.).
- **Operational performance guarantees** (Performance Guarantees): These are contractual terms that force the developer to pay the utility damages if the project fails to perform as specified in the contract, either by failing to achieve commercial operations on schedule or by not meeting production expectations.
- **Project ownership options** (Ownership Options): This strategy involves contractual language that allows the utility to step in and assume ownership of a project that is in trouble, or RFOs that solicit utility ownership options in addition to PPAs.

Confidentiality

Telephone interviewees were told that the report would be made public, and that they should therefore not divulge confidential or sensitive information. To further reduce the potential release of sensitive information, in this report we provide aggregate data and anecdotal information from each utility interview and not detailed data specific to individual utilities. Two respondents were not comfortable providing details about their renewable contracts, even when assured that their data would be displayed only in aggregate form. The vast majority of respondents were forthcoming and generously gave of their time, information, and opinions.

Data Rounding

Through the remainder of the report, data contained in Tables and Figures includes rounding resulting in minor discrepancies where totals may not add correctly.

CHAPTER 3: SUMMARY AND ANALYSIS OF DATA COLLECTED

This chapter comprehensively presents the data that we were able to collect. We start by reviewing the experience of California's IOUs with renewable energy contracting and contract failure, including Qualifying Facilities during the 1980s and 1990s, the Energy Commission's production incentive auctions, and the IOUs' recent contracting efforts. We then turn to a summary of experience from other North American utilities, which is arguably the most relevant of the data presented in this report. We end by highlighting experience with government-run renewable energy tenders and incentive solicitations.

Historical California IOU Experience

As historical leaders in renewable energy development, California's major IOUs possess a wealth of experience with renewable energy contracting and contract failure. Despite that fact, California's experience is, by and large, either dated or too recent to yield conclusive results or otherwise bears little resemblance to the present contracting practices of the state's IOUs. Though we present potentially useful data here, we emphasize that the more relevant experience arguably comes from the contracting practices of other utilities (presented in the next major subsection).

PURPA QF Experience

California aggressively implemented the Public Utility Regulatory Policies Act of 1978 (PURPA) through a variety of standard offer contracts offered by the state's IOUs in the 1980s. By 1986, roughly 16,000 MW of eligible QF projects had received contracts under these programs (primarily Standard Offer #2 and Interim Standard Offer #4, which were suspended in March 1986 and April 1985, respectively). This 16,000 MW included fossil cogeneration facilities, as well as renewable facilities. Many of the facilities receiving contracts under PURPA were required to come on-line within five years, though some extensions were offered.

According to the Energy Commission's 1994 Electricity Report[12], on-line QF and self-generation capacity at that time was roughly 11,100 MW, equating to an overall success rate of 69 percent (and a failure rate of 31 percent). Some of the operational projects had faced delays, however, and the overall success rate would be lower (and the failure rate higher) were those delays taken into consideration.

Focusing just on the renewable energy QF capacity under contract to the state's three largest IOUs, success rates were even lower (and, correspondingly, failure rates were higher). Table 2 presents data on renewable QF capacity under contract to these utilities in the first quarter of 1987 and operational as of the third quarter of 1995. Of nearly 9,000 MW of renewable QF contracts, about 4,100 MW were operational as of 1995, a success rate of just 45 percent. Geothermal and solar projects had relatively higher success rates, at 84 percent and 58 percent respectively, while hydro, biomass, and wind had lower success rates of 40 percent or less. Even among those projects that did achieve commercial operations, a number of projects – especially biomass facilities – were unable to maintain operations as originally expected due to technical issues and fuel unavailability.

Table 2. Success Rates for California Renewable Energy QF Contracts[13]

Technology	Signed Contracts (MW) [1st Quarter 1987]	On-line Projects (MW) [3rd Quarter 1995]	Success Rate (%)
Wind	4,120	1,641	40%
Biomass/Biogas/Solid Waste	2,098	829	40%
Geothermal	999	841	84%
Hydro	1,127	391	35%
Solar	636	368	58%
TOTAL	**8,980**	**4,070**	**45%**

Throughout the late 1980s and early 1990s, the Energy Commission, as well as other parties, used a variety of approaches to predict what fraction of the QF contracts would likely result in operating projects, and over what timeframe. The Energy Commission used, in part, statistical analysis of past completion rates to predict future success. Though we did not seek information on the specific nature of those calculations, it is clear that the Energy Commission, the state's IOUs, and the state's independent power producers all recognized that many projects with signed QF contracts would not ultimately succeed.

Though informative, we do not believe this experience is altogether relevant in today's market conditions. The QF contract rush occurred at the very beginnings of the renewable energy industry in the state, and developers were sometimes poorly capitalized and ill-equipped to develop commercial projects. The contract rush also resulted from high and profitable power purchase agreements available from the state's IOUs on a "first-come" basis with few qualifications or barriers. Unlike the present contracting efforts of the state's IOUs, few attempts were made to reduce the risk of contract failure (the QF projects at the time did not face extensive due diligence, bid deposits, performance guarantees and so forth). These factors suggest that the failure rate of the QF contracts may be higher than one would expect today.

On the other hand, the QF contracts were attractively priced, ensuring that developers would have every reason to push their projects to completion. In addition, projects at the time did not always face the same siting, permitting, and resource supply competition issues faced by renewable energy developers today. These factors suggest that historical QF failure rates could in fact be *lower* than might be expected in the present contracting environment. Because of these opposing influences, one cannot say *definitively* whether this historical experience documents failure rates that are likely to be lower or higher than might be experienced today.

California Production Incentive Auctions

To support utility-scale, grid-supply renewable energy projects in California, the California Energy Commission held three auctions of five-year production incentives between March 1998 and June 2001, awarding a total of approximately $242 million to 81 projects representing about 1,300 MW of capacity. Twelve projects (15 percent) were subsequently canceled due to an inability to meet funding milestones, while 47 projects (58 percent) have come on-line, leaving 22 projects (27 percent) still pending. In capacity terms, 38 MW (3 percent) have been canceled, and 488 MW (37 percent) have come on-line, with 777 MW (60 percent) still pending. Table 3 breaks down project status by technology.

Table 3. Status of Energy Commission's New Renewable Facilities Program, through June 2005[14]

Technology	Total		On-line		Canceled		Delayed/Pending	
	Projects	MW	Projects	MW	Projects	MW	Projects	MW
Biomass	3	19	2	11	1	8	0	0
Digester Gas	1	2	1	2	0	0	0	0
Geothermal	4	157	2	59	0	0	2	98
Landfill Gas	27	77	14	36	10	27	3	13
Small Hydro	5	33	3	31	0	0	2	2
Waste Tire	1	30	0	0	0	0	1	30
Wind	40	986	25	348	1	3	14	635
TOTAL	**81**	**1306**	**47**	**488**	**12**	**38**	**22**	**777**

To receive the full five-year production incentive, projects from the first auction were originally required to be on-line before the end of 2002, projects from the second auction prior to the end of 2001, and projects from the third auction by July 2003. Though legislation subsequently extended those deadlines for projects that could demonstrate that the delays resulted from circumstances beyond their control, it is nevertheless clear that those projects that are still pending (i.e., 27 percent of all projects, representing 60 percent of all capacity) are well behind schedule. The principal reason for the delays is that projects have been unable to secure power purchase agreements that would allow the projects to proceed.[15] This situation was greatly exacerbated by the electricity crisis that roiled the market in 2000-01 and pushed the state's largest investor-owned utility into bankruptcy. Looking ahead, at least some of these pending projects will likely be built to supply California's RPS; these projects will then choose between receipt of their production incentive award or any available supplemental energy payments.

Although the highly abnormal market conditions that appeared in 2000-01 would have inhibited the development of many of these projects regardless of the stringency of the auction process, it is worth noting that the Energy Commission auctions were not intended to guarantee project completion. Instead, they were price-oriented auctions open to any eligible renewable technology, with relatively lenient milestones and relatively lenient measures to reduce the risk of contract failure.[16] For this reason, and because production incentives by their nature offer only a portion of the overall revenue requirements of a renewable facility (unlike PPAs), we believe that the degree of project success/failure under this Energy Commission program offers relatively little guidance for the future of utility renewable energy RFOs in the state.

Recent IOU Contracting Efforts

California's IOUs have recently embarked on one of the most aggressive renewable energy contracting efforts witnessed internationally since California's experience with QFs in the mid-1980s. Some experience with contract failure is now available from these early efforts, and a significant level of project delay and possibly failure appears likely. Experience is limited, however, and much more data will be available in the coming years.

PG&E

PG&E has signed renewable energy contracts through its 2002 interim solicitation, its 2004 renewable energy RFO, and through bilateral negotiations. PG&E's most recent contracting experience includes three new and one repowered wind projects from its 2004 RFO (195-233 MW) and two pre-existing but currently inoperable biomass projects (18 MW). Because contracts for these projects have only recently been signed, and all but one have on-line dates of 2006 or later, it is too early to know whether they will all succeed in achieving commercial operations without delay.[17]

PG&E also signed contracts under its 2002 interim solicitation and via bilateral negotiations in 2003 and 2004. With the exception of two wind repowers, these contracts were with existing renewable generators for which the risk of contract failure should be near zero. Of the two wind repowering contracts, one 18 MW project is now on-line, and the other 37.6 MW contract has been cancelled (though the associated project won a new contract under PG&E's 2004 RFO).

More generally, PG&E reports that biomass fuel availability and wind turbine availability and cost appear to be the most significant risks for their current projects, and that a key challenge is to walk the fine line between making contract terms stringent enough to reduce the risk of contract failure, but not so stringent as to reduce competition and inflate prices.

SCE

SCE aggressively signed contracts for new renewable generation based on its 2003 RFO, with eight contracts totaling 664 – 1,353 MW of capacity. These projects have had signed contracts for a brief period, and contract failure cannot yet be comprehensively assessed (when signed, the projects had expected on-line dates of late 2006, at the earliest). However, in its supplement to its long-term renewable procurement plan filed on December 7, 2005, SCE notes that *at least* six of these eight projects are unlikely to achieve commercial operations by 2010, due in large part to the time requirements for transmission expansion. This suggests that at least six of the eight contracts (75 percent) will, at a minimum, experience significant delay relative to originally planned on-line dates.[18]

SCE also signed four wind repowering contracts in 2005 (37 MW); SCE believes that all four are currently on-track. SCE's interim solicitation in 2002 yielded a number of additional contracts, four of which were for new renewable generation (the majority of the contract capacity was for existing geothermal capacity from the Geysers). Of those four contracts, two have subsequently failed: the 5 MW TrueSolar project, which ultimately failed to gain regulatory approval from the CPUC; and a large North American Power Group biomass facility, which apparently also failed to receive needed regulatory approvals from the CPUC for siting purposes. The other two projects are small (2.5 MW each) landfill gas facilities that are currently on-line. These data suggest, on a project basis, a failure rate of 50 percent.

