

## REFERENCE REPORT #38

# ALL YOU EVER WANTED TO KNOW ABOUT CARBON TRADING

On July 18, 2007, The National Petroleum Council (NPC) in approving its report, *Facing the Hard Truths about Energy*, also approved the making available of certain materials used in the study process, including detailed, specific subject matter papers prepared or used by the Task Groups and their Subgroups. These Topic Papers were working documents that were part of the analyses that led to development of the summary results presented in the report's Executive Summary and Chapters.

**These Topic Papers represent the views and conclusions of the authors. The National Petroleum Council has not endorsed or approved the statements and conclusions contained in these documents but approved the publication of these materials as part of the study process.**

The NPC believes that these papers will be of interest to the readers of the report and will help them better understand the results. These materials are being made available in the interest of transparency.

The attached Topic Paper is one of 38 such working document used in the study analyses. Also included is a roster of the Subgroup that developed or submitted this paper. Appendix E of the final NPC report provides a complete list of the 38 Topic Papers and an abstract for each. The printed final report volume contains a CD that includes pdf files of all papers. These papers also can be viewed and downloaded from the report section of the NPC website ([www.npc.org](http://www.npc.org)).

**NATIONAL PETROLEUM COUNCIL**  
**MACROECONOMIC SUGROUP**  
**OF THE**  
**NPC COMMITTEE ON GLOBAL OIL AND GAS**

---

**TEAM LEADERS**

Douglas B. Petno  
Managing Director and  
Energy Group Head  
J.P. Morgan Securities Inc.

Surina Shukri  
Energy Investment Banking  
J.P. Morgan Securities Inc.

**MEMBERS**

Charles E. Bishop\*  
Director, Economics  
Marathon Oil Corporation

Marc Levinson  
Economist  
JPMorgan Chase & Co.

Larry G. Chorn  
Chief Economist  
Platts Analytics

Richard G. Newell  
Gendell Associate Professor of  
Energy and Environmental Economics  
Nicholas School of the  
Environment and Earth Sciences  
Duke University

R. Dean Foreman  
Senior Economist  
Corporate Planning –  
Economics and Energy Division  
Exxon Mobil Corporation

Adam E. Sieminski  
Chief Energy Economist  
Global Markets/Commodities  
Deutsche Bank AG

Marianne S. Kah  
Chief Economist  
ConocoPhillips

Katherine B. Spector  
Executive Director  
Global Head of Energy Strategy  
Global Currency & Commodities Group  
JPMorgan Chase Bank, N.A.

---

\* Individual has since changed organizations but was employed by the specified company while participating on the study.

# All you ever wanted to know about carbon trading, vol 4 pt 1

Until you know everything, you know nothing

- *In this note we update our thoughts on CO<sub>2</sub> trading in light of the recent EU NAP2 decisions. It is structured in the form of answers to the main questions we've had from our equity, credit and commodity clients over the past 6 months.*
- **What has the EU done?** On November 29 the EU cut the requested 2008-12 CO<sub>2</sub> permit allocations of 9 countries by an average 5% compared to the requests made. Additionally, reduced usage of UN-flexible mechanism (flexmex) permits was allowed, and some loopholes (eg ex-post adjustments and Germany's 4+14) were removed. We believe the EU is taking a more pugnacious approach to phase 2 vs phase 1.
- **What will phase 2 permit allowances be?** If the EU continues its bottom-up calculations in the same ways as for the first 9 countries, the average cut in 2008-12 allocations vs 2005-07 will be around 13%, or 219mt/year. If the EU reverts to its original guidance of "-6% less 2005 over-allocation" the cut will be nearer 155mt. However, with only 45% of the scheme so far decided (and being challenged by some countries) there is still considerable uncertainty. In this report we also identify the emergence of a number of potential CO<sub>2</sub> trading schemes outside of the EU that could absorb some of the relatively low-cost UN flexmex permits.
- **What will the phase 2 price be?** We believe that the CO<sub>2</sub> market is increasingly pricing in the prospect of (a) tighter allowances from the EU and (b) more UN flexmex permits going outside the EU. As indicated in Figure 1, we believe the CO<sub>2</sub> abatement price for our projected 155-219mt/year shortfall is in the order of €20/t, which we continue to use as our core assumption.
- For more information on the key equity-plays on CO<sub>2</sub> trading, please see the accompanying report "*Everything you need to know about carbon trading, vol 4 pt 2: Equity trades on CO<sub>2</sub> - We like it clean*".

Table 1: UN permits available to cover the EU scheme demand

| Mt CO <sub>2</sub> equiv    | EU targets -10% NAP2 vs NAP1 | EU repeats average adjustment factor done so far = -13% NAP2 vs NAP1 |  |
|-----------------------------|------------------------------|----------------------------------------------------------------------|--|
| EU permit demand            | 155                          | 219                                                                  |  |
| UN permits available        | 200                          | 200                                                                  |  |
| Proportion going outside EU | 51%                          | 60%                                                                  |  |
| UN permits coming to EU     | 98                           | 80                                                                   |  |
| UN permits % demand         | 63%                          | 37%                                                                  |  |

Source: JPMorgan estimates.

## Equity Utilities

### Chris Rogers<sup>AC</sup>

(44-20) 7325-9069

christopher.g.rogers@jpmorgan.com

### Ian Mitchell

(44-20) 7325-8623

ian.e.mitchell@jpmorgan.com

### Alberto Gandolfi

(44 20) 7325-5742

alberto.x.gandolfi@jpmorgan.com

### Sofia Savvantidou, CFA

(44-20) 7325-0650

Sofia.Savvantidou@jpmorgan.com

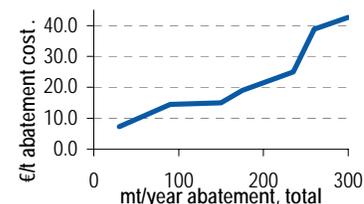
## Credit Utilities

### Olek Keenan, CFA

(44-20) 7777-0017

olek.keenan@jpmorgan.com

Figure 1: CO<sub>2</sub> abatement "merit order"



Source: JPMorgan estimates.

J.P. Morgan Securities Ltd.

See page 29 for analyst certification and important disclosures, including investment banking relationships. JPMorgan does and seeks to do business with companies covered in its research reports. As a result, investors should be aware that the firm may have a conflict of interest that could affect the objectivity of this report. Investors should consider this report as only a single factor in making their investment decision.

## Table of Contents

|                                                                    |           |
|--------------------------------------------------------------------|-----------|
| <b>Executive summary</b> .....                                     | <b>3</b>  |
| The EU is getting tighter.....                                     | 3         |
| Competition from other schemes is emerging .....                   | 3         |
| Permit prices have risen, we see €20/t as a long-term level.....   | 3         |
| <b>EU NAP2 decisions so far</b> .....                              | <b>4</b>  |
| What decisions did the EU make? .....                              | 4         |
| Why did the EU make these cuts? .....                              | 5         |
| What about the decisions yet to be made? .....                     | 6         |
| What might the final outcomes be?.....                             | 7         |
| That's great, but what's the bottom line?.....                     | 9         |
| Can the states fight the EU? Can they win? .....                   | 10        |
| What about post 2012?.....                                         | 11        |
| <b>The importance of the UN schemes</b> .....                      | <b>12</b> |
| What is the relevance of the UN schemes?.....                      | 12        |
| How many UN permits are allowed into the EU scheme?.....           | 12        |
| Can the UN permits go anywhere else than the EU? .....             | 13        |
| That's great, but what's the bottom line?.....                     | 16        |
| What's the UN's position post Kyoto? .....                         | 17        |
| <b>Carbon pricing</b> .....                                        | <b>18</b> |
| What does the carbon market tell us currently? .....               | 18        |
| Where could CO <sub>2</sub> prices go?.....                        | 20        |
| That's great, but what's the bottom line?.....                     | 21        |
| <b>Appendix 1 – Recap on abatement cost calculations</b> .....     | <b>22</b> |
| <b>Appendix 2 – Experience from 2005</b> .....                     | <b>24</b> |
| <b>Appendix 3 – A potted guide to CO<sub>2</sub> trading</b> ..... | <b>25</b> |
| How did CO <sub>2</sub> credits come into existence? .....         | 25        |
| What is the EU Emission Trading Scheme? .....                      | 25        |
| How does CO <sub>2</sub> trading work in practice? .....           | 26        |
| How does the JI/CDM fit into all this? .....                       | 26        |

## Executive summary

*The EU is tightening up phase 2 NAPs, and competition from other trading schemes is emerging for UN credits. We therefore expect to see around 155-219mt of permit "demand" in phase 2, and see the CO<sub>2</sub> price settling at around €20/t long term.*

### The EU is getting tighter

Table 2: EU permit demand vs flexmex supply

|                             | NAP2 =<br>NAP1 -<br>10% | NAP2 =<br>NAP1 -<br>13% |
|-----------------------------|-------------------------|-------------------------|
| EU permit demand            | 155                     | 219                     |
| UN permits available        | 200                     | 200                     |
| Proportion going outside EU | 51%                     | 60%                     |
| UN permits coming to EU     | 98                      | 80                      |
| UN permits % demand         | 63%                     | 37%                     |

Source: JPMorgan estimates.

