

2003 Weather Risk Management Survey:
Contracts Beginning in the 12 Months
After March 2002

prepared for

The Weather Risk Management Association

May 2003

**2003 WEATHER RISK MANAGEMENT SURVEY:
CONTRACTS BEGINNING IN THE 12 MONTHS
AFTER MARCH 2002**

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**2003 WEATHER RISK MANAGEMENT SURVEY:
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I. Introduction

Companies in a variety of industries are subject to substantial weather risk. For example, a utility company that uses natural gas to produce electricity might commit to selling electricity for an entire winter at a pre-determined price. If the winter is colder than expected, the utility will require more natural gas than expected at the same time that natural gas prices are likely to be higher than expected. It has long been possible to hedge the price risk by contracting for a fixed amount of natural gas in futures markets; however, it is only recently that companies have offered weather risk management tools to protect against volume risk. Volume risk can be hedged with an asset whose payoff is indexed to an objective measure of the "coolness" of the winter or "warmness" of the summer.

The Weather Risk Management Association (WRMA) commissioned PricewaterhouseCoopers (PwC) to administer a survey of companies involved in trading weather derivatives. Until 2002, these contracts primarily have been executed in the over-the-counter market, but trades on exchanges are becoming much more common, especially in North America.

This report presents the 2003 survey results, covering contracts that began between April 1, 2002 and March 31, 2003. The report also includes information on trades executed during this period on the Chicago Mercantile Exchange (CME), which has become an important hub for weather trades.

Results from the 2001 and 2002 surveys are also presented. Because survey respondents have differed in each survey, any comparison of results between surveys should be undertaken with care.

II. Basic Weather Risk Management Contracts

A. Heating Degree Day Contracts

The most common weather contracts are based on heating degree days (HDDs). The HDD is a widely used measure for the relative "coolness" of the weather in a given region during a specified period of time. HDDs for any given day are calculated as the greater of (1) zero or (2) 65 degrees Fahrenheit less the day's average temperature,¹ and HDDs for a period of time are defined as HDDs summed over the days of the period.

¹ A day's average temperature is the midnight-to-midnight average of the high and low temperatures.

As an example, a HDD contract might pay the holder \$3,000 for each HDD at Chicago's O'Hare airport in excess of 5,000 HDDs for the period November 1, 2002 to March 31, 2003, up to a maximum of \$2 million. Although limitless contracts are becoming more common, weather contracts typically specify a maximum payout, referred to as the contract's "notional value." Of course, this financial tool comes at the price of a premium paid at the time the contract is initiated.

B. Cooling Degree Day Contracts

The second most common weather contract is based on the cooling degree day (CDD). CDD contracts are like HDD contracts except that they protect against unusually hot summers. CDDs for any given day are calculated as the greater of (1) zero or (2) the day's average temperature less 65 degrees Fahrenheit.

C. Other Weather Contracts

Weather contracts can be based on any objective measure of weather. Among other things, contracted payouts can depend on non-standard temperature measures,² rainfall, snowfall, and wind.

III. The Survey

WRMA and PwC surveyed all members of WRMA and 19 companies submitted final responses to the survey. The respondents are thought to comprise the bulk of the industry.³ The survey respondent list is attached as Appendix A. The survey requested basic information on every weather contract bought or sold that had a begin date after March 31, 2002 and before April 1, 2003. The requested information is listed in Table 1. (The survey instrument is attached as Appendix B.) Because PwC received information separately from the CME, the survey instructed respondents to not report any contracts executed on the CME.

² For example, the extent to which temperature conditions are favorable to a particular crop-eating insect has been determined to depend on average daily temperature in excess of 52.5°F but below 86.5°F. See www.wrma.org.

³ Many WRMA members serve as brokers or consultants and are not principals to weather contracts. All but two of the respondents to the 2003 survey were principals to weather contracts. The two brokers who participated only reported trades for which neither party was a survey participant.