In discussion, SCE reiterated the need for new transmission as its main concern. Of particular concern is that transmission upgrades have a four- to seven-year time horizon, while the PTC only has a two-year time horizon. SCE also noted that wind turbine prices have risen dramatically, in part due to the boom-and-bust cycles created by the PTC, putting wind projects at some risk. Finally, SCE mentioned that the acceleration of the RPS targets to 20 percent by 2010 could further aggravate contract failure rates, as utilities are required to go deep into the pool of possible projects and potentially sign up projects that are earlier in the development cycle.

SDG&E

Under its 2004 RFO, SDG&E signed contracts with 524 – 1,124 MW of new renewable generation capacity. Because contracts for these projects have only recently been signed, and most presumably have commercial operation dates of 2006 and later, it is too early to know whether they will succeed in achieving commercial operations without delay. In 2004, SDG&E also signed contracts through bilateral negotiations with a 4.5 MW hydro facility, a 45 MW biomass project, and a 51 MW wind project, with expected on-line dates late-2005, late-2006, and mid-2006, respectively. We understand the 51 MW wind project to be on schedule but that the biomass project now has a projected on-line date of mid-2007; we are not aware of the status of the hydropower project.

Of more relevance, SDG&E signed 15 renewable energy contracts under its 2002 interim renewable energy solicitation, many of which called for the construction of new renewable generation facilities (CPUC Resolution E-3867). Though details on each of these contracts are not publicly available (and SDG&E did not respond to our interview attempts), some information can be gleaned from public sources. According to an October 19, 2004, factsheet provided on SDG&E's Web site[19], for example, only 12 of these contracts were apparently still in force as of that date, of which only six are clearly identified as new projects. Assuming that three projects did indeed fail, that those projects were to be newly constructed, and that the other six projects have achieved commercial operations, SDG&E's overall success rate for new project contracts under its 2002 RFO was apparently 67 percent on a project basis (six out of nine; information on the capacity of the failed contracts is not public). Five of the six new projects did, however, experience delays before achieving commercial operations (CPUC Resolution R-3867 and R-3883), representing 102 MW of the 110 MW of new capacity under contract at that time (83 percent of the new projects and 93 percent of the capacity experienced delays).[20] All six projects are apparently now operational.[21]

The result of these delays and failures was that SDG&E's actual incremental deliveries contributed 70 percent and 50 percent of the predicted amount for 2003 and 2004 had all projects operated as originally scheduled.[22] According to SDG&E's latest RPS compliance filing, 2005 incremental deliveries are expected to be approximately 70 percent of the projected level had all of the contracts from its 2002 interim solicitation resulted in on-schedule deliveries.

Summary

Each of the state's IOUs is making efforts to reduce the risk of contract failure. Due diligence is conducted by each utility, proposal submission (or short-list) fees of various forms have been required, credit requirements are imposed, pre-operation deposits and milestones have been established, and operational performance guarantees are in place. Many of the details of these requirements are not made public, however, and are often subject to private negotiation among the parties. Additionally, the state's utilities do not take a uniform approach to these requirements and evaluation protocols, and the level of stringency applied is the subject of significant utility discretion.

What is clear is that the tools used by the state's IOUs to date to reduce the risk of contract failure have not been altogether successful. It may be useful in the future to more carefully scrutinize the different approaches used by the state's IOUs to reduce contract failure, document early experience with those various measures, and compare in some detail the approaches used in California with those applied in utility solicitations elsewhere in North America. Given that measures to combat contract failure may often have the unfortunate effect of restricting competition and raising bid prices (both of which would be to the detriment of the state's ratepayers), we strongly recommend that any further efforts to explore the practices of the state's IOUs to reduce contract failure consider these countervailing influences as well.

Other North American Utility Experience

Other North American utilities have considerable recent experience with renewable energy contracting, and contract failure. Before conducting our own interviews with these utilities (listed in Table 1), we performed a limited literature search to assess whether similar information had been gathered previously.

We identified one dated, but relevant, study that was completed on behalf of Hydro-Quebec in 1994.[23] The author of this paper completed a utility survey quite similar to our own. Excluding utility "pioneers" (which include the California IOUs, reported earlier, and Maine), data for that study came from 21 utilities that had procured renewable energy through competitive (and often all-source) solicitations and standard offer contracts in the late 1980s and early 1990s. A total of 318 renewable energy contracts representing 2,333 MW of renewable capacity are included in the sample; contract success rates are summarized in Table 4. Success rates, as defined by on-line projects at the time of the survey, averaged 83 percent on a project basis and 60 percent on a capacity basis. Considering on-line projects and those still under development, success rates are even higher: 93 percent on a project basis and 92 percent on a capacity basis.

Table 4. Success Rates for Historical Utility Renewable Energy Contracts

Technology	Signed Contracts		On-line Project Success Rate (%)		On-line and Under Development Project Success Rate (%)	
	Projects	MW	Projects	MW	Projects	MW
Biomass	46	898	57%	45%	85%	87%
MSW	33	815	76%	85%	88%	93%
Hydro	173	358	91%	83%	97%	99%
Wind	66	262	82%	4%	91%	94%
TOTAL	**318**	**2333**	**83%**	**60%**	**93%**	**92%**

Though a relatively large sample, this early experience is not altogether relevant in today's market conditions, for the same reasons as presented earlier for the California PURPA QF results. Because of this, we chose to conduct our own survey of more recent utility experience with renewable energy contracting.

Utility Respondents and Contracting Context

Fifteen IOUs, eight POUs, and two government entities were interviewed for this report. Of those, four IOUs are not included in the data presented below because they either own their renewable assets or had only contracted with *existing* renewable energy plants, leaving a total pool of twenty-one respondents.

Each interview started by asking how many distinct renewable energy RFOs the respondent utility had issued in recent years. Where more than one RFO had been issued, data were entered separately for each RFO. This explains why 21 respondents produced 29 separate data points in some of the results that follow (each data point represents a distinct RFO, or in the event that a utility did not use an RFO process, the utility's entire renewable contracting experience).

As shown in Table 5, in all, nineteen utilities report that they have issued twenty-five distinct RFOs for renewable energy; five of these RFOs resulted in no signed PPAs[24], but are included in the present study because they provide additional data on approaches used to mitigate the risk of contract failure. The other four data points came from utilities that had chosen to purchase some of their renewable energy through processes other than an RFO (i.e., bilateral negotiations). Utility respondents reported that they had signed 74 power purchase contracts for renewable energy, 81 percent of which derived from an RFO process. These contracts represent 2,857 MW of renewable energy capacity, 76 percent of which came through RFOs.

Eighteen utility respondents were seeking only PPAs with renewable energy developers, while one respondent was looking only for projects to own, and one other was seeking to purchase only unbundled RECs. One utility was seeking either PPAs or project ownership.

Table 5. Summary Information on Utility Respondents and Renewable Energy Contracting

Number of usable utility respondents	21
Number of utilities that relied upon at least one RFO	19
Number of distinct renewable energy RFOs	25
Number of non-RFO contracting efforts	4
Number of total renewable energy contracting "data points"	29
Number of RFOs that resulted in no PPAs	5
Number of utilities only seeking renewable energy PPAs	18
Number of utilities only seeking project ownership	1
Number of utilities only seeking unbundled RECs	1
Number of utilities seeking PPAs or project ownership	1
Number of signed renewable energy contracts	74
Megawatts of signed renewable energy contracts	2,857

Motivation for Renewable Energy Contracting

The dominant motive for renewable energy contracting among our sample is RPS requirements (16 data points, representing 1,938 MW of capacity). Internal utility renewable energy targets (five data points, representing 459 MW of capacity),[25] integrated resource plans (five data points, representing 285 MW), and voluntary renewable energy demand (three data points, representing 175 MW) were also identified. Table 6 shows the contract motives.

Table 6. Contract Motives				
Motive	**Number of Data Points**	**Percentage of Data Points**	**Capacity (MW)**	**Percentage of Capacity**
RPS	16	55%	1938	68%
Internal Target	5	17%	459	16%
IRP	5	17%	285	10%
Green Power	3	10%	175	6%

Technology Selection

Of the 74 renewable energy contracts, wind power was the overwhelming technology of choice, representing roughly half of all of the contracts and 85 percent of the renewable energy capacity under contract. Wind was followed by landfill gas, with 20 percent of the projects and 3 percent of the capacity. Geothermal, biomass, solar, hydropower, and other[26] all had three to five signed contracts each, and 1 to 5 percent of the contracted capacity. (See Figure 1 and Figure 2). The dominance of wind in our sample makes it somewhat difficult to extrapolate the results of our research to technologies other than wind.