On November 29 the EU made initial announcements on 2008-12 allocations for 9 countries representing 45% of the ETS (Emission Trading Scheme). It cut allowances relative to requested NAPs by 5%, and tightened up a number of specific issues on: access to UN flexmex permits; ex-post adjustment potential; Germany's "4+14" rule.

If the EU continues its bottom-up calculations in the same ways as for the first 9 countries, the average cut in 2008-12 allocations vs 2005-07 will be around 13%, or 210mt/year.

If the EU reverts to its original guidance of "-6% less 2005 over-allocation" the cut will be nearer 155mt. However, with only 45% of the scheme so far decided (and being challenged by some countries) there is still considerable uncertainty.

Further, we expect more details from the EU in the coming 12 months relating to the post-2012 period, albeit in thematic rather than numeric terms.

### Competition from other schemes is emerging

Aside from a harsher attitude from the EU, we also see competition for permits coming from potential trading schemes from outside of the EU.

We are steadily seeing the emergence of trading schemes in the US (RGGI and California) and Australia, and significant government purchases by Japan.

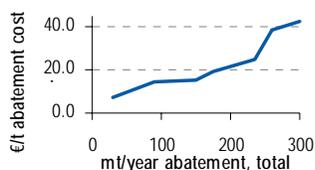
In total these could absorb around 110-120mt of UN flexible mechanism permits ("flexmex", relating to Clean Development Mechanism and Joint Implementation). This is equivalent to around 50-60% of the UN permits available going outside of the EU, acting as a potential support for EU prices.

### Permit prices have risen, we see €20/t as a long-term level

The CO<sub>2</sub> market is telling us that phase 1 is effectively a bust – prices have settled in the €6-8/t territory. This is being driven by 2005 over-allocations, warm/wet weather conditions this winter, and the recent block to banking by the EU.

For phase 2, the market has moved to pricing in the €17-20/t territory, driven by the stricter attitude of the EU towards draft phase 2 NAPs. Given the demand for flexmex permits from outside of the EU, and allowing for industrial and utility abatement and in the context of our 155-219mt/year demand assumption we see prices settling at around €20/t in the long term.

Figure 2: CO<sub>2</sub> abatement "merit order"



Source: JPMorgan estimates.

## EU NAP2 decisions so far

*The EU is clearly taking a tougher line on CO<sub>2</sub> permit allocations for 2008-12 vs 2005-07. We estimate this could equate to a shortfall vs requests of 155-219mt per year for 2008-12. However, we are still a long way from getting enough information to be definitive on allocations vs demand for permits. Individual states will try to fight the EU, but ultimately we do not expect them to succeed. The EU will begin to discuss post-2013 in 2007, perhaps with a view to a single EU allocation plan, but in framework rather than numeric terms.*

### What decisions did the EU make?

On November 29, 2006, the EU announced its decisions on draft 2008-12 National Allocation Plans (“NAP2”) for CO<sub>2</sub> pollution permits for 10 countries, within the context of the EU's Emissions Trading Scheme. Appendix 3 provides a potted summary of the ETS system.

In aggregate, the EU cut the requested NAP2s by 5.2%, resulting in a cut in NAP2 vs NAP1 (covering 2005-08) of 9.2% and equivalent to a shortfall vs 2005 emissions of 1%.

Table 3: EU NAP2 decisions made on November 29, 2006

| CO <sub>2</sub> kt / year allocations | Phase 2 request by country | Phase 1 actual allocations | % change requested | Phase 2 approval by EU | % change approved vs Phase 1 | EU approval vs request by country |
|---------------------------------------|----------------------------|----------------------------|--------------------|------------------------|------------------------------|-----------------------------------|
| Germany                               | 465,000**                  | 499,000                    | -6.8%              | 453,100                | -9.2%                        | -2.6%                             |
| Greece                                | 75,500                     | 74,564                     | 1.3%               | 69,100                 | -7.3%                        | -8.5%                             |
| Ireland                               | 22,640                     | 22,169                     | 2.1%               | 21,150                 | -4.6%                        | -6.6%                             |
| Latvia                                | 7,700                      | 4,576                      | 68.3%              | 3,300                  | -27.9%                       | -57.1%                            |
| Lithuania                             | 16,600                     | 12,265                     | 35.3%              | 8,800                  | -28.2%                       | -47.0%                            |
| Luxembourg                            | 3,950                      | 3,174                      | 24.4%              | 2,700                  | -14.9%                       | -31.6%                            |
| Malta                                 | 2,956                      | 2,942                      | 0.5%               | 2,100                  | -28.6%                       | -29.0%                            |
| Slovakia                              | 41,300                     | 30,502                     | 35.4%              | 30,900                 | 1.3%                         | -25.2%                            |
| Sweden                                | 25,200                     | 22,876                     | 10.2%              | 22,800                 | -0.3%                        | -9.5%                             |
| United Kingdom                        | 246,200                    | 275,500                    | -10.6%             | 246,200                | -10.6%                       | 0.0%                              |
| <b>Total</b>                          | <b>907,046</b>             | <b>947,569</b>             | <b>-4.3%</b>       | <b>860,150</b>         | <b>-9.2%</b>                 | <b>-5.2%</b>                      |
| % scheme reported *                   |                            | 44%                        |                    |                        |                              |                                   |

Source: EU Environment Commission, JPMorgan estimates. \* Phase 1 allocations totaled 2.141bn t/a. \*\* Note Germany had formally requested 482mt, but cut this earlier this week to 465mt

Table 4: EU NAP2 decisions vs 2005 actual emissions and NAP1 levels

| CO <sub>2</sub> kt/a | 2005 actual    | NAP1           | % NAP1 vs '05 | EU NAP2 approved | % EU NAP2 vs '05 |
|----------------------|----------------|----------------|---------------|------------------|------------------|
| Germany              | 474,000        | 499,000        | 5.3%          | 453,100          | -4.4%            |
| Greece               | 71,300         | 74,400         | 4.3%          | 69,100           | -3.1%            |
| Ireland              | 22,400         | 22,300         | -0.4%         | 21,150           | -5.6%            |
| Latvia               | 2,900          | 4,600          | 58.6%         | 3,300            | 13.8%            |
| Lithuania            | 6,600          | 12,300         | 86.4%         | 8,800            | 33.3%            |
| Luxembourg           | 2,600          | 3,400          | 30.8%         | 2,700            | 3.8%             |
| Malta                | 1,980          | 2,900          | 46.5%         | 2,100            | 6.1%             |
| Slovakia             | 25,200         | 30,500         | 21.0%         | 30,900           | 22.6%            |
| Sweden               | 19,300         | 22,900         | 18.7%         | 22,800           | 18.1%            |
| United Kingdom       | 242,400        | 245,300        | 1.2%          | 246,200          | 1.6%             |
| <b>Total</b>         | <b>868,680</b> | <b>917,600</b> | <b>5.6%</b>   | <b>860,150</b>   | <b>-1.0%</b>     |

Source: EU Environment Commission, JPMorgan estimates

## Why did the EU make these cuts?

In its decisions the EU outlined a series of both general and country-specific commentary.

### General comments

The EU found that most of the NAP2 requests were flawed on a number of grounds. In general, though, the overall maximum level of permits was set on the basis of the formula:

$$\begin{aligned} \text{Phase 2 permits} &= \\ & \text{2005 permits} \\ & \text{plus: Country-specific economic growth of between 1.5\% and 5.8\% CAGR} \\ & \text{minus: General technological improvements in carbon intensity of 2.5\% per year} \\ & \text{plus/minus: Country-specific adjustments} \end{aligned}$$

The country-specific adjustments were driven generally by whether the NAP is consistent with the country's Kyoto targets (see Appendix 3), including incorporation of the experiences in 2005 (see Appendix 2). The details of these calculations are shown in table 5 below.

The EU also made comments with regards to:

- **Limitation of the use of UN flexible mechanisms** (ie permits from outside the EU, which we discuss in more detail in the "Importance of UN schemes" section of this report) to a minimum of 10% of the total NAP up to a maximum of 50% of the gap between the country's actual emissions and its Kyoto Protocol target.
- **Banking** (keeping permits from phase 1 for use in phase 2) was basically ruled out on state aid grounds. This was one of the main reasons for the widening contango between phase 2 and phase 1 permits seen since the EU's announcements.
- **Auctioning** (ie selling permits rather than allocating for free) can be implemented ex-post as long as is within the current levels agreed under the NAP1 system. The EU decision document refers to concerns raised by the EU's "High-Level Group on Competitiveness, Energy and the Environment" with reference to the windfall profits being made by utilities currently. This results from the incorporation of 100% of permit prices into power prices despite the utilities typically getting 90–95% of their required permits for free (discussed in the "Get the balance right" chapter of this report).
- In general **more information** on precise installation lists and treatment of new entrants needs to be confirmed. This is important as it means we have a degree of indeterminacy currently in calculating the company-specific impacts of these EU decisions.