| Table 1 | | | | | | | | | | | |
|--|---|--------------------------------|------------------------------|--------------------|------|--------------------|-----------|-------|--------|-------|-------|
| Information Requested for Each WRM Contract Bought or Sold with Begin Date After March 31, 2002 and Before April 1, 2003* | | | | | | | | | | | |
| Information Requested | Options Given for Answer | | | | | | | | | | |
| 1. Begin and end dates | Dates | | | | | | | | | | |
| 2. Weather measure | <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"><u>Exclusively Temperature</u></td> <td style="width: 50%;"><u>Not Excl. Temperature</u></td> </tr> <tr> <td>Heating Degree Day</td> <td>Rain</td> </tr> <tr> <td>Cooling Degree Day</td> <td>Snow</td> </tr> <tr> <td>Other</td> <td>Wind</td> </tr> <tr> <td></td> <td>Other</td> </tr> </table> | <u>Exclusively Temperature</u> | <u>Not Excl. Temperature</u> | Heating Degree Day | Rain | Cooling Degree Day | Snow | Other | Wind | | Other |
| <u>Exclusively Temperature</u> | <u>Not Excl. Temperature</u> | | | | | | | | | | |
| Heating Degree Day | Rain | | | | | | | | | | |
| Cooling Degree Day | Snow | | | | | | | | | | |
| Other | Wind | | | | | | | | | | |
| | Other | | | | | | | | | | |
| 3. Geographic region | <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"><u>North America</u></td> <td style="width: 50%;"><u>Rest of World</u></td> </tr> <tr> <td>West</td> <td>Asia</td> </tr> <tr> <td>Midwest</td> <td>Australia</td> </tr> <tr> <td>East</td> <td>Europe</td> </tr> <tr> <td>South</td> <td>Other</td> </tr> </table> | <u>North America</u> | <u>Rest of World</u> | West | Asia | Midwest | Australia | East | Europe | South | Other |
| <u>North America</u> | <u>Rest of World</u> | | | | | | | | | | |
| West | Asia | | | | | | | | | | |
| Midwest | Australia | | | | | | | | | | |
| East | Europe | | | | | | | | | | |
| South | Other | | | | | | | | | | |
| 4. Notional value | A U.S. Dollar Amount | | | | | | | | | | |
| 5. Agreed settlement payment per degree day (HDD or CDD contracts only) | A U.S. Dollar Amount | | | | | | | | | | |
| 6. Is counterparty on list provided of expected survey participants? | Yes or No | | | | | | | | | | |

*The survey instrument is attached as Appendix B.

The last question regarding counterparty was asked to allow adjustment for contracts that are reported twice: once by the seller of the contract and once by the buyer. Specifically, a contract for which the counterparty is a survey participant counted as half of a contract, and its notional value was divided by two. The list of survey participants was compiled based on responses to a pre-survey done of all WRMA members.

The survey tabulations assign contracts to half-year periods (seasons). To simplify the references, we use seasonal definitions corresponding to the northern hemisphere. Winter is defined to extend from October to the following April and the rest of the year is defined as summer.

Contracts for which the coverage period included more than one season were broken into as many contracts as seasons covered, and the contract's notional value was allocated in proportion to the relative coverage durations. No adjustments were made to one-season contracts.

CME Trades

The CME directly reported the number of weather trades executed on the exchange over the survey period. Parties can purchase contracts on the CME based on temperature measures in one of 10 cities. The contracts are standardized HDD and CDD contracts with fixed tick sizes (\$100) and no limit on liability. Based on conversations with WRMA, PwC estimated the maximum payout amount (notional value) based on the standard deviation of HDDs and CDDs since 1979.⁴ Standard deviations were calculated by city and season, and the maximum payout for each counterparty was assumed to equal the product of two standard deviations and the tick size.

IV. Survey Results

This section presents the results of the 2003 survey and compares those results to the 2001 and 2002 surveys. Because the weather risk market experienced a significant reorganization in 2002, the sample of responding companies differed between the surveys. Of the 19 respondents to the 2003 survey, 13 participated in the 2002 survey and 11 participated in 2001. The different samples could explain much of the variation between the surveys.

A. All Contract Types

Table 2 summarizes results from the three surveys. The number of contracts and total notional values for all contract types are separated into half-year seasons (winter and summer). Results from the CME are presented separately.

In total, respondents reported 4,517 trades with starting dates between April 2002 and March 2003. These contracts had a total notional value of \$3.5 billion. These totals do not include trades that occurred on the CME, which increased from around 300 between October 2001 and March 2002 to **7,239 between October 2002 and March 2003**. These contracts had an estimated total notional value of \$686 million. In total, the notional value of trades executed between October 2002 and March 2003 reached almost **\$4.2 billion**.

According to the survey responses, the number of summer contracts in 2002 outnumbered the number of winter contracts. In the past, the opposite has been true. The emergence of the CME could explain this shift since many heating contracts were executed there. Total notional value of winter trades continues to exceed summer notional value, as it has in the past.

⁴ Overall standard deviations by month were 213 (CDD) and 337 (HDD), but these varied by city, from as low as 65 (CDDs in Portland) to 363 (HDDs in Des Moines). These calculations were completed based on monthly data by city from the CME website, www.cme.com.