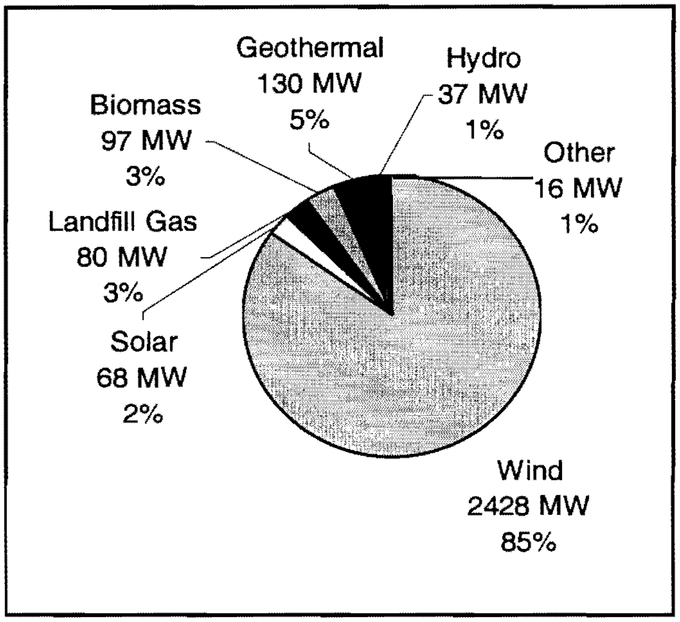

Figure 1. Total Contract Capacity (MW), by Technology

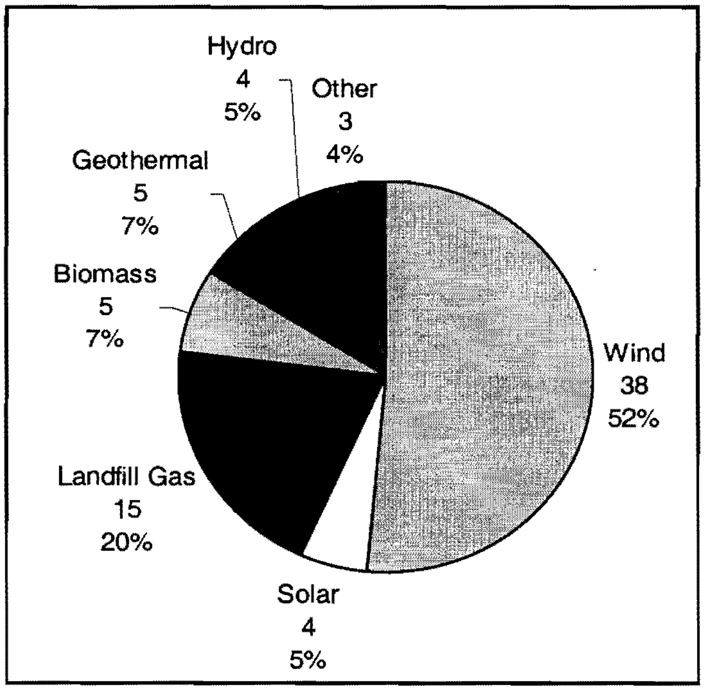

Figure 2. Total Number of Contracts, by Technology

Aggregate Contract Status and Success Rates

Just over *half* of the seventy-four renewable energy contracts in our overall sample can be categorized as successful (defined as projects that are either on-line or are scheduled to come on-line on schedule), whether represented by capacity (53 percent; 1,521 MW out of a total of 2,857 MW) or by number of projects (51 percent; 38 out of 74 projects). These results are shown graphically in Figure 3 and Figure 4. This success rate may drop to the extent that currently on-schedule projects ultimately fail to meet their schedules, or are unable to come on-line. On the other hand, if projects that are currently experiencing significant delays or are in default, achieve commercial operations at expected production levels, then the success rate could rise.

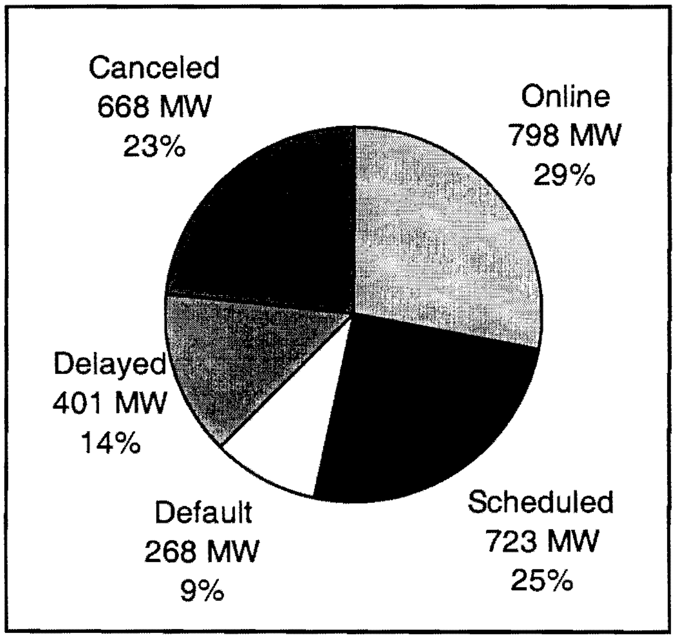

Figure 3. Contract Status, by Capacity (MW)

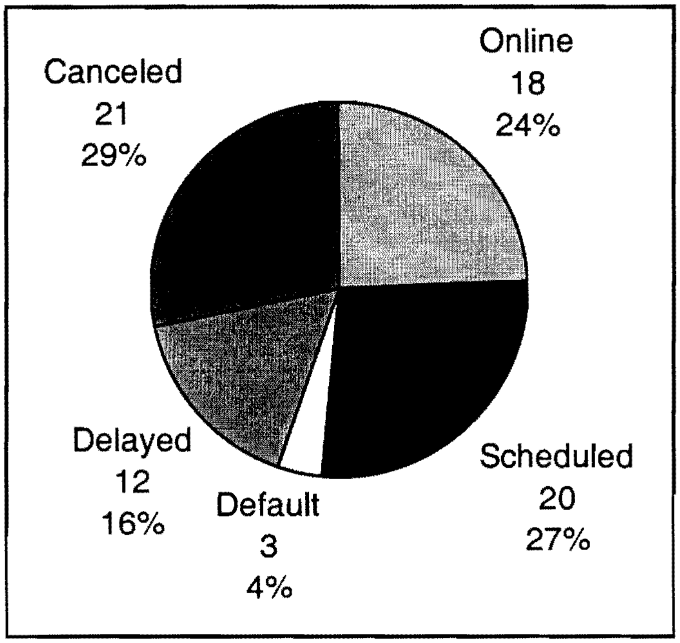

Figure 4. Contract Status, by Number of Projects

The data also provide information on the various types of contract failure. Absolute project cancellation rates are at 23 percent and 29 percent on a contract and capacity basis, respectively. We expect these figures to rise as projects that are now delayed or are scheduled to come on-line encounter difficulties. Projects that are significantly delayed constitute 14 percent (capacity basis) and 16 percent (project basis) of our sample, while projects that are on-line but are not maintaining contracted production levels (in default) equal 9 percent (capacity basis) and 4 percent (project basis).[27]

Contract Success by Technology Type

Figure 5 and Figure 6 show contract status by renewable technology type, in an attempt to discern whether certain kinds of renewable technologies witness higher levels of contract success, on average. Of the 38 wind contracts, 47 percent appear to be succeeding at this time, while 73 percent of the fifteen landfill-gas projects appear to be succeeding. On a capacity basis, success rates were 57 percent for wind (1,372 MW of 2,428 MW) and 87 percent for landfill gas (70 MW of 80 MW). Based on these results, it appears as if contract success rates for wind power are significant lower than those for landfill gas.

For each of the other technologies in our sample, including solar, hydro, biomass, and geothermal, there were too few data points to meaningfully evaluate technology-specific success rates. When combined into one category, however, this category experienced lower success rates than wind or landfill gas: 43 percent of projects (9 of 21) and just 23 percent of capacity (80 MW of 349 MW). Project delays appear particularly problematic for these projects. Based on our overall sample, we are left to conclude that landfill gas projects have (on average) generally experienced the fewest problems in achieving commercial operations, while wind projects have encountered more significant problems and other renewable technologies have fared even worse.

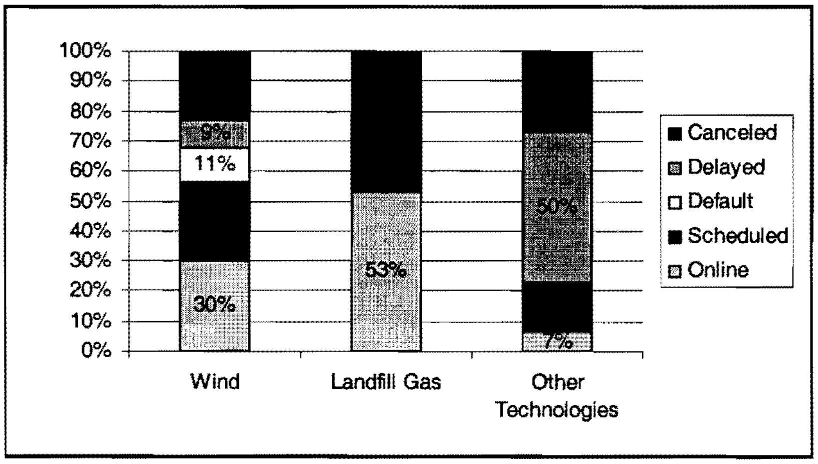

Figure 5. Success and Failure Rates by Technology (by Capacity, MW)

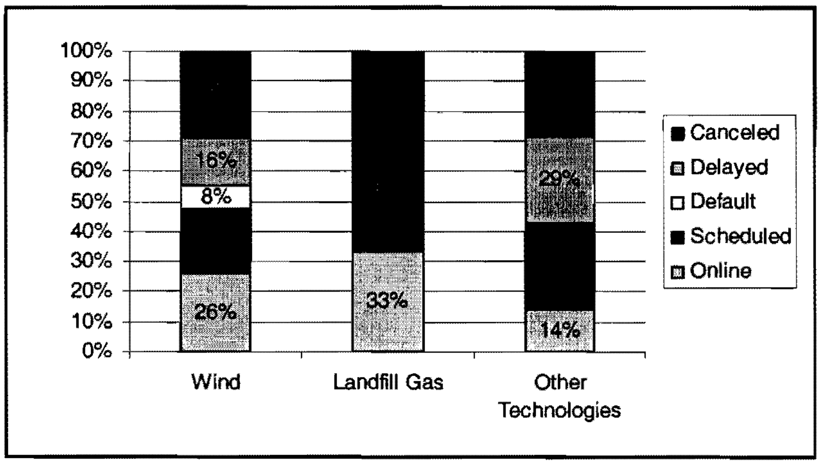

Figure 6. Success and Failure Rates by Technology (by Number of Projects)

Contract Success Rates by Utility RFO

The degree of contract success varies not only by technology, but also by utility and solicitation. Specifically, 12 of the RFOs in our sample and all four non-RFO contracting efforts have experienced some degree of contract failure, while 8 RFOs had 100 percent contract success rates. Figure 7 shows the contract success rates for these 24 RFOs and contracting efforts in histogram form.

These data illustrate that contract failure rates are far from uniform across utilities and solicitations, and appear bimodal, with many utilities experiencing low or no failures, and many others experiencing extraordinarily high rates of contract failure. Some of this disparity reflects the fact that many of the utilities in our sample have only signed one or two renewable energy contracts. If the data are restricted to only larger RFOs (specifically, those that resulted in two or more contracts with a combined capacity of 50 MW or more), the number of data points drops from 24 to 9, and the distribution becomes less bimodal, as shown in Figure 8. There remains, however, a considerable degree of disparity across solicitations.