In general the language used, and the decisions made, by the EU are a lot harsher than they were for the phase 1 NAPs made in 2004.

### Country-specific issues

The EU also made a number of country-specific comments that may prove instructive when determining its views towards the countries where it has yet to make a decision.

- **Germany:** The EU stated that it will block NAPs that have features that guarantee allowances beyond 2012 as being a form of state aid if they are not also applied across all other EU. This relates mostly to Germany's so-called "4+14 rule". Under this, any new plant that replaces an older, dirtier plant gets all the old plant's allocations for four years (ie it would in effect be "over-allocated") and then receive 100% of its theoretical requirements for free for 14 years. Removal of this rule is likely to be the main sticking point in the German government's attitude towards the approved NAP2.
- **Sweden:** In general the EU accepted all the Swedish NAP with the exception of its allowance for UN flexible mechanism permits. These are limited to 50% of required cuts to achieve the country's Kyoto targets. Given that Sweden has already met its required Kyoto target, the theoretical allowance would be zero. However, the Swedish NAP proposed allowing UN permits equivalent to 20% of the NAP in. The EU still wants to encourage UN permits, and therefore applied the minimum 10% allowed.
- **Ireland:** Firstly the EU limited the use of UN permits to 21.9% of the total scheme from the 50% proposed. Second the ability to adjust permit allocations on an ex-post basis was eliminated. Ex-post adjustments had been used by Germany in phase 1, but have actually been barred for phase 2.
- **Greece:** The main country-specific comment from the EU related to the need to remove the ex-post adjustment rule.

### What about the decisions yet to be made?

The EU has received notification of allocation plans from a further 8 countries which it has not yet made a decision on, representing 29% of phase 1 allocations. In total these countries are actually requesting a net 2.6% increase in emissions in phase 2 vs phase 1.

We don't yet have a formal date of announcement from the EU for these countries - the EU says simply that "*The assessment of other allocation plans received is underway and will be concluded as soon as possible.*". Under its own rules, the EU is supposed to make a decision within three months of being notified. We'd expect decisions towards the end of December, or more realistically early January 2007.

Table 5: NAP2 notified to the EU, but not yet decided upon by EU

|              | Phase 2 request by country | Phase 1 actual allocations | % change requested | Date notified to EU          |
|--------------|----------------------------|----------------------------|--------------------|------------------------------|
| Belgium      | 63,140                     | 62,054                     | 1.7%               | 20 September 2006            |
| France       | 149,700                    | 156,459                    | -4.3%              | To be resubmitted by end Dec |
| Cyprus       | 6,450                      | 5,708                      | 13.0%              | 30 September 2006            |
| Estonia      | 24,580                     | 18,954                     | 29.7%              | 16 June 2006                 |
| Finland      | 39,580                     | 45,500                     | -13.0%             | 29 September 2006            |
| Netherlands  | 92,500                     | 88,955                     | 4.0%               | 26 September 2006            |
| Poland       | 256,570                    | 238,226                    | 7.7%               | 23 September 2006            |
| Slovenia     | 8,299                      | 8,759                      | -5.3%              | 6 November 2006              |
| <b>Total</b> | <b>640,818</b>             | <b>624,615</b>             | <b>2.6%</b>        |                              |

Source: JPMorgan estimates

Finally we have the countries for which draft proposals have been made at the national level (and reported in the press) but have not yet been formally notified to the EU. Given this notification was supposed to happen by June 30, 2006, the EU has taken legal action against these countries. Clearly it will be well into next year until

we get more information on these countries. Note that we have yet to see even draft plans for Denmark. Requests for the "refusenik" countries are equivalent to an 8% cut vs phase 1 assuming Denmark is flat period-on-period.

Table 6: NAP2 drafts reported in press, but not yet notified formally to the EU

|                | Phase 2 request<br>indicated in press | Phase 1 actual<br>allocations | % change phase 2 vs<br>phase 1. |
|----------------|---------------------------------------|-------------------------------|---------------------------------|
| Austria        | 32,800                                | 33,300                        | -1.5%                           |
| Czech Republic | 101,900                               | 97,547                        | 4.5%                            |
| Denmark *      | 33,413                                | 33,413                        | 0.0%                            |
| Spain          | 152,600                               | 182,000                       | -16.2%                          |
| Hungary        | 30,845                                | 29,925                        | 3.1%                            |
| Italy          | 209,000                               | 222,152                       | -5.9%                           |
| Portugal       | 33,967                                | 38,166                        | -11.0%                          |
| <b>Total</b>   | <b>594,526</b>                        | <b>636,503</b>                | <b>-6.6%</b>                    |

Source: JPMorgan estimates. \* Note no press reports of a proposed Danish NAP yet found

## What might the final outcomes be?

The EU generated its NAP decisions effectively off the formula detailed in the table below. This starts with 2005 emissions as a baseline, adding the EU's official assessment of economic growth between 2005 and 2010, deducting a standard energy efficiency factor of 2.5% per year and then making a number of (normally small) industry-specific and country-specific adjustments. On average these were -1.3% vs average requests of +4.1%.

Table 7: How were the NAP2 decisions calculated?

| CO <sub>2</sub> , kt equiv | 2005<br>emissions | % growth     | % efficiency  | 2010 Basic<br>allowance | EU<br>adjustments | EU allowed<br>NAP | Requested<br>adjustment | Requested<br>NAP |
|----------------------------|-------------------|--------------|---------------|-------------------------|-------------------|-------------------|-------------------------|------------------|
| Germany                    | 474,000           | 9.6%         | -13.1%        | 457,410                 | -0.9%             | 453,100           | 1.7%                    | 465,000          |
| Greece                     | 71,300            | 19.9%        | -13.1%        | 76,148                  | -9.3%             | 69,100            | -0.9%                   | 75,500           |
| Ireland                    | 22,400            | 27.2%        | -13.1%        | 25,558                  | -17.2%            | 21,150            | -11.4%                  | 22,640           |
| Latvia                     | 2,900             | 50.0%        | -13.1%        | 3,970                   | -16.9%            | 3,300             | 93.9%                   | 7,700            |
| Lithuania                  | 6,600             | 37.4%        | -13.1%        | 8,204                   | 7.3%              | 8,800             | 102.3%                  | 16,600           |
| Luxembourg                 | 2,600             | 27.2%        | -13.1%        | 2,967                   | -9.0%             | 2,700             | 33.1%                   | 3,950            |
| Malta                      | 1,980             | 11.9%        | -13.1%        | 1,956                   | 7.3%              | 2,100             | 51.1%                   | 2,956            |
| Slovak Republic            | 25,200            | 32.4%        | -13.1%        | 30,064                  | 2.8%              | 30,900            | 37.4%                   | 41,300           |
| Sweden                     | 19,300            | 16.6%        | -13.1%        | 19,976                  | 14.1%             | 22,800            | 26.2%                   | 25,200           |
| UK                         | 242,400           | 14.3%        | -13.1%        | 245,309                 | 0.4%              | 246,200           | 0.4%                    | 246,200          |
| <b>Total</b>               | <b>868,680</b>    | <b>13.4%</b> | <b>-13.1%</b> | <b>871,561</b>          | <b>-1.3%</b>      | <b>860,150</b>    | <b>4.1%</b>             | <b>907,046</b>   |

Source: JPMorgan estimates. European Commission report from 29 November 2006

If we apply a similar analysis to the countries that have yet to report, applying the same average adjustment of -1.3% we arrive at a situation where (on average) the EU would cut emission allowances for the remaining countries by 16% vs phase 1 and by 14% vs requested / rumoured schemes.

In aggregate this would entail total phase 2 allocations being 12.9% below phase 1, and 10% below requests, generating a shortfall of 285mt vs phase 1 allocations and 219mt vs phase 2 requests.