| Table 2. Summary Statistics for All Contract Types and All Geographical Regions | | | |
|--|----------------------------------|---|--|
| | Total Number of Contracts | Total Notional Value (\$ millions) | Average Notional Value (\$ thousands) |
| April 2001 Survey (N=19) | | | |
| April - October 1998 | 209 | 734 | 3,512 |
| October 1998 – April 1999 | 486 | 1,102 | 2,267 |
| April 1998-April 1999 | 695 | 1,836 | 2,642 |
| April - October 1999 | 362 | 641 | 1,772 |
| October 1999 – April 2000 | 923 | 2,318 | 2,511 |
| April 1999-April 2000 | 1,285 | 2,959 | 2,303 |
| April - October 2000 | 1,126 | 641 | 569 |
| October 2000 – April 2001 | 1,633 | 1,876 | 1,149 |
| April 2000-April 2001 | 2,759 | 2,517 | 912 |
| April 2002 Survey (N=20) | | | |
| April - October 2001 | 868 | 933 | 1,075 |
| October 2001 - March 2002 | 3,069 | 3,373 | 1,099 |
| April 2001-March 2002 | 3,937 | 4,306 | 1,094 |
| April 2003 Survey (N=19) | | | |
| April - October 2002 | 2,413 | 1,108 | 459 |
| October 2002 - March 2003 | 2,104 | 2,394 | 1,138 |
| April 2002-March 2003 | 4,517 | 3,501 | 775 |
| CME Contracts | | | |
| April - October 2002 | 2,161 | 149 | 69 |
| October 2002 - March 2003 | 5,078 | 537 | 106 |
| CME April 2002-March 2003 | 7,239 | 686 | 95 |
| April 2003 + CME Contracts | | | |
| April - October 2002 | 4,574 | 1,257 | 275 |
| October 2002 - March 2003 | 7,182 | 2,931 | 408 |
| April 2002-March 2003 | 11,756 | 4,188 | 356 |

Source: PricewaterhouseCoopers-WRMA survey of weather risk management contracts, 2001, 2002, and 2003, and Chicago Mercantile Exchange.

The average notional value of 2002-2003 contracts is lower than the average notional value in most of the prior periods. Average notional value for winter contracts has been relatively consistent across surveys, but the average notional value for summer contracts has varied

widely. This variation could reflect differences in the sample population rather than any industry pattern.

B. Distribution by Market and Weather Measure

Tables 3, 4.A and 4.B summarize the distribution of weather contracts by market and weather measure. The key findings are:

1. The CME claims a significant share of trades involving CDD and HDD contracts. Of the total value of trades reported, the CME was responsible for 25.4 percent of the notional value of HDD contracts and 16.3 percent of CDD contracts. Overall, over 16.4 percent of the total notional value reported for trades between April 2002 and March 2003 was generated on the CME. (The number of trades executed on the CME swamps the numbers of trades reported by respondents, but low tick size and notional value of CME trades makes the share of the total number of trades less meaningful than the dollars associated with those trades.) See Table 3.

| Table 3 | | | | | | | | | |
|---|--------------------------------------|-------------|-----------|-------------|----------------------|-----------|-----------|-----------|-------------|
| 2002-2003 CME as a Share of All Reported Trades by Type of Contract, All Regions | | | | | | | | | |
| Period of Contract Coverage includes all or part of: | Exclusively Temperature Contracts | | | | Other Contract Types | | | | Total |
| | HDD | CDD | Other | Subtotal | Rain | Snow | Wind | Other | |
| CME Share of Total Reported Notional Value | | | | | | | | | |
| April - October 2002 | 46.4 | 13.0 | NA | 12.8 | NA | NA | NA | NA | 11.9 |
| October 2002 - March 2003 | 24.5 | 100.0 | NA | 18.7 | NA | NA | NA | NA | 18.3 |
| <i>April 2002-March 2003</i> | <i>25.4</i> | <i>16.3</i> | <i>NA</i> | <i>17.0</i> | <i>NA</i> | <i>NA</i> | <i>NA</i> | <i>NA</i> | <i>16.4</i> |
| CME Share of Number of Reported Trades | | | | | | | | | |
| April - October 2002 | 82.0 | 63.0 | NA | 50.9 | NA | NA | NA | NA | 47.2 |
| October 2002 - March 2003 | 75.0 | 100.0 | NA | 73.9 | NA | NA | NA | NA | 70.7 |
| <i>April 2002-March 2003</i> | <i>75.6</i> | <i>68.5</i> | <i>NA</i> | <i>65.1</i> | <i>NA</i> | <i>NA</i> | <i>NA</i> | <i>NA</i> | <i>61.6</i> |

Source: PricewaterhouseCoopers-WRMA survey of weather risk management contracts, 2001, 2002, and 2003, and Chicago Mercantile Exchange.

2. The majority of contracts remain temperature-based. Through 2000, virtually all reported weather risk contracts were based on temperature measures. By 2002/3, the number of reported temperature-based contracts fell to around 85 percent of both summer and winter contracts (see Table 4.A). The notional value of these

contracts continued to dominate others, representing 91.9 percent of summer and 97.4 percent of winter contracts (see Table 4.B).

3. HDD and CDD contracts account for most temperature-based contracts, but the share of non-standard temperature contracts was much higher in the 2003 survey compared to prior years. The difference is particularly noticeable in the winter 2002/3 season, when HDD contracts were a much smaller share of the total and Other Temperature's share was much larger, relative to past survey results. To a smaller extent, in summer 2002 CDD contracts appear to have ceded share to Other Temperature contracts. As more HDD and CDD trades are executed on the CME, Other Temperature contracts as a share of non-CME trades can be expected to increase.