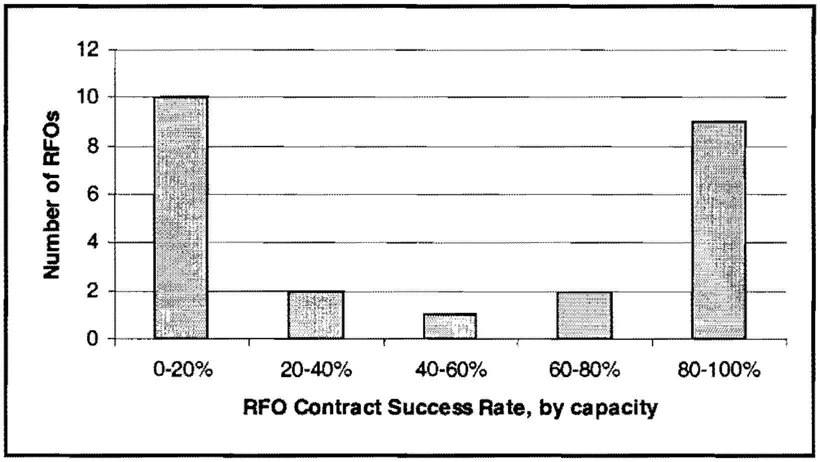

Figure 7. Contract Success Histogram (All RFOs)

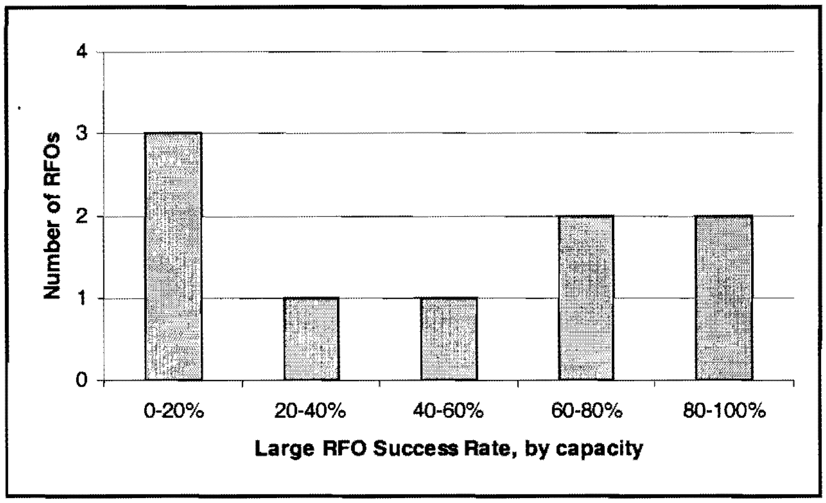

Figure 8. Contract Success Histogram (Larger RFOs)

Some of the remaining variation in contract success should reflect the degree to which a variety of procurement strategies are used to reduce the risk of contract failure. The specific approaches used by utilities in our sample are described later. Here we simply note that from our data, at least, we were unable to discern a strong correlation between the contract success rate of RFOs and either the number of mitigation strategies employed by the utility or the level of due diligence performed. This may simply reflect data limitations, or it may reflect the fact that many other factors also come into play in determining the fate of individual contracts and that overall market conditions can have a significant effect on contract status. With the data collected for this project, we are unable to tease apart these various influences.

Failure Causes

The causes of contract failure vary. Figure 9 shows the number of times particular failure causes were cited by respondents as an issue for contracts that they had signed. It is important to note that this information was not consistently collected on a project-by-project basis and is instead presented for each of the 12 RFOs that experienced some degree of contract failure in combination with four utilities that experienced contract failure outside of an RFO setting.

The top causes of contract failure include siting and permitting issues, developer financing troubles, capital cost increases, and transmission and interconnection issues. Many respondents specifically commented on the recent rise in wind turbine costs as being particularly problematic. Biomass projects, on the other hand, appear to be more significantly constrained by resource availability. Interestingly, only one respondent noted problems with technology as being a factor in project failure; this may be a result of the dominance in our sample of wind power, a relatively mature technology. Issues associated with the credit quality of the purchaser (utility finance) were only identified in the two Nevada RFOs, where the state's major utility has faced significant credit concerns in recent years. In addition to financing challenges, the Nevada utilities (in their December RPS compliance plan filing to the Nevada utilities commission) also note as problematic the tendency for developers to propose speculative projects, the lack of experience by some of the sellers, and the inability of suppliers to negotiate with subcontractors necessary to develop their projects. In fact, the Nevada utilities observe that the lowest-price bids that they have received have often come from the developers with modest or non-existent track records, while more experienced developers have tended to offer the highest prices. Other utilities confirmed this view.

Not surprisingly, many of the failure causes are interrelated. One respondent, for example, noted that a developer it was working with did not understand the complexity of transmission issues, and the resulting delay meant wind turbine prices had increased, making the project uneconomic. Other examples included developers having difficulties securing a site and incurring delays that then made the project unable to receive the PTC or unable to obtain a turbine order. The most unusual anecdote was of a Midwest wind farm that had experienced delays due to PTC and turbine availability but ultimately failed because the project's funding dried up when its Japanese investor became spooked by possible bat deaths.

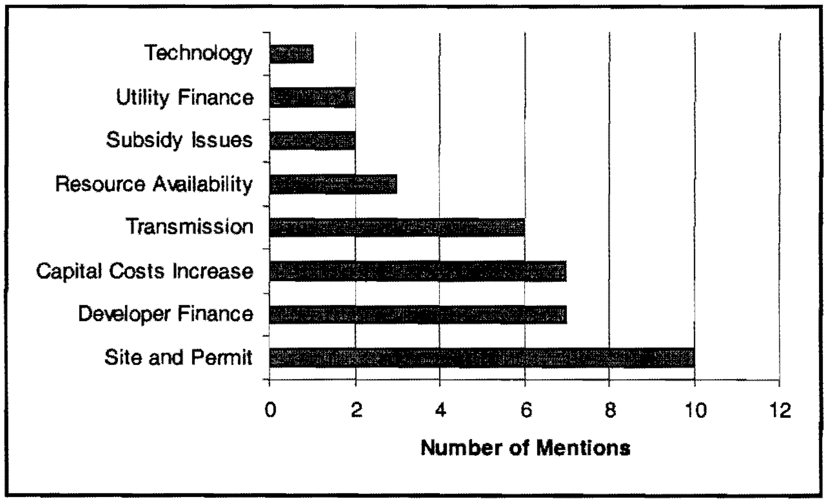

Figure 9. Causes of Contract Failure

Mitigation Strategies

A variety of procurement strategies can be used to reduce the risk of contract failure. A persistent theme that emerged from the interviews was that contracting for renewables has often been a delicate balancing act: requirements in the PPAs or the RFO process that are unduly stringent can seriously limit the number of developers willing to enter into contracts (increasing prices), but requirements that are too loose can easily result in high rates of project attrition and contract failure. It was also recognized that even with stringent requirements that seek to ensure project success, overall market conditions can still result in contract failure.

Ultimately, each utility has had to choose what level of stringency to apply, and utilities have sometimes altered these requirements over time. Our interview respondents disagree on these various strategies, with some choosing to be more stringent over time as experience has been gained, and others moving in the opposite direction. There also does not appear to be a consistent view about which of the various strategies are optimal, and a great deal of experimentation is therefore still taking place.

Though each mitigation strategy can itself vary in its level of stringency (for example, due diligence might be limited or extensive, and performance requirements can be strict or somewhat more lenient), we had neither the budget nor time to exhaustively collect these details; in future work, it may be useful to seek additional information in this area. Here we simply report the number of respondents who indicated that their utility had used various mitigation strategies in their renewable energy procurement and contracting efforts.

Figure 10 presents the mitigation strategies used by our utility respondents. The most commonly cited approaches include due diligence, operational performance guarantees, and pre-operation milestones/bid deposits. Experience with each of these approaches is discussed in more detail below.

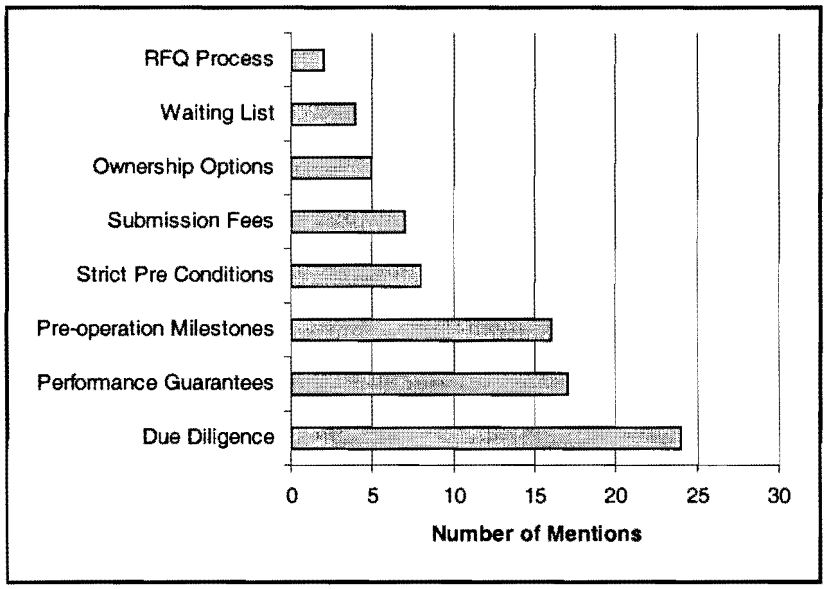

Figure 10. Use of Mitigation Strategies

Request for Qualifications

Two utilities specifically mentioned working only with developers that the utility had worked with in the past or came highly recommended. This "pre-vetting" process gave these utilities confidence that the projects so selected would be successful and helped the utilities avoid the time and expense of negotiating with developers who may ultimately not be able to complete projects. These two utilities effectively bypassed the RFO process altogether and simply approached trusted developers (or vice versa) when they needed projects. Though only these two utilities in our sample used a Request for Qualifications (RFQ)-like process, a few additional utilities were contemplating using a more formal RFQ approach in the future. For example, Nevada's IOUs have experienced a high degree of renewable energy contract failure and have proposed to address this (in part) by using an RFQ process or by more heavily weighing non-price considerations in bid evaluation. Other utilities expressed the view that inclusiveness would increase competition and drive down prices and that an open RFO process was likely to achieve better results than one in which an RFQ narrowed the list of eligible bidders.

Waiting List

The three utilities (one utility had two RFOs, resulting in a total count of four in Figure 10) that specifically mentioned using a waiting list said it was more of an informal "second tier" of short-listed projects that could be contacted if PPA negotiations broke down with the first-tier of projects, or if a contracted project failed early in the development process. Waiting lists do not help avoid contract failure, but they can provide a backup pool of possible projects in the event that projects do fail and a utility does not want to go back to the market with a new RFO.

Ownership Options

Two utilities issued RFOs that specifically allowed utility ownership options, and two others mentioned considering ownership as a mitigation strategy that they might use in the future. One utility, faced with two failing wind projects, chose to purchase the development rights from these projects and plans to build and operate the plants themselves. Another utility uses a unique structure where an unregulated subsidiary takes a passive equity investment in renewable projects once they have a signed PPA and PUC approval. Though this structure allegedly aligns the interests of the developer and the utility, it does not appear to have increased contract success rates for this particular utility.