Table 8: Potential NAP2 under EU guidelines assuming average -1.3% adjustment factor

|                                       | 2005<br>emissions | % growth     | % efficiency  | 2010 Basic<br>allowance | EU<br>adjustments | EU allowed<br>NAP | % ch vs<br>phase 1 | % vs Requested<br>phase 2 |
|---------------------------------------|-------------------|--------------|---------------|-------------------------|-------------------|-------------------|--------------------|---------------------------|
| Belgium                               | 55,314            | 11.5%        | -13.1%        | 54,426                  | -1.3%             | 53,719            | -13.4%             | -14.9%                    |
| France                                | 131,238           | 11.0%        | -13.1%        | 128,417                 | -1.3%             | 126,747           | -19.0%             | -15.3%                    |
| Cyprus                                | 6,671             | 21.1%        | -13.1%        | 7,203                   | -1.3%             | 7,110             | 24.6%              | 10.2%                     |
| Estonia                               | 12,622            | 49.7%        | -13.1%        | 17,238                  | -1.3%             | 17,014            | -10.2%             | -30.8%                    |
| Finland                               | 33,052            | 13.7%        | -13.1%        | 33,248                  | -1.3%             | 32,816            | -27.9%             | -17.1%                    |
| Netherlands                           | 80,351            | 13.7%        | -13.1%        | 80,828                  | -1.3%             | 79,778            | -10.3%             | -13.8%                    |
| Poland                                | 121,542           | 26.4%        | -13.1%        | 137,728                 | -1.3%             | 135,938           | -42.9%             | -47.0%                    |
| Slovenia                              | 8,704             | 24.6%        | -13.1%        | 9,706                   | -1.3%             | 9,580             | 9.4%               | 15.4%                     |
| Austria                               | 33,373            | 11.0%        | -13.1%        | 32,655                  | -1.3%             | 32,231            | -3.2%              | -1.7%                     |
| Czech Republic                        | 81,119            | 25.8%        | -13.1%        | 91,434                  | -1.3%             | 90,245            | -7.5%              | -11.4%                    |
| Denmark **                            | 26,469            | 11.5%        | -13.1%        | 26,044                  | -1.3%             | 25,705            | -23.1%             | -23.1%                    |
| Spain                                 | 181,063           | 17.6%        | -13.1%        | 189,257                 | -1.3%             | 186,797           | 2.6%               | 22.4%                     |
| Hungary                               | 25,853            | 14.2%        | -13.1%        | 26,150                  | -1.3%             | 25,810            | -13.8%             | -16.3%                    |
| Italy                                 | 221,395           | 7.2%         | -13.1%        | 208,330                 | -1.3%             | 205,622           | -7.4%              | -1.6%                     |
| Portugal                              | 36,413            | 8.8%         | -13.1%        | 34,845                  | -1.3%             | 34,392            | -9.9%              | 1.3%                      |
| <b>Total</b>                          | <b>1,055,179</b>  | <b>15.2%</b> | <b>-13.1%</b> | <b>1,077,511</b>        | <b>-1.3%</b>      | <b>1,063,504</b>  | <b>-15.7%</b>      | <b>-13.9%</b>             |
| <b>Total including decisions made</b> | <b>1,923,859</b>  | <b>14.4%</b> | <b>-13.1%</b> | <b>1,949,073</b>        | <b>-1.3%</b>      | <b>1,923,735</b>  | <b>-12.9%</b>      | <b>-10.2%</b>             |

Source: JPMorgan estimates. \*\* Note that Denmark has not proposed a NAP yet, nor have we seen any press reports.

Table 9: Projected EU allowed NAP2 vs allocated NAP1 and requested NAP2 assuming average -1.3% adjustment factor

|                                       | Projected EU NAP2 | Allocated NAP1   | Projected Shortfall in<br>EU NAP 2vs NAP1 | Requested<br>NAP2 | Projected shortfall in EU<br>NAP2 vs requested NAP2 |
|---------------------------------------|-------------------|------------------|-------------------------------------------|-------------------|-----------------------------------------------------|
| Belgium                               | 53,719            | 62,054           | -8,336                                    | 63,140            | -9,421                                              |
| France                                | 126,747           | 156,459          | -29,712                                   | 149,700           | -22,953                                             |
| Cyprus                                | 7,110             | 5,708            | 1,402                                     | 6,450             | 660                                                 |
| Estonia                               | 17,014            | 18,954           | -1,940                                    | 24,580            | -7,566                                              |
| Finland                               | 32,816            | 45,500           | -12,684                                   | 39,580            | -6,764                                              |
| Netherlands                           | 79,778            | 88,955           | -9,177                                    | 92,500            | -12,722                                             |
| Poland                                | 135,938           | 238,226          | -102,289                                  | 256,570           | -120,632                                            |
| Slovenia                              | 9,580             | 8,759            | 822                                       | 8,299             | 1,281                                               |
| Austria                               | 32,231            | 33,300           | -1,069                                    | 32,800            | -569                                                |
| Czech Republic                        | 90,245            | 97,547           | -7,302                                    | 101,900           | -11,655                                             |
| Denmark **                            | 25,705            | 33,413           | -7,708                                    | 33,413            | -7,708                                              |
| Spain                                 | 186,797           | 182,000          | 4,797                                     | 152,600           | 34,197                                              |
| Hungary                               | 25,810            | 29,925           | -4,115                                    | 30,845            | -5,035                                              |
| Italy                                 | 205,622           | 222,152          | -16,530                                   | 209,000           | -3,378                                              |
| Portugal                              | 34,392            | 38,166           | -3,774                                    | 33,967            | 425                                                 |
| <b>Total</b>                          | <b>1,063,504</b>  | <b>1,261,118</b> | <b>-197,614</b>                           | <b>1,235,344</b>  | <b>-171,840</b>                                     |
| <b>Total including decisions made</b> | <b>1,923,654</b>  | <b>2,208,687</b> | <b>-285,033</b>                           | <b>2,142,390</b>  | <b>-218,736</b>                                     |

Source: JPMorgan estimates.

### Are we being too pessimistic?

We'd see this as potentially being too pessimistic assessment. Remember the EU indicated in its initial NAP2 guidance notes in January 2006 that average cuts of 6% vs phase 1 would be appropriate. However, this was before it emerged that there was a 4% over-allocation in 2005.

As a consequence, it might be more reasonable to assume that the EU would look to "bend" the system to achieve an overall 10% cut – this would entail an average "adjustment factor" of nearer +4.6% vs the -1.3% in the countries announced so far.

Even this apparently generous approach (only Lithuania and Malta in the initial decisions were given over 4%) the EU will still look to cut requested allowances by 8.8% for the remaining countries. This would entail a shortfall in NAP2 permits vs NAP1 of 221mt, and a shortfall vs requested NAP2 permits of 155mt.

Table 10: Potential NAP2 under EU guidelines assuming average +4.6% adjustment factor

|                                           | 2005<br>emissions | % growth     | % efficiency  | 2010 Basic<br>allowance | EU adjustments | EU allowed NAP   | % ch vs phase 1 | % vs Requested<br>phase 2 |
|-------------------------------------------|-------------------|--------------|---------------|-------------------------|----------------|------------------|-----------------|---------------------------|
| Belgium                                   | 55,314            | 11.5%        | -13.1%        | 54,426                  | 4.6%           | 56,930           | -8.3%           | -9.8%                     |
| France                                    | 131,238           | 11.0%        | -13.1%        | 128,417                 | 4.6%           | 134,324          | -14.1%          | -10.3%                    |
| Cyprus                                    | 6,671             | 21.1%        | -13.1%        | 7,203                   | 4.6%           | 7,535            | 32.0%           | 16.8%                     |
| Estonia                                   | 12,622            | 49.7%        | -13.1%        | 17,238                  | 4.6%           | 18,031           | -4.9%           | -26.6%                    |
| Finland                                   | 33,052            | 13.7%        | -13.1%        | 33,248                  | 4.6%           | 34,778           | -23.6%          | -12.1%                    |
| Netherlands                               | 80,351            | 13.7%        | -13.1%        | 80,828                  | 4.6%           | 84,547           | -5.0%           | -8.6%                     |
| Poland                                    | 121,542           | 26.4%        | -13.1%        | 137,728                 | 4.6%           | 144,064          | -39.5%          | -43.9%                    |
| Slovenia                                  | 8,704             | 24.6%        | -13.1%        | 9,706                   | 4.6%           | 10,153           | 15.9%           | 22.3%                     |
| Austria                                   | 33,373            | 11.0%        | -13.1%        | 32,655                  | 4.6%           | 34,158           | 2.6%            | 4.1%                      |
| Czech Republic                            | 81,119            | 25.8%        | -13.1%        | 91,434                  | 4.6%           | 95,640           | -2.0%           | -6.1%                     |
| Denmark **                                | 26,469            | 11.5%        | -13.1%        | 26,044                  | 4.6%           | 27,242           | -18.5%          | -18.5%                    |
| Spain                                     | 181,063           | 17.6%        | -13.1%        | 189,257                 | 4.6%           | 197,963          | 8.8%            | 29.7%                     |
| Hungary                                   | 25,853            | 14.2%        | -13.1%        | 26,150                  | 4.6%           | 27,353           | -8.6%           | -11.3%                    |
| Italy                                     | 221,395           | 7.2%         | -13.1%        | 208,330                 | 4.6%           | 217,913          | -1.9%           | 4.3%                      |
| Portugal                                  | 36,413            | 8.8%         | -13.1%        | 34,845                  | 4.6%           | 36,448           | -4.5%           | 7.3%                      |
| <b>Total</b>                              | <b>1,055,179</b>  | <b>15.2%</b> | <b>-13.1%</b> | <b>1,077,511</b>        | <b>4.6%</b>    | <b>1,127,077</b> | <b>-10.6%</b>   | <b>-8.8%</b>              |
| <b>Total including<br/>decisions made</b> | <b>1,923,859</b>  | <b>14.4%</b> | <b>-13.1%</b> | <b>1,949,073</b>        | <b>2.0%</b>    | <b>1,987,227</b> | <b>-10.0%</b>   | <b>-7.2%</b>              |

Source: JPMorgan estimates. \*\* Note that Denmark has not proposed a NAP yet, nor have we seen any press reports.