C. Distribution by Geographic Region

Table 5 shows that the almost half of all trades reported by respondents (other than CME) are based on measures in North America. This result is quite different than previous years, when North American trades represented over two-thirds of the total number of trades. Of the trades reported by respondents, 18.0 percent were in Asia and 32.8 percent were in Europe. The change in samples between the surveys could explain much of this difference.

D. Percent of Contracts for Which Counterparty is Not a Survey Participant

Table 6 reports the percentage of contracts that were between a survey participant and a survey non-participant (outside contracts). In 2003, 73.7 percent of reported trades were between a participant and a non-participant. In the past, this share has been around 60 percent. The increase appears to be driven by a significantly higher share of summer contracts taking place between participants and non-participants (81.1 percent in summer 2002 compared to 45.4 percent in summer 2001).

The large share of contracts between respondents and non-respondents could reflect a broader utilization of weather contracts as a tool to control risk.

| Table 4.A | | | | | | | | | |
|--|--------------------------------------|-------------|-------------|--------------|----------------------|------------|------------|------------|--------------|
| Percentage Distribution of Number of Contracts by Type of Contract, All Regions | | | | | | | | | |
| Period of Contract Coverage includes all or part of: | Exclusively Temperature Contracts | | | | Other Contract Types | | | | Total |
| | HDD | CDD | Other | Subtotal | Rain | Snow | Wind | Other | |
| April 2001 Survey (N=19) | | | | | | | | | |
| April - October 1998 | 0.0 | 99.5 | 0.5 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| October 1998 - April 1999 | 95.7 | 2.7 | 1.2 | 99.6 | 0.0 | 0.4 | 0.0 | 0.0 | 100.0 |
| <i>April 1998-April 1999</i> | 66.9 | 31.8 | 1.0 | 99.7 | 0.0 | 0.3 | 0.0 | 0.0 | 100.0 |
| April - October 1999 | 0.6 | 97.8 | 1.7 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| October 1999 - April 2000 | 97.2 | 0.7 | 1.4 | 99.2 | 0.0 | 0.5 | 0.0 | 0.2 | 100.0 |
| <i>April 1999-April 2000</i> | 70.0 | 28.0 | 1.5 | 99.5 | 0.0 | 0.4 | 0.0 | 0.2 | 100.0 |
| April - October 2000 | 0.8 | 94.6 | 2.8 | 98.2 | 1.0 | 0.0 | 0.4 | 0.4 | 100.0 |
| October 2000 - April 2001 | 88.7 | 0.8 | 7.2 | 96.6 | 2.0 | 1.1 | 0.2 | 0.1 | 100.0 |
| <i>April 2000-April 2001</i> | 52.8 | 39.1 | 5.4 | 97.3 | 1.6 | 0.7 | 0.3 | 0.2 | 100.0 |
| April 2002 Survey (N=20) | | | | | | | | | |
| April - October 2001 | 1.3 | 77.1 | 10.4 | 88.8 | 10.6 | 0.0 | 0.3 | 0.2 | 100.0 |
| October 2001 - March 2002 | 83.4 | 0.2 | 6.5 | 90.1 | 5.8 | 2.8 | 0.4 | 0.9 | 100.0 |
| <i>April 2001-March 2002</i> | 65.3 | 17.2 | 7.4 | 89.8 | 6.9 | 2.2 | 0.4 | 0.7 | 100.0 |
| April 2003 Survey (N=19) | | | | | | | | | |
| April - October 2002 | 4.1 | 41.5 | 40.7 | 86.3 | 9.9 | 0.0 | 1.7 | 2.0 | 100.0 |
| October 2002 - March 2003 | 72.9 | 0.0 | 12.2 | 85.1 | 7.2 | 4.5 | 1.5 | 1.8 | 100.0 |
| <i>April 2002-March 2003</i> | 36.2 | 22.2 | 27.4 | 85.7 | 8.6 | 2.1 | 1.6 | 1.9 | 100.0 |
| CME Trades | | | | | | | | | |
| April - October 2002 | 21.1 | 78.9 | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| October 2002 - March 2003 | 90.6 | 9.4 | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| <i>CME Apr 2002-Mar 2003</i> | 69.9 | 30.1 | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 |

Source: PricewaterhouseCoopers-WRMA survey of weather risk management contracts, 2001, 2002, and 2003, and Chicago Mercantile Exchange.