Submission Fees

Submission fees have been employed by five utilities (two utilities had two RFOs each, resulting in a total count of seven), though the stringency of these fees likely varies considerably. Many others commented that such fees are particularly disliked by developers. To partially accommodate this concern, some utilities have applied submission fees only once projects make the shortlist. Other utilities stated that they have so far chosen not to use submission fees to ensure that as many projects as possible bid into their RFOs.

Strict Pre-Conditions

Strict pre-conditions for proposal submission have also been used by five utilities (some utilities had multiple RFOs, hence a total count of eight). One utility, for example, required that project proposals include clear commitments from equity partners and that projects identify potential lenders and submit letters from those lenders indicating that (1) they had read the RFO, (2) they had reviewed the proponent's financial model, and (3) they were either highly confident that they would finance the project or already had agreements in place to do so. Such strict requirements ensured that only viable projects would bid, and all projects selected under this RFO are on schedule. Not surprisingly, many developers did not like these requirements and expressed concern that competitive prices were to some degree sacrificed in the name of ensuring project viability and that smaller developers were disadvantaged relative to their larger competitors. In another case, a utility made a firm wind turbine order a pre-condition for submitting a bid under its latest (2005) RFO as a result of the recent shortage of wind turbines. The Nevada IOUs, meanwhile, are considering the development of strict pre-conditions for developer financial strength and experience that are scaled to the size of the project bid (larger projects would be required to meet a higher threshold). Proffering the opposing view on strict pre-conditions, one utility respondent said that it was more efficient to cull proposals based on various evaluation criteria than to rigidly require all projects to meet certain strict pre-conditions, especially when each project is unique.

Pre-Operation Milestones

Pre-operational milestones with deposits were among the most popular of the mitigation strategies, though the nature and stringency of the milestones and the level of possible deposit forfeiture varies considerably. Future work should seek to collect these details more systematically. One utility respondent noted that it is planning to increase the pre-operation security requirements for its next RFO, as it has found this mechanism to be a helpful way of screening projects. Another expressed the view that stepped increases in milestone security as a project gets closer to commercial operations can be a very useful tool to ensure that maximum effort is being applied to meet pre-defined milestones. Though many respondents advocated stringent deposit requirements and milestones, others argued that this approach can easily drive up the cost of renewable projects and drive away developers, further eroding competition. One utility said that it had established milestones and deposits but had chosen not to rigidly enforce these contract provisions in a number of instances in which the project was still making (delayed) progress towards commercial operations out of fear that strict enforcement could have severely reduced the ability of the projects to come on-line at all.

Performance Guarantees

Operational performance guarantees (taking the form of electrical production guarantees of various forms, or liquidated damages for construction delays) were possibly the most controversial topic. Though performance guarantees are clearly common, there is less agreement on the appropriate level of stringency. Many of the utility respondents felt that making damages too high would drastically reduce the pool of developers, while others felt that without some sort of performance guarantee they would get "burned" by developers.

Due Diligence

Some form of due diligence was used by the vast majority of utility respondents. Many of these utilities reported that they placed a great deal of emphasis on due diligence and that their evaluation processes were extensive, all of this to help ensure that only truly viable projects would earn contracts. Though this approach has reportedly worked well for many utilities, some of the smaller utilities noted that they simply lacked the time and expertise to engage in such extensive due diligence. In collecting data, we categorized due diligence as either "low" – meaning a cursory review of developers' history and financing, "average" – a more in depth look at the technology, developer financing and experience, as well as site control; and finally "extensive" – a thorough investigation of all aspects of the proposed project. Of the 24 data points for due diligence, 3 utilities practiced "extensive" due diligence, 4 were rated "low", and the rest were "average." One respondent specifically hoped that extensive due diligence could help reduce the risk of contract failure and replace the need for restrictive security and performance guarantees. A different respondent, on the other hand, noted with concern that extensive due diligence can take a considerable amount of time, yielding delays and potentially leading to lost projects. A final utility reported that it hoped to limit the degree of due diligence in future solicitations and instead rely more heavily on pre-operation milestones and deposit requirements.

Other Strategies

Several other strategies, not otherwise included in the categories above, were mentioned by one or more of the interview respondents.

- <u>Utility finance:</u> In response to concerns about the impaired credit of the state's utility and the resulting difficulty for developers in accessing financing, Nevada has created its Temporary Renewable Energy Development (TRED) program. Through this program, a predetermined allocation of funds collected by the state's electric utilities are placed in a third-party trust that will disburse payments to renewable energy developers for the electricity sold to the utilities. By creating a separate trust, project financiers are guaranteed payment regardless of the financial situation of the utility. The Nevada utilities, however, feel that "TRED is not the panacea that everyone thought it would be," because some financiers are still uncomfortable with the poor credit of the utility purchasers.
- <u>Over-contracting:</u> Though not yet approved by the state's regulatory commission, Nevada's major electric utilities have proposed the concept of "design reserves" through which the utilities would agree to over-contract with renewable generators in order to build a procurement cushion of 15 percent above the annual RPS obligation; this extra supply of renewable energy

certificates could then be used in the event of an undersupply of renewable generation in future years.

- Marketing and noticing: At least one utility indicated that it planned to use a more thorough marketing and noticing strategy in the future to ensure that developers were aware of and had adequate time to respond to its RFOs.
- Regulatory approval: Another utility indicated that it was going to seek assurances from the state regulatory commission that the commission's approval of renewable energy contracts (and disallowance of recovery) would not be decided purely on the basis of price.
- PTC availability: One utility respondent specifically noted that it had taken on PTC risk to help ensure project success. In particular, the utility agreed to pay the developer the value of the PTC, if the PTC was not renewed or accessible to the project.
- Transmission and integration: One respondent noted that it had a separate, unregulated business to assist developers with integrating wind into the transmission grid to reduce transmission problems.

Government Contract Tenders and Incentive Auctions

This section presents renewable energy success rates under government bidding programs. Two types of programs are considered: (1) those that provide successful bidders with a long-term contract for a project's full output, and (2) those that provide successful bidders with more limited forms of financial support – for example, a grant or production incentive. The former type of program has been prevalent in Europe (experience in the United Kingdom, Ireland, and France is covered here), while the latter has been more common in the United States (experience from New Jersey, New York, Pennsylvania, and Massachusetts is covered here; the California Energy Commission's use of this approach was discussed earlier[28]).

Although one might think that the states covered below would provide the closest analogy to California's present contracting activities, the European experience may be more relevant for the purpose at hand – for example, determining contract failure rates. This is because the state programs have provided only partial aid to projects in the form of grants or production incentives and have therefore typically not replaced the need for a long-term power purchase contract for electricity production. The European programs, in contrast, have provided a complete, long-term contract for the project's full output – similar to the PPAs offered by electric utilities covered in the previous section. That said, even the European experience is not as relevant as the US utility experience covered previously in part because market conditions in Europe may be quite different than in the US.

Perhaps of most importance, relatively few steps have been taken by the European or state programs to reduce the risk of contract failure. As discussed in more detail below, certain aspects (either unintended or by design) of the UK and French programs actually *encouraged* speculative projects with a potentially high likelihood of failure. Ireland learned from this experience (and its own), and in later rounds not only over-contracted for capacity, but also required that bidders secure planning and permitting permission, as well as site control, before bidding. Among the US programs covered here, mitigation strategies have ranged from nonexistent on one end of the spectrum to detailed due diligence, bid bonds, and development and construction milestones on the other.

The United Kingdom

During the 1990s, the UK supported utility-scale renewables primarily through multiple rounds of competitive tenders for long-term contracts. This bidding process was known as the Non-Fossil Fuel Obligation (NFFO) in the UK and Northern Ireland (NI) and the Scottish Renewables Obligation (SRO) in Scotland. All told, there were five rounds of UK-NFFO tenders, two rounds of NI-NFFO tenders, and three rounds of SRO tenders. Table 7 reports aggregate results of this process by technology, updated through the first half of 2005.

In total, the NFFO/SRO tenders have yielded an overall completion/success rate of 50 percent on a project basis and just 33 percent on a capacity basis. The two technologies with the largest shares of capacity under contract – municipal and industrial waste (MIW) and wind – have generally fared the worst, with capacity completion rates of around 20 percent.

Table 7. Combined Status of UK-NFFO, NI-NFFO, and SRO as of June 30, 2005[29]

Technology	Total		On-line		Pending or Canceled	
	Projects	MW*	Projects	MW*	Projects	MW*
Biomass	32	256	9	107	23	149
Hydro	146	95	70	49	76	46
LFG	329	700	242	510	87	190
MIW**	90	1,398	22	261	68	1,137
Sewage Gas	31	34	24	25	7	9
Wave	3	2	1	0.2	2	1.8
Wind	302	1,154	100	246	202	908
TOTAL	**933**	**3,639**	**468**	**1,198**	**465**	**2,441**

* MW are expressed in terms of Declared Net Capacity (DNC), which is the amount of baseload capacity required to produce an equivalent amount of energy over a year (sometimes called an "average MW"). Thus, a 4 MW wind farm with a 25% capacity factor would have a DNC of 1 MW.
**MIW = Municipal and Industrial Waste

There are a number of reasons for the relatively poor success rate in the United Kingdom.[30] First, the UK government was intensely focused on reducing costs, with a stated commitment to reduce the average price per kWh of each successive tender. This practice effectively set the average price for a given technology in the previous tender as a benchmark that all bidders seeking contracts in the following tender must beat. This focus on declining costs, along with the complete lack of a non-performance penalty, little due diligence, and a lengthy allowed development period (four years for third round of the UK-NFFO, and five years for the fourth and fifth rounds of the UK-NFFO),[31] encouraged generators to bid speculatively based on expectations of declining technology costs. To further increase their chance of securing a contract, developers naturally looked to sites with the strongest renewable resources – which in the United Kingdom often coincide with sensitive areas not always appropriate for development. As a result, many projects were ultimately refused planning and permitting permission.

Ireland

Similar to the United Kingdom, Ireland has also, until recently, supported utility-scale renewables through a process of competitive bidding for long-term (15-year) contracts, known as the Alternative Energy Requirement (AER). Between 1995 and 2003, there were six rounds of AER tenders. Like the NFFO, the AER was a competitive process, with the lowest bids in each technology band being offered contracts, generally (at least in AER I-IV) without regard to qualitative considerations, such as the financial strength of the project or the likelihood of completion.