Table 11: Projected EU allowed NAP2 vs allocated NAP1 and requested NAP2 assuming average +4.6% adjustment factor

|                                       | Projected EU NAP2 | Allocated NAP1   | Projected Shortfall in<br>EU NAP 2vs NAP1 | Requested NAP2   | Projected shortfall in EU<br>NAP2 vs requested NAP2 |
|---------------------------------------|-------------------|------------------|-------------------------------------------|------------------|-----------------------------------------------------|
| Belgium                               | 56,930            | 62,054           | -5,124                                    | 63,140           | -6,210                                              |
| France                                | 134,324           | 156,459          | -22,135                                   | 149,700          | -15,376                                             |
| Cyprus                                | 7,535             | 5,708            | 1,827                                     | 6,450            | 1,085                                               |
| Estonia                               | 18,031            | 18,954           | -923                                      | 24,580           | -6,549                                              |
| Finland                               | 34,778            | 45,500           | -10,722                                   | 39,580           | -4,802                                              |
| Netherlands                           | 84,547            | 88,955           | -4,408                                    | 92,500           | -7,953                                              |
| Poland                                | 144,064           | 238,226          | -94,163                                   | 256,570          | -112,506                                            |
| Slovenia                              | 10,153            | 8,759            | 1,394                                     | 8,299            | 1,854                                               |
| Austria                               | 34,158            | 33,300           | 858                                       | 32,800           | 1,358                                               |
| Czech Republic                        | 95,640            | 97,547           | -1,907                                    | 101,900          | -6,260                                              |
| Denmark **                            | 27,242            | 33,413           | -6,172                                    | 33,413           | -6,172                                              |
| Spain                                 | 197,963           | 182,000          | 15,963                                    | 152,600          | 45,363                                              |
| Hungary                               | 27,353            | 29,925           | -2,572                                    | 30,845           | -3,492                                              |
| Italy                                 | 217,913           | 222,152          | -4,239                                    | 209,000          | 8,913                                               |
| Portugal                              | 36,448            | 38,166           | -1,718                                    | 33,967           | 2,480                                               |
| <b>Total</b>                          | <b>1,127,077</b>  | <b>1,261,118</b> | <b>-134,041</b>                           | <b>1,235,344</b> | <b>-108,267</b>                                     |
| <b>Total including decisions made</b> | <b>1,987,227</b>  | <b>2,208,687</b> | <b>-221,460</b>                           | <b>2,142,390</b> | <b>-155,163</b>                                     |

Source: JPMorgan estimates

## That's great, but what's the bottom line?

We believe that average "cuts vs requests" are going to run at around 9-14% for the remaining countries that the EU will report on, generating a **shortfall vs requests of 155-219mt in aggregate per year.**

The burning question, of course, is what the actual demand for permits might be. **Given that 2005 was over-allocated** to the tune of 94mt (see Appendix 2 for more details) this might suggest the **155-219mt shortfall vs requests is the maximum "demand" level also if governments have repeated their apparent "gaming"**. **However, we would wait until seeing 2006 data and final NAP2 approvals for all countries before being too definitive in this regard.**

## Can the states fight the EU? Can they win?

Under EU Directive 2003/87/EC, which established the ETS for phases 1 and 2, there's theoretically a split between EU and national competency on allocations.

The overall NAP, according to Article 9.3 of the Directive, is within the control of the European Union:

*“Within three months of notification of a national allocation plan by a Member State under paragraph 1, the Commission may reject that plan .... The Member State shall only take a decision under Article 11.2 if proposed amendments are accepted by the Commission.”*

However, the aforementioned Article 11.2 makes it clear the detailed allocations are under the control of the individual countries:

*“For the five-year period beginning 1 January 2008 ... each Member State shall decide upon the total quantity of allowances it will allocate for that period and ... This decision shall be taken at least 12 months before the beginning of the relevant period and be based on the Member State's national allocation plan developed pursuant to Article 9 ... taking due account of comments from the public”*

The bottom line, then, is that it is up to local governments to allocate the permits, and the EU would then have to challenge any deviations from the NAPs through the courts. Put another way, **it's more a case of “can the EU fight the states, and can they win”?**

So far, the only vocal objection has come from Germany, which saw cuts even beyond its initially revised offer. The German Economics Ministry has already stated that it (according to Point Carbon, December 1 2006) *“is ready to face a lawsuit from the EU as it does not plan to implement the EU changes”*.

Given that the decision on allocations is supposed to be taken “12 months before the beginning of the relevant period” we'd expect any further complaints to emerge by January 2007.

However, given that the EU has not approved (or indeed received) all the NAPs yet, we see a good chance that the EU may end up having to fight "ex-post" court cases once phase 2 has actually started.

**Ultimately, however, we believe that once the overall NAPs have been set by the EU, it will not be possible for the countries to allocate more permits on a sustainable basis.**

## What about post 2012?

On November 13, 2006, the EU launched a review of the ETS as it stands, with a view to formulating a new Directive to cover the post 2012 trading periods.

The EU anticipates that the full report will be published by the European Climate Change Programme (ECCP) by June 30 2007. The EU then plans to issue a new draft directive during 2H07.

In effect, the EU is looking in this report at four areas:

- **Scope of the ETS:** The EU would like to include other greenhouse gases within the scheme, as well as just CO<sub>2</sub>. The EU will separately look at bringing other sectors into the scheme – notably aviation where an initial view should be published by the EU as soon as December 20, 2006.
- **Harmonisation and predictability:** Given the problems faced so far by the divergent contents of the countries NAPs, the EU will look at moving to a standard NAP. Indeed, mention is made of having a single EU-wide cap on emissions, which would be a natural precursor to a single EU-wide allocation plan. It also appears that the EU would like to extend the trading periods beyond the 5 years currently set in the Directive to encourage long-term investment.
- **Robust compliance and enforcement:** So far there is a lack of consistency in checking up on emitters. The EU would like to improve this – again we'd look for a move to a single EU-wide scheme.
- **Involving third countries:** As discussed in the next chapter, there are other trading schemes potentially being set up elsewhere in the world, and the EU would like to potentially link these to the EU scheme.

**Overall, then, we expect the EU to talk in some detail over the coming 12 months about the post-2013 period as potentially bringing a single, unified EU scheme, which would remove the elements of national-interest that currently exist.**

We would not, however, expect any numbers on allocations to emerge for post-2013 because (as discussed below) the post-Kyoto commitments have not been set yet.

## The importance of the UN schemes

*The EU looks set to let c200mt/year of permits in from outside the ETS to cover our identified 155-219mt/year shortfall vs the proposed NAP2. We estimate that, adjusting for potential demand from other countries including the US and Japan, around 80-100mt of supply might be available at a price of €10/t or less. Long term we expect to see a global (or at least multi-regional) trading scheme emerge, but this is a post-2012 concept.*

### What is the relevance of the UN schemes?

Under the "Linking Directive" (Directive 2004/101/EC) the EU allows the use of emission permits generated from the United Nations' "Clean Development Mechanism" and "Joint Implementation" (known as "Emission Reduction Units schemes within the ETS). These are known as Certified Emission Reductions (CERs) and Emission Reduction Units (ERUs) respectively. These are a subset of a broader range of "flexible mechanisms" (or flexmex) allowed under the Kyoto Protocol.

The UNFCCC has currently approved c680mt of CDM permits that could be delivered into the EU scheme by 2012, to which can be added c320mt of JI permits – ie up to 200mt/a of permits are available from outside of the EU.

This compares to an implied demand of around 155-219mt/year as calculated above. Given that the "cost" of these credits is probably <€10/t, it is clear why the EU wants to limit their access to the EU ETS.

### How many UN permits are allowed into the EU scheme?

In its "Further guidance on allocation plans for 2008-2012" (December 22, 2005) the EC noted that the original Directive stated:

"The plan shall specify the maximum amount of CERs and ERUs which may be used by operators in the Community scheme as a percentage of the allocation of the allowances to each installation. The percentage shall be consistent with the Member State's supplementarity obligations under the Kyoto Protocol and decisions adopted pursuant to the UNFCCC or the Kyoto Protocol."

Supplementarity in this case refers to the UN's "Marakesh Accords" that state "the use of the mechanisms (ie CERs and ERUs) shall be supplemental to domestic action".

The EU then, in its November 29 decisions, stated that it saw 10% as being a reasonable minimum level of allowed CERs/ERUs, but that maximum levels would be set according the supplementarity principle in a strict manner less any permits being bought by the local governments.

This resulted in cuts in the allowed level of CERs/ERUs in Ireland from 50% of the scheme to 21% and in Sweden from 20% down to 10%.

We might see further limitations on CERs/ERUs going beyond this point however, as applying this “minimum” of 10% of scheme size would suggest around 192-197mt of permits might be allowed in – which is within the range of the 155-219mt shortfall in allocations vs requested permits identified so far.