Table 4.B
Percentage Distribution of Notional Value by Type of Contract, All Regions

| Period of Contract Coverage includes all or part of: | Exclusively Temperature Contracts | | | | Other Contract Types | | | | Total |
|---|--------------------------------------|-------------|-------------|--------------|----------------------|------------|------------|------------|--------------|
| | HDD | CDD | Other | Subtotal | Rain | Snow | Wind | Other | |
| April 2001 Survey (N=19) | | | | | | | | | |
| April - October 1998 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| October 1998 - April 1999 | 96.1 | 1.3 | 2.2 | 99.6 | 0.0 | 0.4 | 0.0 | 0.0 | 100.0 |
| <i>April 1998-April 1999</i> | <i>57.7</i> | <i>40.8</i> | <i>1.3</i> | <i>99.8</i> | <i>0.0</i> | <i>0.2</i> | <i>0.0</i> | <i>0.0</i> | <i>100.0</i> |
| April - October 1999 | 0.3 | 99.1 | 0.6 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| October 1999 - April 2000 | 98.7 | 0.1 | 1.0 | 99.7 | 0.0 | 0.2 | 0.0 | 0.1 | 100.0 |
| <i>April 1999-April 2000</i> | <i>77.4</i> | <i>21.5</i> | <i>0.9</i> | <i>99.8</i> | <i>0.0</i> | <i>0.1</i> | <i>0.0</i> | <i>0.1</i> | <i>100.0</i> |
| April - October 2000 | 0.7 | 91.1 | 5.5 | 97.3 | 1.5 | 0.0 | 1.0 | 0.2 | 100.0 |
| October 2000 - April 2001 | 90.8 | 0.4 | 1.9 | 93.0 | 6.6 | 0.2 | 0.1 | 0.1 | 100.0 |
| <i>April 2000-April 2001</i> | <i>67.9</i> | <i>23.5</i> | <i>2.8</i> | <i>94.1</i> | <i>5.3</i> | <i>0.1</i> | <i>0.3</i> | <i>0.1</i> | <i>100.0</i> |
| April 2002 Survey (N=20) | | | | | | | | | |
| April - October 2001 | 1.4 | 76.4 | 15.1 | 92.9 | 6.8 | 0.0 | 0.1 | 0.2 | 100.0 |
| October 2001 - March 2002 | 87.5 | 0.2 | 8.0 | 95.7 | 0.5 | 0.3 | 0.2 | 3.2 | 100.0 |
| <i>April 2001-March 2002</i> | <i>68.8</i> | <i>16.7</i> | <i>9.6</i> | <i>95.1</i> | <i>1.9</i> | <i>0.3</i> | <i>0.2</i> | <i>2.6</i> | <i>100.0</i> |
| April 2003 Survey (N=19) | | | | | | | | | |
| April - October 2002 | 4.1 | 66.3 | 21.5 | 91.9 | 7.6 | 0.0 | 0.1 | 0.4 | 100.0 |
| October 2002 - March 2003 | 64.7 | 0.0 | 32.7 | 97.4 | 0.9 | 0.4 | 1.2 | 0.1 | 100.0 |
| <i>April 2002-March 2003</i> | <i>45.5</i> | <i>21.0</i> | <i>29.1</i> | <i>95.7</i> | <i>3.0</i> | <i>0.3</i> | <i>0.8</i> | <i>0.2</i> | <i>100.0</i> |
| CME Trades | | | | | | | | | |
| April - October 2002 | 26.2 | 73.8 | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| October 2002 - March 2003 | 93.8 | 6.2 | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| <i>CME Apr 2002-Mar 2003</i> | <i>79.1</i> | <i>20.9</i> | <i>0.0</i> | <i>100.0</i> | <i>0.0</i> | <i>0.0</i> | <i>0.0</i> | <i>0.0</i> | <i>100.0</i> |

Source: PricewaterhouseCoopers-WRMA survey of weather risk management contracts, 2001, 2002, and 2003, and Chicago Mercantile Exchange.