Table 8 conveys the aggregate results of all six AER tenders, as of June 2005. Out of 1,081 MW awarded contracts, 233 MW have so far come on-line – a success rate of just 22 percent. Though expected commercial operation dates obviously vary by AER round, all AER VI projects (except for offshore wind and biomass-CHP projects, which have until the end of 2006) were expected to be on-line and selling electricity by December 31, 2004. Since AER VI was the last tender, any project (except offshore wind and biomass CHP) not yet indicated as "on-line" in Table 8 can be considered to be experiencing delays, at a minimum.

Table 8. Aggregate Results from AER Rounds I-VI (as of June 2005)[32]

Technology	**Total**		**On-line**	
	Projects	**MW**	**Projects**	**MW**
Fossil CHP	27	80	9	29
Biomass CHP	3	27	1	3
Landfill Gas	16	42	>6	22
Digester Gas	9	2	0	0
Waste to Energy	1	30	0	0
Onshore Wind	93	840	>13	175
Offshore Wind	2	50	0	0
Small Hydro	29	10	>10	4
TOTAL	**180**	**1081**	**>39**	**233**

Starting with AER III in 1997, allowances were made for possible contract failure. For example, AER III had a target of 100 MW but awarded contracts to 159 MW to provide a cushion (of 59 percent) in the event of project failure. Similarly, AER V had a target of 255 MW but contracted with 363 MW to provide a 42 percent cushion. More importantly, to try and mitigate relatively poor completion rates in early rounds, the government eventually (for AER V and VI) required that bidders demonstrate site control, as well as full planning and permitting permission.[33] Results of these mitigation strategies are so far mixed – as of June 2005, AER V and VI's overall capacity completion rates were just 12 percent and 16 percent, respectively, though projects reportedly in construction at that time will, if completed, push AER VI's success rate up to 61 percent.

France

In February 1996, France launched the "EOLE 2005" program, with an objective of bringing 250-500 MW of new wind power capacity on-line by 2005. As in the United Kingdom and Ireland, the "EOLE 2005" program was based on a series of competitive tenders for long-term contracts. Price was the primary criteria, though other factors were considered as well. Successful applicants were awarded a contract with EDF (France's electric utility), and had three years to come on-line (or else risk a penalty equal to 1 percent of the cost of the project).

Contracts were awarded through several stages of tenders, with sub-tranches targeting specific types of projects.[34] In aggregate, 55 projects adding up to 362 MW were awarded long-term contracts before the program was discontinued in early 2000. At the end of 2000, only 49 MW of the 362 MW had been built (success rate of 13 percent).[35] This number reportedly increased to 115 MW at the end of 2001 (success rate of 32 percent); we have been unable to obtain more recent data, which would be needed to provide a final, updated success rate.[36]

Though more recent data is not available to gauge project completion post-2001, the EOLE 2005 program is generally considered to have been unsuccessful. Turbine supply problems (one French turbine manufacturer delayed the introduction of its turbines to the market, while a Dutch turbine supplier favored by several projects went bankrupt) and permitting problems reportedly contributed to project delays and low completion rates. Furthermore, a number of the projects awarded contracts were clearly speculative in nature, not yet having measured the wind resource at the time of the tender. The preliminary nature of these projects complicated financing and often resulted in project economics that were ultimately considered to be unviable once further due diligence occurred.[37]

New Jersey

In July 2002, the New Jersey Board of Public Utilities (NJBPU) announced that it had competitively awarded $11.3 million in funding (through a combination of grants and production incentives) to four "grid supply" renewable energy projects: two involving wind power, one involving landfill gas, and one involving photovoltaics (PV). As shown in Table 9, the smaller wind project is in construction and is scheduled for completion in 2005, the landfill gas project is still in development, and the PV and larger wind projects have been canceled.[38] This solicitation therefore currently has a project completion rate of 25 percent (22 percent in capacity terms), with 50 percent of projects (66 percent in capacity terms) canceled and the remaining 25 percent (12 percent in capacity terms) pending.

Table 9. Status of NJBPU 2001 Grid Supply Solicitation

Technology	Total		On-line		Canceled		Pending	
	Projects	MW	Projects	MW	Projects	MW	Projects	MW
Wind	2	29	1	8	1	21	0	0
LFG	1	4	0	0	0	0	1	4
PV	1	1	0	0	1	1	0	0
TOTAL	**4**	**34**	**1**	**8**	**2**	**22**	**1**	**4**

This relatively poor success rate is reflective, in part, of the lenient nature of the solicitation. Projects were essentially allowed to dictate their own development schedule (as long as it did not exceed one year for design, one year for permitting, and two to three years for construction), and there were no bid bonds or other financial commitments to discourage speculative bids. Proposals were, however, evaluated by an independent advisory committee of industry experts, in part for viability.

New York

Through the New York State Energy Research and Development Authority (NYSERDA), New York has conducted three solicitations supporting grid-supply renewable generation facilities, including two exclusively supporting wind projects, and one that supported landfill gas generation projects.[39] NYSERDA also helps administer the state's RPS and has conducted one solicitation under the RPS. Each is summarized below and in Table 10.

Program Opportunity Notice (PON) 498 Wind Project Development. Under this program, NYSERDA ultimately awarded in 1998 a total of $7 million to two wind projects totaling 41.5 MW. Both ultimately came on-line, the smaller project in 2000 and the larger one in 2001. A third wind power project of 10.5 MW was initially selected and awarded $4 million in support. However, the contact was never executed, and the proponent eventually withdrew. The reason for withdrawal of the third project was that permitting was proving to be more challenging than the proponent had appetite for, and ultimately the proponent could not make the economics work and lost interest, to focus on bigger and more-profitable projects in regulated markets where a 20-year PPA with a creditworthy entity was more likely than in New York's deregulated market. The form of support under this program was a mixture of up-front grants (25 percent of incentive dollars) and three years of quarterly incentive payments made based on project availability (75 percent of incentive dollars).[40]

PON 672 Wind Project Development. Under this program, $17 million of five-year production incentives were awarded in 2002 to five wind power projects totaling 315 MW. These wind projects ranged in *proposed* capacity from 40 to 100 MW. The outcome, however, has evolved due to the adoption of the New York RPS. Specifically, all incentive-based contracts have now been terminated by mutual consent, freeing the proposed projects to compete under NYSERDA's more attractive RPS solicitations (New York's RPS rules require forfeiture of incentive-based payments to be eligible for RPS support). Of the original five projects, one project (the Maple Ridge Wind Farm) is nearing completion (January 31, 2006) at a much larger size of 231 MW (the original proposal was for 100 MW) and now has a contract with NYSERDA under the New York RPS. The other four projects have experienced delays, for a variety of reasons. One project has missed development milestones due to avian impact issues and is behind schedule by more than a year. Another project missed contract milestones because of general local opposition, and the developer refocused its efforts on the larger Maple Ridge project and other prospects. A forth project missed contract milestones because of general local opposition, and the developer ultimately refocused its efforts on its second project under PON 672. This last project is in the midst of an Environmental Impact Statement (EIS) and faces local opposition, and is competing with another project for limited transmission.

PON 732 Alternative Fuels, Power Generation and Energy Storage. Under this program, three landfill gas generation projects totaling 5.2 MW received a total of $1.5 million in support in 2003 and 2004. The structure of the funding consists of 25 percent spread over milestones that end with construction and 75% based on performance over four years. All three projects are still pending.

RFP 916 RPS Solicitation. NYSERDA also serves as the central procurement agent under New York's RPS and in that role will conduct periodic procurements for renewable energy attributes. NYSERDA prepared a standard purchase agreement for RECs and released its first formal Request for Proposals, RFP 916, on December 20, 2004. Contracts were to be a maximum of 10 years in duration and payment for RECs was to be at a fixed $/MWh price. Sealed-bids were submitted for consideration on January 18, 2005, and the initial award group was announced just three business days later. NYSERDA ultimately awarded contracts to seven projects for the rights to environmental attributes (RECs) associated with 281.45 MW of incremental generation. The seven contracts included the full output from two wind projects, a portion of the output from two other wind projects, and incremental generation from three repowered/upgraded hydroelectric projects. By the end of 2005, the three hydroelectric upgrades were already online; two wind projects had been fully commissioned; and a third wind project (the largest at 231 MW) had commissioned 69.3 MW with the remainder under construction. One of the wind farms (21.5 MW under contract) is apparently experiencing some delays. The contract durations vary considerably, with the shortest term being one year, and the other contracts being either four or ten years.

The results of PON 672 complicate calculations of project success rates. However, assuming that the 100 MW project (slated to come fully on-line in early 2006, at 231 MW) would have achieved commercial operations under PON 672 at 100 MW absent RPS-related contract cancellation, but that the other four projects were not meeting their milestones and are therefore considered unsuccessful, then NYSERDA's combined success rate under PON 672, 498, and 732 has been 38 percent (39 percent if the 5.2 MW of pending landfill gas projects are considered likely to achieve commercial operations). NYSERDA's more recent RPS solicitation will have a much higher success rate: assuming that only the 21.5 MW wind project is ultimately delayed or unsuccessful, NYSERDA's success rate with RFP 916 will be 92 percent. Combining all of the solicitations, an overall success rate of roughly 63 percent has been achieved.

NYSERDA has employed several mechanisms to reduce the risk of contract failure in these programs. Under PON 672, 498, and 732, NYSERDA included performance milestones in the contracts, made performance incentives only available at or after commercial operation, and limited such incentives to no more than five years in duration. Projects were ranked for selection based on incentive levels per kW installed as well as other subjective development criteria. Though these mechanisms are not as stringent as one is likely to see in a utility PPA, they were used to improve the chances of project success. NYSERDA's RPS contracts are more stringent and include performance security and milestones, with security forfeited in the event a project does not reach fruition by a specified milestone. This is likely to be one of the reasons that NYSERDA's contracting success rate has been higher under its most recent RPS solicitation than under earlier PONs.

Table 10. Status of NYSERDA's Renewable Energy Support PONs								
Technology	Total		On-line		Canceled		Pending	
	Projects	MW	Projects	MW	Projects	MW	Projects	MW
Wind: PON 498	3	52	2	41.5	1	10.5	0	0
Wind: PON 672	5	315	0	0	5	315	0	0
Landfill Gas: PON 732	3	5.2	0	0	0	0	3	5.2
Hydro: RFP 916	3	3.2	3	3.2	0	0	0	0
Wind: RFP 916	4	278.25	2 + part of another	95.05	0	0	1 + part of another	183.2
TOTAL	**18**	**653.7**	**7+**	**139.8**	**6**	**325.5**	**4+**	**188.4**

Pennsylvania

In Pennsylvania, the Sustainable Development Fund (SDF) serving PECO's service territory has issued, as part of the Pennsylvania Wind Development Program, several rounds of competitive solicitations to provide a total of $12 million of support to utility-scale wind projects throughout the state. Through this program, SDF support has typically taken the form of $/MWh production incentives, though other forms of financial support (for example, debt financing) have also been available.