## Can the UN permits go anywhere else than the EU?

We are beginning to get further news flow from different countries with regards to the implementation of pollution permit trading. These nascent schemes could represent alternative homes for the UN sourced permits, reducing the flow into the EU scheme. In general, these may have some impact on the back-end of the 2008-12 period, but a bigger impact on the post-2012 period.

### California – possibly 47mt/year of demand from 2011

On September 27, 2006, the State of California (the world’s 12th largest emitter of greenhouse gases) implemented law AB-32, designed to establish a *“first-in-the-world comprehensive program of regulatory and market mechanisms to achieve real, quantifiable, cost-effect reductions of greenhouse gases”*.

The macro aim of AB-32 is to reduce GHG emissions by 25% by 2020 based on 1990 emissions and by 80% by 2050, starting with mandatory caps from 2012. The aim of the act is to implement a plan to achieve these aims by January 2009 that would take effect by 2011.

As indicated in the table, in order to meet the 25% reduction target, California needs to reduce its emissions by 139.9mt of CO<sub>2</sub> equivalent between 2002 (the last available data) and 2020. Presuming that California follows the Kyoto “supplementarity” rule, it could source up to 69.9mt from outside the state, presumably including UN schemes.

Table 12: State of California GHG emissions, excluding electricity imports

|                                          | 1990  | 2002  | 2020  | "Effort" | 50% of "Effort" |
|------------------------------------------|-------|-------|-------|----------|-----------------|
| GHG emissions - mt CO <sub>2</sub> equiv | 360.6 | 410.3 | 270.5 | -139.9   | -69.9           |

Source: US Environment Protection Agency, JPMorgan estimates.

However, whilst California has set an overall GHG reduction target, the specifics of implementation are left entirely up to the California Air Resources Board (CARB). It is perfectly possible that the CARB might try to implement a solution that is not amenable to permit trading – eg by imposing further emission standards on cars, rather than on limiting the output of power stations. Nonetheless, should a cap-and-trade scheme be implemented, California could act as a “draw” for up to 70mt/year of UN flexmex credits.

### US North East / Mid-Atlantic (RGGI) possibly 22mt/year of demand from 2009

Regional Greenhouse Gas Initiative (RGGI, pronounced “reggie”) aims to *“implement a multi-state cap-and-trade program with a market-based emissions trading system”*. Following a set of agreements on December 20, 2005, RGGI was implemented in seven states in the north-east and mid-Atlantic of the US. The main focus of the scheme is the emissions from electricity generating plants.

On August 15, 2006, the RGGI issued a “model rule” that will form the basis of state regulatory rules necessary to implement a cap-and-trade scheme that will achieve a stabilization of emissions at current levels between 2009 and 2015, followed by a 10% reduction 2015-19. The initial cap is 121.2m short tons (109mt) of CO<sub>2</sub> per year. It’s worth noting, however, that none of the States has actually implemented this rule yet into law.

In some regards RGGI’s plans are likely to be harsher than those in the EU scheme – for example on December 6, 2006, the State of New York issued a preliminary regulation that, starting in 2009 once it is ready to issue permits, all permits should be issued for free. That said, some of the costs associated with buying these permits is likely to end up in the utilities’ rate bases – as a result the marginal impact on the groups’ economics are likely to be the spread between allowed and market prices, assuming there is no direct pass-through.

Interestingly, RGGI’s system will allow emission offsets from outside of North America if the emission permit price rises above \$10/permit (2005 money, inflated by CPI+2% pa) capped at 20% of each generators emissions. This provides an obvious arbitrage point between the EU and RGGI schemes, as illustrated in the table below. Assuming the cap is triggered we could see RGGI demand for ETS permits in the order of up to c22mt (ie 109mt x 20%) per year as a maximum.

Table 13: Comparing RGGI international trigger level to EU ETS pricing

| €/t                                       | 2005 avg | 2006 | 2007 | 2008 | 2009 | 2010 |
|-------------------------------------------|----------|------|------|------|------|------|
| RGGI international trigger \$/short tonne | 10.0     | 10.4 | 10.8 | 11.3 | 11.7 | 12.2 |
| RGGI international trigger - €/t          | 8.3      | 8.6  | 9.0  | 9.4  | 9.7  | 10.1 |
| EU ETS permits                            | 15.1     | 6.8  | 7.5  | 18.6 | 19.0 | 19.6 |

Source: JPMorgan estimates.

A problem for RGGI (and indeed California) is that the authority of states to regulate the import of electricity is somewhat dubious from a legal perspective. If, in a deregulated environment, a large manufacture buys power from a producer in (say) Pennsylvania, then the NY State authorities cannot regulate the transaction. As a result, generators may choose to move production out of RGGI / California and into non-regulated states. This type of “leakage” (albeit limited in scope) will tend to devalue permits over time.

**The rest of the US – several legal and new political routes to follow**

In aggregate, the US emits around 7,067mt/year of GHGs in CO<sub>2</sub> equivalent, making it arguably the most significant gap in the potential for global CO<sub>2</sub> trading. As outlined in recent JPMorgan research (“*Liability for Climate Change*”, November 29, 2006) there are two significant court cases going on that are attempting to jump start a process of nationwide greenhouse gas controls:

- **Massachusetts vs EPA:** This is being held by the Supreme Court and concerns Section 202(a)(1) of the Clean Air Act. This statute requires the US Environmental Protection Agency to set standards for motor-vehicle emissions that “may reasonably be anticipated to endanger public health or welfare”. Massachusetts wants the court to order the EPA to set such standards for carbon dioxide and other greenhouse gases. The court probably cannot get to that result unless it finds first that carbon dioxide is a pollutant within the meaning of the

Clean Air Act. Such a finding would undercut the Bush Administration's contention that it has no authority to regulate greenhouse gases, and would lend support to other legal attacks. The first hearing by the Court was held on November 29, 2006, but further progress is unlikely for several months and indeed could easily result in the case being thrown out.

- **Connecticut vs American Electric Power:** This is being held before the US Court of Appeals for the Second Circuit in New York. It alleges that five electric generating companies have created a public nuisance by emitting large amounts of carbon dioxide. The plaintiffs, eight states and New York City, claim that this alleged nuisance is actionable under federal common law rather than under a specific statute. They ask the court to impose an unspecified cap on the defendants' emissions of carbon dioxide, and do not request monetary damages. The US district court ruled for the utilities, holding that the case presents a political question that cannot be decided in court.

Clearly we're a long way from either of these emerging as a cap on emissions, let alone a cap-and-trade scheme, but they perhaps illustrate the multi-directional nature of the pressure to regulate GHGs.

From a political perspective, there is a lot more than just Al Gore going on:

- Senator Kerry introduced bi-partisan legislation looking for a freeze on GHG emissions and potentially a cap-and-trade scheme into the US Senate on October 10, 2006.
- On October 16, 2006, Governor Schwarzenegger of California and Governor Pataki of New York inked an agreement to link California's scheme to RGGI (see details of each scheme above).
- Senators McCain and Lieberman said on November 17, 2006, that they will reintroduce their proposed bill that seeks to set mandatory limits on GHG emissions and a national trading scheme in next year's Congress.

Given the newly Democratic complexion of the House and Senate, and given there are Presidential elections in November 2008 (which are likely to have an environmental slant) it may be that a political outcome is reached more quickly than a lawsuit based one.

For further information regarding the potential emerging US carbon markets please see the recent reports from our US analyst Marc Levinson "*Warming to rules on climate change*", September 27, 2006, and "*Liability for climate change*" November 29, 2006.

#### **Other countries – more coming, but slowly?**

Over time we are convinced that more and more CO<sub>2</sub> trading schemes will appear, and that these will act as competition for the EU and US schemes with regards to accessing UN permits. However, these are likely to take quite some time to emerge – possibly by 2010-12, but more likely not until post 2012. We look at three of the most significant potential players:

- **China (3,650mt CO<sub>2</sub> equiv in 1994)** – China is second only to the US in terms of GHG emissions. On September 1, 2006, the government announced that it will launch a scheme to make power plants pay to emit Sulphur Dioxide. We wouldn't

see it as impossible that China might look to move onto CO<sub>2</sub> in the future, and possibly implement a trading scheme also.

- **Japan (1,355mt CO<sub>2</sub> in 2004):** So far Japan has set aside €103m equivalent for 2007 to purchase UN credits – ie c5-10mt per year. The country has also toyed with trading scheme concepts in the past, but has more recently focused on carbon taxes instead.
- **Australia (529mt CO<sub>2</sub> equiv in 2004)** – Several states proposed a national CO<sub>2</sub> trading scheme in August, and Prime Minister Howard in mid November launched a taskforce to consider the best routes to a trading scheme for the country as a possible precursor to a broader Asia-Pacific scheme. Clearly, whilst proceeding with good intentions, Australia is a long way from launching a scheme.