| Table 5 Percentage Distribution for Number of Contracts by Region, All Contract Types | | | | | | | | | | |
|--|---------------|-------------|-------------|-------------|--------------|-------------------|------------|-------------|------------|--------------|
| Period of Contract Coverage includes all or part of: | North America | | | | | Rest of the World | | | | Total |
| | West | Mid-west | East | South | Sub-total | Asia | Aus-tralia | Eur-ope | Other | |
| April 2001 Survey (N=19) | | | | | | | | | | |
| Apr – Oct 1998 | 20.1 | 39.7 | 25.4 | 14.8 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| Oct 1998 – Apr 1999 | 15.6 | 36.0 | 29.6 | 17.9 | 99.2 | 0.0 | 0.0 | 0.4 | 0.4 | 100.0 |
| <i>April 1998-April 1999</i> | <i>17.0</i> | <i>37.1</i> | <i>28.3</i> | <i>17.0</i> | <i>99.4</i> | <i>0.0</i> | <i>0.0</i> | <i>0.3</i> | <i>0.3</i> | <i>100.0</i> |
| April – October 1999 | 18.8 | 27.9 | 11.6 | 41.4 | 99.7 | 0.3 | 0.0 | 0.0 | 0.0 | 100.0 |
| Oct 1999 – Apr 2000 | 15.5 | 33.5 | 25.1 | 21.9 | 96.0 | 0.7 | 0.0 | 3.3 | 0.1 | 100.0 |
| <i>April 1999-April 2000</i> | <i>16.4</i> | <i>31.9</i> | <i>21.3</i> | <i>27.4</i> | <i>97.0</i> | <i>0.5</i> | <i>0.0</i> | <i>2.3</i> | <i>0.1</i> | <i>100.0</i> |
| Apr – Oct 2000 | 21.0 | 30.1 | 27.1 | 17.5 | 95.7 | 2.8 | 0.2 | 1.1 | 0.3 | 100.0 |
| Oct 2000 – Apr 2001 | 9.7 | 31.9 | 31.1 | 11.8 | 84.4 | 4.8 | 0.2 | 9.8 | 0.7 | 100.0 |
| <i>April 2000-April 2001</i> | <i>14.3</i> | <i>31.2</i> | <i>29.5</i> | <i>14.1</i> | <i>89.1</i> | <i>4.0</i> | <i>0.2</i> | <i>6.2</i> | <i>0.5</i> | <i>100.0</i> |
| April 2002 Survey (N=20) | | | | | | | | | | |
| April - October 2001 | 21.8 | 21.4 | 26.0 | 15.3 | 84.6 | 13.2 | 0.3 | 1.8 | 0.0 | 100.0 |
| Oct 2001 – Mar 2002 | 6.5 | 23.3 | 23.2 | 11.5 | 64.5 | 10.8 | 0.4 | 24.4 | 0.0 | 100.0 |
| <i>April 2001-March 2002</i> | <i>9.8</i> | <i>22.9</i> | <i>23.8</i> | <i>12.3</i> | <i>68.9</i> | <i>11.3</i> | <i>0.4</i> | <i>19.4</i> | <i>0.0</i> | <i>100.0</i> |
| April 2003 Survey (N=19) | | | | | | | | | | |
| April – October 2002 | 4.3 | 21.6 | 26.3 | 9.2 | 61.4 | 16.3 | * | 22.3 | * | 100.0 |
| Oct 2002 – Mar 2003 | 1.3 | 13.3 | 14.6 | 5.7 | 35.0 | 20.1 | * | 44.8 | * | 100.0 |
| <i>April 2002-March 2003</i> | <i>2.9</i> | <i>17.7</i> | <i>20.9</i> | <i>7.6</i> | <i>49.1</i> | <i>18.0</i> | <i>*</i> | <i>32.8</i> | <i>*</i> | <i>100.0</i> |
| CME Trades | | | | | | | | | | |
| April – October 2002 | 27.0 | 23.1 | 30.9 | 19.0 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| Oct 2002 – Mar 2003 | 12.1 | 40.3 | 24.7 | 22.9 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| <i>CME Apr '02-Mar '03</i> | <i>16.5</i> | <i>35.2</i> | <i>26.6</i> | <i>21.8</i> | <i>100.0</i> | <i>0.0</i> | <i>0.0</i> | <i>0.0</i> | <i>0.0</i> | <i>100.0</i> |

Source: PricewaterhouseCoopers-WRMA survey of weather risk management contracts, 2001, 2002, and 2003, and Chicago Mercantile Exchange.

Cells with an asterisk (*) have been withheld due to confidentiality concerns.

Table 6
Percent of Contracts for Which Counterparty is Not a Survey Participant,
All Contract Types