Phase I supported two projects, one of which eventually had to relinquish its award due to delays caused by local opposition and legal action, which prevented the project from meeting its contractual milestones. That same project, however, successfully re-applied for incentives under Phase III of the program and eventually came on-line.[41] Three other projects also received funds under Phase III; one of these lost its funding due to an inability to meet contractual milestones. In Phase IV, SDF negotiated a funding award with a single wind project but never actually consummated an agreement because the developer decided to deploy the turbines to a different wind project in another state.

Table 11. Results from the Pennsylvania Wind Development Program							
Program Phase	**Year**	**Total**		**On-line**		**Canceled**	
		Projects	**MW**	**Projects**	**MW**	**Projects**	**MW**
Phase I	2000	2	80	1	15	1	65
Phase III	2002	4	159	3	119	1	40
Phase IV	2005	1	35	0	0	1	35
	TOTAL	**7**	**273**	**4**	**134**	**3**	**139**

In summary, a total of seven funding awards have led to four successful project completions (57 percent success rate) and three funding terminations (43 percent cancellation rate). In capacity terms, 49 percent of funded capacity has come on-line, while 51 percent has been cancelled. As mentioned above, one of the three terminated projects eventually came on-line through a subsequent phase of the program. The other two terminated projects are still being developed, though do not currently have access to SDF funding.

SDF has attempted to ensure a high success rate through several means. First, SDF enlisted a team of experts to conduct detailed due diligence on all proposals. Second, SDF used its discretion to fund only those projects most likely to come on-line within the time frame specified by each solicitation (rather than focusing exclusively on the level of the incentive requested, as often occurs in an auction format). Finally, modest application fees and a forfeitable performance security fee (equal to $1,500/MW of capacity) helped to discourage speculative or immature projects.

Massachusetts

In the fall of 2003, the Massachusetts Technology Collaborative (MTC) announced the award of $32 million in funding through the first round of its Massachusetts Green Power Partnership (MGPP) Program to support the financing and construction of new renewable projects.[42] This novel solicitation offered support in the form of either long-term renewable energy certificate (REC) purchase commitments or price supports in the form of REC option agreements. Round 1 awards were made to six projects totaling 98.6 MW of total capacity, including two wind projects, a biomass repowering of a former coal plant, a landfill gas generator, a hydroelectric generator and a grid-supply PV plant. A summary of the awards and their status is shown in Table 12 below.

Table 12. Status of MTC's MGPP Round 1 Supply Solicitation								
Technology	**Total**		**On-line**		**Canceled**		**Pending**	
	Projects	**MW**	**Projects**	**MW**	**Projects**	**MW**	**Projects**	**MW**
Wind	2	43.5	0	0	0	0	2	43.5
Biomass	1	50	0	0	0	0	1	50
Landfill Gas	1	3.3	1	3.3	0	0	0	0
Hydroelectric	1	1.3	0	0	0	0	1	1.3
Photovoltaic	1	0.5	0	0	0	0	1	0.5
TOTAL	**6**	**98.6**	**1**	**3.3**	**0**	**0**	**5**	**95.3**

Of the projects securing awards, the landfill gas plant has completed construction; the hydroelectric and biomass plants are under construction and expected to be on-line in 2006. One wind plant is permitted but is still seeking to secure wind turbines in a scarce market; the other wind generator has had its primary permit appealed, with the appeal underway and expected to be resolved one way or the other in the next several months. Finally, the PV project has just secured key financing support and is now set to move forward.

At this juncture, no projects have been cancelled. However, every project not yet completed is moving forward more slowly than initially envisioned, with the exception of the biomass plant, which is still moving according to its contractual timetable. Both wind projects were initially expected to come on-line in late 2004. Their delays were caused by similar events: first by a protracted permitting process, and subsequently by uncertainty in the extension of PTC. The smaller project is now experiencing further delays due to the subsequent shift in the global wind turbine market; the larger project must resolve a legal appeal to its primary permit before proceeding. Finally, the PV project necessitated special legislation for the host community to own the power generation asset, introducing a delay.

Though some uncertainty remains as to what fraction of the projects may ultimately fail, the MTC's process tried to limit the risk of contract failure. First, a panel of industry experts was used to help select projects, with project viability an important evaluation criterion. Second, while all MGPP contracts allow the generator a one-time, nine-month extension without repercussion to the generator, thereafter, all contracts have milestones after which MTC has the opportunity to reconsider the funding. Some contracts also have security or penalty payments that *could* be collected upon failure to meet the milestones, if MTC chooses to enforce them. To date, MTC has not yet elected to enforce penalty provisions or reconsider awards as milestones have been missed. Extensions have been granted because MTC ultimately wants the projects to succeed, and because each has made satisfactory forward progress. No further extensions are guaranteed, but extensions will be considered on a case-by-case basis.

CHAPTER 4: CONCLUSIONS

This report has presented the experiences of electric utilities and others in contracting with renewable energy projects. A key purpose of this report has been to collect and present success and failure rates for renewable energy contracts.

We were successful in collecting information from California (PURPA QFs, Energy Commission production-incentive auctions, and recent IOU experience), from 21 other North American utilities and from government solicitations in support of renewable energy. Some of these experiences are considerably more relevant to the contracting efforts of California's IOUs than are others. Though available data are somewhat spotty in places, our sample is nonetheless extensive, consisting more than *21,500 MW* of renewable energy contracts. Table 13 presents in summary form some of the key findings of our efforts.

We find some weak evidence that capacity-based success and failure rates have changed somewhat over time. Though capacity-based success rates among California QF contracts from the 1980s averaged only 45 percent, for example, contracting success rates were seemingly on the rise in the late1980s and early 1990s (up to 60 – 92 percent nationwide). Data collected on recent utility experience shows a capacity-based success rate of just 53 percent (considering on-line and on-schedule projects). If projects that are not achieving their performance goals are also included as successful projects, however (leaving only cancelled projects and those that are significantly delayed and not yet on-line as failures), then the success rate jumps to 62 percent.

We also find that success rates vary considerably among utilities and across situations. Within our sample of recent North American utility experience, we find that landfill gas projects have experienced the least amount of failures, while the attrition rate for wind power and other renewable technologies has been higher. European experience also shows greater levels of project success among landfill and sewage gas facilities than from traditional biomass and wind power projects. Experience from other renewable energy contracting efforts suggests some variation in failure rates among different technology types as well, but those relationships are not always consistent among the examples presented in this report.

The experience of government-run auctions for renewable energy contracts in Europe and incentive solicitations in the United States bear less relevance to California's current contracting practices. In large part as a result of their design, success rates among these programs are often lower than for utility solicitations in which: (1) a full revenue-requirements contract is being offered, and (2) procurement mechanisms are typically used to reduce the risk of contract failure. Specifically, project success rates have ranged from 22 to 33 percent in Europe, from 22 to 63 percent in the states of New Jersey, New York, Pennsylvania, and Massachusetts, and 37 percent for the California Energy Commission's production incentive auctions.

Table 13. Summary of Information on Contract Success Rates			
Context	**Signed Contracts (MW)**	**Success Rate (MW Basis)**	**Notes**
Recent North American Utility Experience	2857	53-62%	Includes 29% on-line and 25% on schedule; range reflects whether projects in default are considered successful or not. Does not include 14% that have been significantly delayed. Overall project cancellation rate equals 23%, but this will increase over time.
Historical North American Utility Experience	2333	60-92%	60% reflects on-line capacity at the time of the survey (1994), while 92% includes contracted capacity that was still under development at that time.
California PURPA QFs	8980	45%	Relevance to current IOU contracting practices is weak.
European Contract Tenders	5082	22-33%	Combines tenders in UK (33%), Ireland (22%), and France (32%, but expected to be higher if more recent data were available). More projects may come on-line with time, though such projects will generally have experienced delays. Signed capacity underestimates total because uses "declared net capacity" ratings for the UK. Experience not altogether relevant because, with some exceptions, little was done to mitigate contract failure.
US State Incentive Auctions	1060	22-63%	Combines incentive auctions from NJ (22-35% depending on whether pending projects are counted as successful), NY (63%, based on assumptions presented earlier and including all solicitations combined), PA (49%), and MA (55%; successful projects assumed to include projects currently on-line or under construction). Experience not altogether relevant because programs offered incentives, not full revenue requirements.
California Energy Commission Auctions	1306	37%	An additional 60% of projects are still pending, but have experienced substantial delays. Relevance to current IOU contracting practices is weak.

Project success and failure rates, at least among other North American utilities, appear bimodal, with many utilities experiencing low or no failures, and many others experiencing extraordinarily high rates of contract failure. Some of this disparity may be due to the varying degree to which utilities use a variety of procurement strategies to reduce the risk of contract failure. It also reflects the fact that many of the utilities in our sample have signed only one or two renewable energy contracts. In any case, the disparity of experiences further complicates the development of a single, uniform target for over-procurement at this stage of the California RPS. Moreover, given the scope of this project, we were unable to link specific mitigation strategies with lower failure rates, to separate the influences of solicitation design and overall market conditions on failure rates, or to provide specific recommendations on which of the mitigation approaches might be most effective.

Though there is considerable variation among utilities with contract failure, and data limitations prevent robust conclusions, the experience presented in this report suggests that an overall failure rate of 20 to 30 percent should likely be considered the *minimum* level of expected failure for large RFOs conducted over multiple years (any individual RFO may well be able to beat these failure rates). In fact, failure rates much higher than these levels (50 percent, or even greater in some cases) are supported by historical experience, especially for projects that use pre-commercial technologies or that (like many projects in California) are likely to face siting, permitting, resource supply, transmission, or other barriers to development. Somewhat supportive of failure rates at these or higher levels is recent experience with renewable energy contracting by California's IOUs, which shows what appears to be a healthy degree of contract failure; we have no reason to believe that this will not continue in future RFO cycles, especially as the state's utilities dig deeper into the pool of possible projects.

There is a clear need to carefully monitor the ongoing status of renewable energy contracting in California. California's renewable energy contracting efforts are unique in their scale and design, and each RFO is different. A single uniform over-procurement target gleaned from the experiences described in this paper and held constant for years would not be appropriate. Ongoing and more systematic monitoring of contract failure in the state will help inform the appropriate level of (and changes to) any over-contracting target that might be established. We note that at the present time, the amount of information made public by the state's IOUs makes it difficult to accurately track contract status and project failure rates.