### That’s great, but what’s the bottom line?

**We believe that we will, eventually, see the emergence of a global (or at least multi-regional) GHG cap-and-trade scheme. However, this is clearly a post-2012 proposition.**

In the meantime, given Japan can take c10mt per year from next year at €10/t, RGGI could take 22mt of emissions at a price well below the current EU ETS post 2009, California as much as 70mt from 2011 before counting potential from other US states, Australia or China we’d see at least 50% of UN permits going to other schemes.

**Assuming that 50-60% of UN permits go to other schemes for 2008-12, we’d calculate that they would cover around 37-63% of the potential demand for permits in the EU scheme.**

Whilst a somewhat vague range, it illustrates both the significance of CERs/ERUs and the concept that they probably won’t be enough to cover demand for permits.

In turn this means that the CO<sub>2</sub> price should trade at a premium to the CER/ERU cost of <€10/t. How much more is largely function of the level of abatement that needs to be delivered, as discussed in the next chapter.

Table 14: UN permits available to cover the EU scheme demand

| Mt CO <sub>2</sub> equiv    | EU targets -10% NAP2 vs NAP1 | EU repeats average adjustment factor done so far = -13% NAP2 vs NAP1 |
|-----------------------------|------------------------------|----------------------------------------------------------------------|
| EU permit demand            | 155                          | 219                                                                  |
| UN permits available        | 200                          | 200                                                                  |
| Proportion going outside EU | 51%                          | 60%                                                                  |
| UN permits coming to EU     | 98                           | 80                                                                   |
| UN permits % demand         | 63%                          | 37%                                                                  |

Source: JPMorgan estimates.

## What's the UN's position post Kyoto?

In mid November 2006 the United Nations Framework Conference on Climate Change (UNFCCC) held its annual policy meeting, this year in Nairobi.

The decisions made at this meeting mostly related to technical matters, and rather than reaching a post-2012 agreement it simply reached agreements on "*a detailed work plan spelling out the steps needed to reach agreement on a new set of commitments*".

The main statistic referred to the UNFCCC is that "*global emissions of greenhouse gases have to be reduced to very low levels, well below half of levels in 2000, in order to avoid dangerous climate change*".

Clearly reaching a set of final commitments similar to those reached in the Kyoto Protocol is likely to be a very protracted process. We would expect, though, that it is substantially more ambitious than the 5%-over-20-years reduction of Kyoto in terms of both scale and timing.

The next UNFCCC technical negotiations are to be held in Bonn on May 7-18, 2007, but we would not expect any major news at that stage. Then in December 3-14, 2007 (probably to be hosted by Indonesia on the island of Bali) we see the potential for more substantive announcements to be made ahead of a formal review of the Kyoto process scheduled for a year later.

In reality, though, we wouldn't expect a new "global" agreement to be reached until after the next US Presidential elections, scheduled for November 2008.

**The bottom line is that we remain convinced that there will be a "son of Kyoto", which will be both more substantial and long term than Kyoto itself, but that we are unlikely to get any final decision on magnitudes until 2009.**

## Carbon pricing

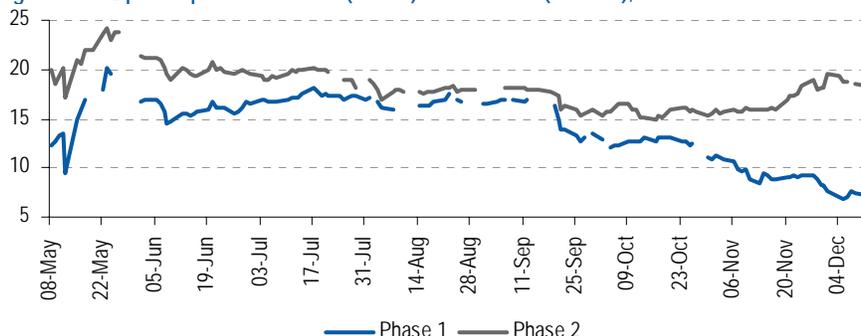
**The CO<sub>2</sub> market is currently telling us that phase 1 is effectively a bust, and that phase 2 will be significantly stricter. Our core assumption is that phase 2 prices will settle at €20/t, but with significant uncertainty on the NAP2s in the EU this may become a fluid assumption in the coming months.**

### What does the carbon market tell us currently?

CO<sub>2</sub> permits have continued their roller-coaster ride since our last major update (see “*All you ever wanted to know about carbon trading vol 3*”, May 9, 2006). The main characteristics have been:

- **Mid to late May – Steady recovery from post-crash lows:** Phase 1 contracts reached lows of c€10/t and c€15/t on phase 2 following the announcement that too many permits were allocated for 2005. After this somewhat extreme sell-off, we believe the subsequent share price recovery was driven by: profit taking by short-sellers; a reappraisal of the potential for 2006/7 to not feature the same surplus of 2005; the potential for banking of permits from phase 1 to phase 2.
- **1<sup>st</sup> week in June – Another period of decline:** Expectations that the final Polish data might show a larger-than-expected surplus, combined with an abortive German proposal to sell up to 50mt of permits at a fixed price rather than auction pushed the price down by c20%, albeit on relatively narrow volumes.
- **Mid June to Mid September – A new stability:** With only a handful of phase 2 NAPs actually being presented by the EU’s theoretical June 30 deadline, the remainder emerging only slowly and relatively little natural trading from the utilities, the price of permits traded basically sideways for almost all of the third quarter in a range around €16-17/t for phase 1 and €18-20/t for phase 2.
- **Mid September to Early November – The weather strikes back:** In the period September 19 to October 14, phase 1 contracts came off by 28% to form a new level at c€12/t and phase 2 by 12% to c€15-16/t. We believe this was driven in large part by the realization that third quarter and early fourth quarter weather conditions were warmer and wetter than usual, reducing the demand for coal and gas fired power generating capacity. This drove a fall in all commodities (eg German power off by c5%, UK gas by c10%) including CO<sub>2</sub>. This process took another leg down in late October.
- **Early November to Current – The EU gets tough:** In the run up to, and confirmation of, the EU’s pronouncements on phase 2 CO<sub>2</sub> NAPs we have seen a substantial widening of the contango between phase 1 and 2. To date, since November 9, we have seen a c20% fall in phase 1 and c20% rise in phase 2. The fall in phase 1 has been driven by the EU’s move to block banking, and a continuation of the “warm/wet weather trade”. We think the rise in phase 2 is clearly a consequence of the market anticipating a much tougher attitude by the EU than previously expected.

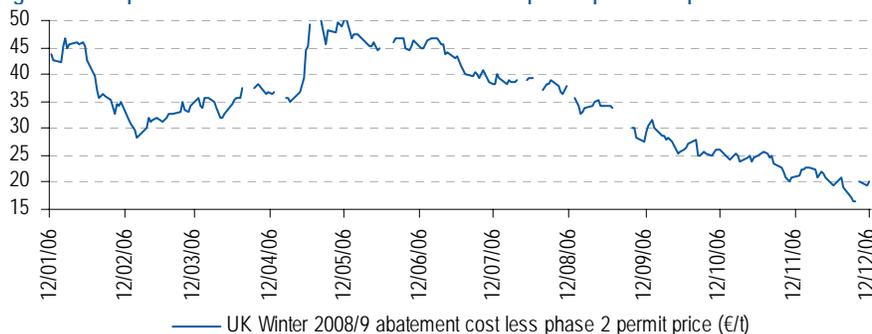
Figure 3: CO<sub>2</sub> permit prices - Phase 1 (2006/7) and Phase 2 (2008-12), €/t



Source: Bloomberg, JPMorgan estimates.

This market anticipation of a stricter EU attitude to phase 2 is confirmed, we believe, by the move in the spread between the phase 2 permit price and one of the more closely followed abatement costs – UK winter 2008 coal-to-gas abatement. This is now at the lowest level it has been at since the beginning of the year, although we would note it is still currently €20/t out of the money.

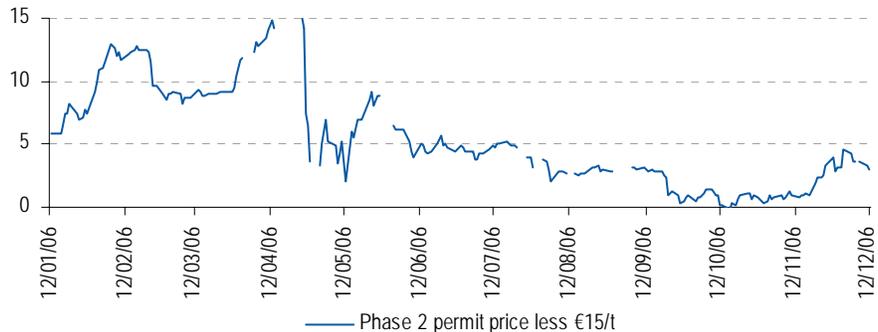
Figure 4: Comparison of UK winter abatement costs less permit prices for phase 2



Source: JPMorgan estimates, Company data.