| Period of Contract Coverage includes all or part of: | North America | | | | | Rest of the World | | | | Total |
|--|---------------|-------------|-------------|-------------|-------------|-------------------|-------------|-------------|-------------|-------------|
| | West | Mid-west | East | South | Sub-total | Asia | Aus-tralia | Eur-ope | Other | |
| April 2001 Survey (N=19) | | | | | | | | | | |
| Apr – Oct 1998 | 50.0 | 73.5 | 92.5 | 67.7 | 72.7 | NA | NA | NA | NA | 72.7 |
| Oct 1998 - Apr 1999 | 53.9 | 71.4 | 71.5 | 72.4 | 68.9 | NA | NA | 50.0 | 50.0 | 68.7 |
| <i>April 1998-April 1999</i> | 52.5 | 72.1 | 77.2 | 71.2 | 70.0 | NA | NA | 50.0 | 50.0 | 69.9 |
| April – October 1999 | 51.5 | 58.4 | 52.4 | 49.3 | 52.6 | 100.0 | NA | NA | NA | 52.8 |
| Oct 1999 – Apr 2000 | 53.8 | 72.5 | 76.3 | 54.0 | 66.3 | 83.3 | NA | 73.3 | 0.0 | 66.5 |
| <i>April 1999-April 2000</i> | 53.1 | 69.0 | 72.6 | 52.0 | 62.3 | 85.7 | NA | 73.3 | 0.0 | 62.6 |
| Apr – Oct 2000 | 57.8 | 60.5 | 58.0 | 36.5 | 54.8 | 90.3 | 50.0 | 100.0 | 100.0 | 56.4 |
| Oct 2000 – Apr 2001 | 69.6 | 59.5 | 58.7 | 55.2 | 59.8 | 92.4 | 25.0 | 88.1 | 90.9 | 64.2 |
| <i>April 2000-April 2001</i> | 62.5 | 59.9 | 58.4 | 45.8 | 57.6 | 91.8 | 33.3 | 89.0 | 92.9 | 61.0 |
| April 2002 Survey (N=20) | | | | | | | | | | |
| April - October 2001 | 47.1 | 45.7 | 36.7 | 21.8 | 39.0 | 87.0 | 0.0 | 50.0 | NA | 45.4 |
| Oct 2001 – Mar 2002 | 62.1 | 63.8 | 58.1 | 55.2 | 60.1 | 89.4 | 66.7 | 64.8 | NA | 64.4 |
| <i>April 2001-March 2002</i> | 54.8 | 60.0 | 53.0 | 46.1 | 54.4 | 88.8 | 53.3 | 64.4 | NA | 60.2 |
| April 2003 Survey (N=19) | | | | | | | | | | |
| April – October 2002 | 85.6 | 78.3 | 79.9 | 83.3 | 80.3 | 96.2 | * | 72.1 | * | 81.1 |
| Oct 2002 – Mar 2003 | 66.7 | 60.0 | 55.0 | 71.9 | 60.1 | 97.4 | * | 55.2 | * | 65.4 |
| <i>April 2002-March 2003</i> | 81.7 | 71.9 | 71.8 | 79.3 | 73.6 | 96.8 | * | 61.4 | * | 73.7 |

Source: PricewaterhouseCoopers-WRMA survey of weather risk management contracts, 2001, 2002, and 2003, and Chicago Mercantile Exchange.

Cells with an asterisk (*) have been withheld due to confidentiality concerns.

IV. Attachments

Appendix A is the list of survey participants, and Appendix B is the survey instrument.

Appendix A

List of Survey Participants

(In alphabetical order)

1. ABN AMRO
2. Accord Energy Limited (Centrica Subsidiary)
3. AXA Corporate Solutions
4. Bank of Tokyo-Mitsubishi Ltd.
5. Castlebridge Partners
6. Entergy-Koch Trading
7. GFI Group
8. Hess Energy Trading Company
9. Innogy PLC
10. Mirant Americas Energy Marketing LP
11. Mitsui Sumitomo Insurance Company, Ltd.
12. Mizuho Corporate Bank
13. Societe Generale
14. Sompo Japan
15. Southern Hydro
16. Swiss Re New Markets
17. Tokio Marine and Fire Insurance Co. Ltd.
18. Tokyo Electric Power Company, Inc.
19. XL Weather and Energy

Appendix B
Survey Instrument



Survey of Weather Risk Management Contracts

Administered by

PricewaterhouseCoopers LLP
National Economic Consulting
April 28, 2003

Survey of Weather Risk Management Contracts

Instructions. Please submit your confidential response to PricewaterhouseCoopers by May 8, 2003. Do not leave blanks: If the answer to a question is zero, please enter "0"; if the answer to a question is not available, please enter "NA".

Please direct any questions to: John Stell
202-312-7583
John.L.Stell@us.pwcglobal.com

Please enter your data in the spreadsheet (you will need either Excel 97 or Excel 2000).

Part I. General Information

1. Company name _____
2. Name of person responding to survey ("respondent") _____
3. Title of respondent _____
4. Telephone number of respondent _____
5. Email address of respondent _____
6. Please check the box identifying your company's primary line of business.
Agriculture Energy Other
Banking Insurance

Part II. Information on Weather Risk Contracts Bought or Sold That Have Began Dates After 3/31/2002 and Before 4/1/2003

- Table 1 below requests information on each weather risk contract your company has bought or sold that has a begin date after 3/31/2002 and before 4/1/2003.
- Tables A, B, C on pages 3-5 provide information necessary to complete Table 1.
- All values are to be reported in U.S. dollars using the exchange rate prevailing at a time of contract settlement.
- DO NOT REPORT ANY TRADES EXECUTED ON THE CHICAGO MERCANTILE EXCHANGE.
- The notional value for a swap contract is the maximum contingent payment to your company plus the maximum contingent payment to the counterparty.
- Do not leave any fields blank. Enter "NA" if information is not available.
- The survey ends with Table 1.