As experience is gained in the state with renewable energy contracting, it may also be helpful to more carefully scrutinize the different approaches used by the state's IOUs to lessen contract failure, document early experience with those various measures, and compare in some detail the approaches used in California with those applied in utility solicitations elsewhere in North America. It may also be helpful to evaluate the causes of contact failure in California and analyze the extent to which those failures could have been cost-effectively reduced through procurement design (compared to failures caused by market conditions that could not have easily been anticipated). Because measures to combat contract failure may have the unfortunate effect of restricting competition and raising bid prices, such analyses should take care to evaluate the advantages *and* disadvantages of these various procurement strategies.

APPENDIX A: INTERVIEW GUIDE

Renewable Energy Contract Failure Study

Utility:

Contact Person: Phone Number:

Date Called:

General Notes:

Context:

Was there a traditional RFO process?	
If so, when was your RFO issued?	
Were you looking for a PPA, RECs, or to own the project(s)?	
What was the timeframe of the project?	
Time to respond to RFO?	
PPA signup date?	
Project start date?	
Term of the PPA?	
What was the motivation of the project? (RPS, Green power, IRP, etc.)	
What was the target (e.g. 100MW, 5,000 MWhrs, % of generation)?	
Was the target technology specific? (i.e. Solar, Wind, etc)	

Project information:

Number of projects that responded to RFO:	
Number of projects shortlisted:	
Number and MW of projects with signed/announced PPAs:	

Projects with PPA's by technology:

Tech	Wind	Solar	LFG	Biomass	Geotherm.	Hydro	Other?
#							
MW							

On-line and failure information for projects:

Number and MW of projects now on-line by technology

Tech	Wind	Solar	LFG	Biomass	Geotherm.	Hydro	Other?
#							
MW							

Of those on-line, number and MW that have experienced delays (and how long).	
Of those on-line, number and MW that have failed to meet production targets or have defaulted.	
Of those not yet on-line, number and MW that are on schedule to come on-line as per PPA.	
Of those not yet on-line, number and MW that are delayed but still may come on-line.	
Of those not yet on-line, number and MW that have been cancelled altogether.	
Number of projects with cost increases after signed PPA.	
Other cancellations or delays?	

Cause(s) for projects that were cancelled, delayed, or underperformed:

REASON	Proj	Proj	Proj	Proj
Failure to site and/or permit				
Interconnection or transmission				
Financial failure of generator				
Lack of creditworthy purchaser				
Availability and/or cost of resource				
Changes in capital prices				
Technology issues				
Project delay results in loss of subsidy (e.g. PTC)				
In-eligibility under state program				
Other (please clarify)				

Mitigation strategies:

Strict pre-conditions	
Due diligence	
Proposal submission Fees	
Pre-operation milestones with deposit	
Operational performance guarantees (liquidated damages)	
Use of waiting list	
Profitable PPAs	
RFQ process	
Change project ownership	
Future/other strategies?	

ENDNOTES

[1] The utilities have also signed new contracts with existing renewable energy generators.
[2] Center for Resource Solutions. "Achieving a 33% Renewable Energy Target." Prepared for the California Public Utilities Commission, November 1, 2005.
[3] California Energy Commission. "Implementing California's Loading Order for Electricity Resources." CEC-400-2005-043, July 2005.
[4] Ryan Wiser, Kevin Porter and Mark Bolinger. "Preliminary Stakeholder Evaluation of the California Renewables Portfolio Standard." CEC-300-2005-011, June 2005.
[5] Center for Resource Solutions. "Achieving a 33% Renewable Energy Target." Prepared for the California Public Utilities Commission, November 1, 2005.
[6] California Energy Commission. "2005 Integrated Energy Policy Report." CEC-100-2005-005-CTF, November 2005.
[7] Center for Resource Solutions. "Achieving a 33% Renewable Energy Target." Prepared for the California Public Utilities Commission, November 1, 2005.
[8] In their 2006 renewable energy procurement plans, SCE and PG&E also note that presumptively increasing the IPT to 1.2 percent is not appropriate at least in part because the IPT represents a *delivery* requirement, not a *contracting* requirement.
[9] Despite several attempts, we were unable to contact SDG&E.
[10] This was not always possible, however, due to confidentiality constraints, lack of institutional memory, or a lack of time on the part of the respondent.
[11] Delayed is defined not as a simple delay of a few months in construction, but as significant delays in the project coming on-line coupled in many cases with uncertainty of the project ever becoming successful.
[12] California Energy Commission. "1994 Electricity Report." P300-95-002, November 2005.
[13] PG&E, SCE and SDG&E 1st Quarter 1987 and 3rd Quarter 1995 Cogeneration and Small Power Production Quarterly Reports.
[14] California Energy Commission. "Renewable Energy Program: 2005 Annual Report to the Legislature." CEC-300-2005-020, November 2005.
[15] Individual projects, of course, have experienced delays as a result of a number of other factors as well, including permitting and siting barriers, resource supply, and overall market uncertainty. Project cancellations, meanwhile, have been primarily caused by lack of PPAs, siting and permitting challenges, interconnection costs, equipment failures, legal challenges, and inadequate fuel supplies.
[16] To increase the likelihood of serious bids, the Energy Commission required the submission of bid bonds to provide a guarantee of performance in the auction and indicate that the bidder was proposing a serious, viable project. However, the bid bond was never intended to guarantee performance throughout the construction or during the operation of the project. Full refunds of the bid bond were provided when projects filed permit applications, the rationale being that filing for permits could involve a significant expenditure of funds by the developer that would not be made unless the developer intended to develop the project. In the second two auctions, the Energy Commission supplemented the bid bond requirement by also instituting a series of bonuses and penalties to encourage early project completion. For more information, see Mark Bolinger and Ryan Wiser, "Production Incentive Auctions to Support Large-Scale Renewables Projects in Pennsylvania and California." Lawrence Berkeley National Laboratory, September 2002.
[17] Based on PG&E's supplement to its long-term renewables procurement plan, filed December 7, 2005, it appears as if PG&E's contract with a repowered Altamont wind project may be significantly delayed beyond its 2006-2008 originally projected on-line date.
[18] SCE also notes that many of the projects have delayed submitting their interconnection applications to the CA ISO and that further delays may be caused by the required timelines for environmental studies. What is clear is that a number of the projects under contract with SCE are at an early stage of development. Delay and project cancellation are significant risks for these projects. Concerns have also been raised about the viability of SCE and SDG&E's massive solar-thermal

contracts, which rely on a technology and cost projections that have not yet been commercially proven. How SCE and SDG&E have attempted to mitigate this risk is not publicly known at this time.

[19] http://www.sdge.com/regulatory/renewablesFactSheet.doc.

[20] As a condition for approving the delays, SDG&E was able to garner certain concessions from the project developers.

[21] To our knowledge, the specific causes of the delays and apparent failures have not been made public, with one exception. An Oasis Power 60 MW wind project was apparently delayed due to: (1) PPA revisions needed to accommodate the project's financiers; (2) uncertainty on the operations of the CA ISO's PIRP program; (3) delays with the interconnection facilities agreement; and (4) uncertainty over the extension of the PTC (CPUC Resolution E-3883). In all cases, however, the CPUC found that project delays were not caused by SDG&E's actions.

[22] In its original advice letter filings, SDG&E predicted that the 15 signed contracts would result in 4 percent and 7 percent incremental deliveries in 2003 and 2004, respectively.

[23] Gregg Morris. "Utility Experiences with Private, Renewable Energy Generating Sources." Prepared for Hydro-Quebec, March 18, 1994.

[24] One of these RFOs actually resulted in signed PPAs, but the utility was unwilling to share any details about the contracts (number, capacity, technology, or status).

[25] These internal targets have often been established either in anticipation of future regulation, or as a result of regulation that requires municipal utilities to implement an internal RPS.

[26] This "other" category comes from the New England Power 1991 renewable RFO and includes waste to energy and waste heat.

[27] The three projects in default are all wind projects located in Texas that have been transmission-constrained and have therefore significantly under-performed. All three contracts have apparently resulted in lawsuits; at issue is whether the generator is responsible for transmission curtailments.

[28] Other states have also provided incentive support to utility-scale renewable energy projects. Here we focus on those states that have more extensive recent experience.

[29] Source: http://www.dti.gov.uk/renewables/policy_pdfs/nffofs11June2005.pdf

[30] These reasons are described in Mitchell, C. "The England and Wales Non-Fossil Fuel Obligation: History and Lessons." *Annual Review of Energy and Environment.* Stanford University, California, USA, 2005.

[31] Although there were no explicit penalties for exceeding the four- and five-year development periods, a project that did so would begin to cut into the length of the NFFO contract. As such, the NFFO process created incentives to bid low (to secure a contract), wait as long as possible to construct the project (hoping for technology cost reductions), and then bring the project on-line just prior to the end of the allowed development period (in order to capture the full series of contract payments).

[32] Data synthesized from documents found at http://www.dcmnr.gov.ie/NR/rdonlyres/2E9CE305-4C9D-4CE2-87E2-2FB8DF13A6AD/0/AERProgramme2005.doc.

[33] For example, see http://www.dcmnr.gov.ie/NR/rdonlyres/F070739C-0716-41AF-8A4E-DEBC1F8A99F5/0/AERVIdraft9dcmnrPrintersFinalVersion.pdf. In the future (under a different type of policy support), Ireland will impose even stricter assurances, including a valid interconnection agreement from the relevant grid operator.

[34] For example, in the first stage, there were two sub-tenders: one for developers that had already measured the wind resource, and another for those that had not. The second stage also had two sub-tenders: one for projects on the continent, and another for projects in overseas French territories.

[35] ADEME, May 2001 Quarterly News Bulletin of the ToTem Project. http://translate.google.com/translate?hl=en&sl=fr&u=http://www.ademe.fr/travail/totem/ContexteProjet.htm&prev=/search%3Fq%3DEOLE%2B2005%26hl%3Den%26lr%3D

[36] http://www.renewable-energy-policy.info/relec/france/policy/bidding.html

[37] See: http://translate.google.com/translate?hl=en&sl=fr&u=http://e2phy.in2p3.fr/2001/bal2/sld005.htm&prev=/search%3Fq%3DEOLE%2B2005%26hl%3Den%26lr%3D

[38] The 21 MW wind project was cancelled when the completed wind resource study revealed a resource that was considered unviable, even given the NJBPU support.

[39] NYSERDA has also offered two programs supporting wind prospecting.
[40] 92 percent availability earned the full incentive, and the incentive declined linearly to zero at 42 percent availability.
[41] Phase II of the program did not offer production incentives but rather other forms of financing, such as subordinated debt. Perhaps in part due to the less-attractive nature of such incentives (relative to a production incentive), there were no viable respondents to Phase II, and no funding awards were made.
[42] Round 2 of MGPP is now underway, offering $39 million. The RFP was issued in January 2005, with responses due in March 2005. The results are expected to be announced shortly.