Survey of Weather Risk Management Contracts (Page 2 of 5)

| Table 1 Weather Risk Management Contracts Bought or Sold That Have Begin Dates After March 31, 2002 and Before April 1, 2003 Page _____ of _____ | | | | | | | |
|--|--------------------------------|------------------------------|---|--|--|--|--|
| No. | Contract Begin Date (mm/dd/yy) | Contract End Date (mm/dd/yy) | Weather Measure (enter code from Table A) | Geographic Region where Weather Event Measured (enter code from Table B) | Payment per degree day (enter NA if payment not based on degree days) (\$US) | Maximum Contingent Payment (Notional Value; see footnote regarding swaps) (\$US) | Counterparty listed in Table C? (Y or N) |
| 1 | / / | / / | | | \$ | \$ | |
| 2 | / / | / / | | | \$ | \$ | |
| 3 | / / | / / | | | \$ | \$ | |
| 4 | / / | / / | | | \$ | \$ | |
| 5 | / / | / / | | | \$ | \$ | |
| 6 | / / | / / | | | \$ | \$ | |
| 7 | / / | / / | | | \$ | \$ | |
| 8 | / / | / / | | | \$ | \$ | |
| 9 | / / | / / | | | \$ | \$ | |
| 10 | / / | / / | | | \$ | \$ | |
| 11 | / / | / / | | | \$ | \$ | |
| 12 | / / | / / | | | \$ | \$ | |

If you have more than 12 contracts, please make copies of this blank table. Indicate copy number in the table header. All values are to be reported in U.S. dollars using the exchange rate prevailing at a time of contract settlement. The notional value for swap contracts is defined as the sum of the maximum payment to your company and the maximum payment to the counterparty.

Survey of Weather Risk Management Contracts (Page 3 of 5)

| Table A | |
|---|--|
| Codes for Weather Events Determining Contingent Payments | |
| Code | Weather Measure on Which Contingent Payment Depends |
| Contracts Based Exclusively on Temperature | |
| HDDF | Heating-degree-days measured in degrees Fahrenheit |
| HDCC | Heating-degree-days measured in degrees Celsius |
| CDDF | Cooling-degree-days measured in degrees Fahrenheit |
| CDDC | Cooling-degree-days measured in degrees Celsius |
| TOTH | All other exclusively temperature-based measures |
| Contracts Not Based Exclusively on Temperature | |
| RAIN | Any measure based exclusively on rainfall. |
| SNOW | Any measure based exclusively on snowfall. |
| WIND | Any measure based exclusively on wind. |
| OTHR | All others, including combinations of the above. |

Survey of Weather Risk Management Contracts (Page 4 of 5)

| Table B | |
|---|--|
| Codes for Geographic Regions Where Weather Events are Measured | |
| Code | Description |
| ASA | Asia -- all of Eurasia other than Europe as defined below, plus Cyprus, Japan, Indonesia, Philippines, Sri Lanka, Pacific islands (including Hawaii and Guam) not associated with North American, South American, or Australian continents. (Includes Turkey and Georgia.) |
| AUS | Australian continent--includes Australia, Tasmania, New Zealand, Papua New Guinea, islands associated with the continent. |
| EUR | Europe including England, Ireland, Iceland, Greenland, Gibraltar, all of Russia, Azores, and Mediterranean islands. (Does not include Turkey or Georgia.) |
| North America | |
| NAW | West Canada: Alberta, British Columbia, Northwest Territories, Yukon West U.S.: Alaska, Arizona, California, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington |
| NAM | Midwest Canada: Saskatchewan, Manitoba, Ontario Midwest U.S.: Colorado, Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, Ohio, Wisconsin, Wyoming. |
| NAE | East Canada: Quebec, New Brunswick, Nova Scotia, Newfoundland, Prince Edward Island East U.S.: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, South Carolina, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia |
| NAS | South U.S.: Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, Oklahoma, Tennessee, Texas, Puerto Rico Mexico: All. Caribbean Islands: All |
| Other | |
| OTH | Includes South America, Central America south of Mexico, Africa, islands associated with these land masses, islands not classified and not clearly associated with a continental land mass. |

Survey of Weather Risk Management Contracts (Page 5 of 5)

| Table C | |
|---|---|
| List of Companies Pre -Committing To Completing the Survey | |
| 1 | ABN AMRO |
| 2 | Accord Energy Limited (Centrica Subsidiary) |
| 3 | AXA Corporate Solutions |
| 4 | Bank of Tokyo-Mitsubishi Ltd. |
| 5 | Castlebridge Partners |
| 6 | Entergy-Koch Trading |
| 7 | GFI Group |
| 8 | Hess Energy Trading Company |
| 9 | Innogy PLC |
| 10 | Mirant Americas Energy Marketing LP |
| 11 | Mitsui Sumitomo Insurance Company, Ltd. |
| 12 | Mizuho Corporate Bank |
| 13 | Societe Generale |
| 14 | Sompo Japan |
| 15 | Southern Hydro |
| 16 | Swiss Re New Markets |
| 17 | Tokio Marine and Fire Insurance Co. Ltd. |
| 18 | Tokyo Electric Power Company, Inc. |
| 19 | XL Weather and Energy |