Similarly, if we look at the phase 2 price compared to the potential price of CDM/JI permits (say around €15/t) we can see that the spread between the phase 2 price and the potential CDM price has returned close to its 1 year average (€5.3/t) having been near zero for most of 3Q/early 4Q. This would suggest to us that the carbon market is at least pricing in a full complement of CDM/JI permits, and that industrial abatement (but not yet power) is required.

Figure 5: Phase 2 permit price less €15/t as a proxy for need for CDM/industrial abatement



Source: JPMorgan estimates.

We therefore believe the CO<sub>2</sub> market clearly shows us (a) that phase 1 is more-or-less a “bust” as a result of the very warm ‘06/07 winter and the final blocking of banking into phase 2 and that (b) the EU will be significantly more strict in phase 2 than in phase 1 and that abatement beyond CDM/JI credits will be needed.

### Where could CO<sub>2</sub> prices go?

So far we have identified around 155-219mt of potential demand for permits each year in phase 2. To cover this demand we’d identify:

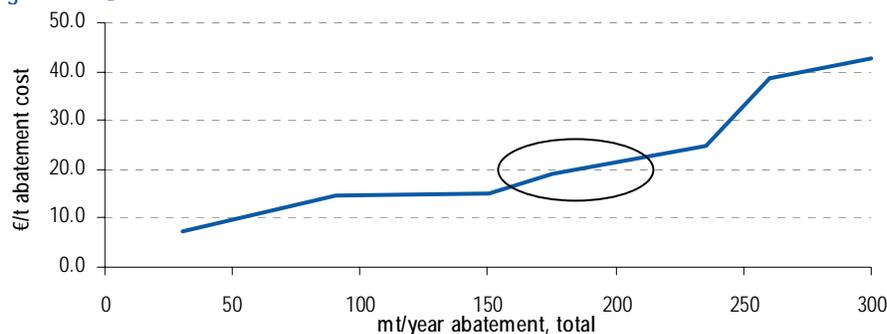
- **CDM/JI:** We see around 80-100mt per year coming in from the UN flexmex schemes (ie a high uptake from the non-EU schemes). Our Structured Commodity & Environmental Products team currently see CERs trading at around €14.3-14.8/t for 2008-09 delivery (contact nigel.r.scott@JPMorgan.com for more information). Press reports put ERUs at around half this level currently.
- **Industrial abatement:** We would not try to replicate the industrial abatement models that the specialist consultancies do (eg PointCarbon, New Carbon Finance), but if one-third to half of the potential industrial abatement they indicate comes through we’d see around 60mt pricing in at c€15/t and a similar quantity at €25/t.
- **Electricity abatement:** As indicated in Appendix 3 of this note, we calculate UK power generation switching from coal-to-gas costing around €19/t currently in summer and €38/t in winter. We’d also identify German lignite-to-coal switching at slightly over €40/t. In our recent report “*The Junction Box v2*” (October 12, 2006) we also calculated that coal with carbon-capture & sequestration (CCS) would breakeven at €35/t at our long-term commodity price assumptions (ARA#2 at \$40/t, oil and \$50/bbl).

As indicated in the chart below, all this suggests that the market should clear at around c€20/t in the middle of our identified demand range of 155-219mt/year for phase 2.

We'd make two further points:

- **Significant uncertainty remains:** As mentioned throughout the note so far we still have significant uncertainties with regards to (a) what the EU does with the remaining NAPs, (b) the inflow of UN flexmex credits is still hard to discern, and (c) phase 1 is illustrating that exogenous factors (such as weather conditions) can have a significant impact on near-end pricing.
- **Price inelasticity despite wide spread of possible demand levels:** Demand of 155-219mt (a near 50% spread) can be met between €15-22/t, suggesting that without any major changes in EU climate policy towards the NAPs that the overall decision making process is unlikely to make a significant difference to CO<sub>2</sub> prices. We would need to see demand materially below or above these levels to see the CO<sub>2</sub> price outcome being significantly different to our €20/t central case.

Figure 6: CO<sub>2</sub> abatement "merit order"



Source: JPMorgan estimates.

### That's great, but what's the bottom line?

**Phase 1 is effectively a write-off, we believe, but is of little consequence given that the biggest "shorts" (the power generators) should already have mostly fully contracted for 2007 already.**

Looking into phase 2, the recent movement in CO<sub>2</sub> prices seems to support the idea that the EU's tightening, combined with the emergence of other trading schemes over the next five years means we are more likely to be a "€20/t world" than a "€10/t world". We believe a paradigm shift in EU opinion towards the NAPs is needed to move outside of the 155-219mt/year demand level we forecast before prices would move materially away from this €20/t level.

**We therefore continue to use €20/t CO<sub>2</sub> assumptions in our financial forecasts for the utilities in Europe.**

Please see the accompanying report "*Everything you need to know about carbon trading vol 4 pt 2: Equity trades on CO<sub>2</sub>: We like it clean*" for more details.

Going forward, though, we will need to continue to review these assumptions, and perhaps be able to tighten them up somewhat as we get more information on phase 2 NAPs from the EU, and further clarity on the development of schemes elsewhere in the world.

## Appendix 1 – Recap on abatement cost calculations

In line with the economic laws of supply and demand, a market will clear when the price is set at a level where supply equals demand. In the CO<sub>2</sub> market, supply is generated through government action – ie the allocation of permits. Demand is managed by the emitters.

In the CO<sub>2</sub> space, we see the main method of reducing demand for permits in volume is via switching from a highly CO<sub>2</sub>-intensive production technology to a lower CO<sub>2</sub>-intensity technology. Of the 5 CO<sub>2</sub> ETS sectors, we see the utility sector as having the biggest opportunity for doing this – it accounts for c60% of the scheme, and power can be produced from different technologies.

The main cited abatement potential is from coal-fired power production in the UK to gas-fired power production. We'd also see switching in Germany from lignite-fired production to hard coal-fired production as a potential area.

### **UK coal-to-gas switching**

We have used API#2 ARA coal contracts plus a domestic freight cost of \$4/t, and a run rate of 0.4t/MWh (equivalent to 36% thermal efficiency) compared to Bloomberg's baseload UK power contracts to generate a "dirty dark spread".

For the "dirty spark spread" we have used NBP gas prices at a heat rate of 5,900btu/kWh (58% efficiency achieved by Siemens Frame H and Alstom GT26).

We have then deducted the spark spread from the dark spread and divided by the CO<sub>2</sub> emission reduction of 530kg/MWh to arrive at an abatement cost in €/t.

More importantly, we have built separate functions for summer and winter switching. We see summer switching as being more relevant as almost all capacity is required to run during the winter months due to the level of demand on the system.

### **German lignite to coal switching**

As per the UK we have used API#2 coal contracts, this time compared to EEX baseload German power contracts for the dirty dark spread, using 0.33t/MWh (43% efficiency, higher than the UK and reflecting newer coal plant technology).

Lignite is not a market traded commodity, so we have used our own assessment of the "dirty lignite dark spread", which remains flat over time, reflecting the mouth-of-mine nature of lignite power plants.

### **Other abatement approaches are available, but difficult to track**

We would note that there are obviously other ways to abate CO<sub>2</sub>: CER certificates under JI / CDM methods; reduction in output by industrial (rather than utility) emitters; longer term building of new generation plant (eg nuclear). However, the economics of these methods are not readily calculated – they are generally based on proprietary technologies or embedded industrial margins – and as such we would not expect them to be direct drivers of the CO<sub>2</sub> price on a day-to-day basis.

The table below takes a snapshot of CO<sub>2</sub> prices and abatement costs as at December 8, 2006. We have built a suite of Bloomberg CIX functions to track these abatement costs, which are available to JPM clients on request. Regular updates of these statistics can be found in our weekly review “The Equity Meter Reader”, again available to JPM clients on request as part of our Utilities research product offering.

Table 15: CO<sub>2</sub> prices vs utility abatement costs

|                        | € / tonne  |       |       |       |       | % change since |        |        |        | % vs relevant permit |      |      |      |      |
|------------------------|------------|-------|-------|-------|-------|----------------|--------|--------|--------|----------------------|------|------|------|------|
|                        | Last quote | -1w   | -1m   | -2m   | -3m   | -1w            | -1m    | -2m    | -3m    | Last quote           | -1w  | -1m  | -2m  | -3m  |
| Permit price, 2007     | 7.65       | 8.80  | 9.85  | 12.75 | 16.95 | -13.1%         | -22.3% | -40.0% | -54.9% |                      |      |      |      |      |
| Permit price, 2008     | 18.60      | 18.10 | 16.00 | 16.00 | 18.05 | 2.8%           | 16.3%  | 16.3%  | 3.0%   |                      |      |      |      |      |
| Permit price, 2009     | 18.55      | 18.10 | 16.75 | 16.20 | 18.50 | 2.5%           | 10.7%  | 14.5%  | 0.3%   |                      |      |      |      |      |
| <b>Abatement costs</b> |            |       |       |       |       |                |        |        |        |                      |      |      |      |      |
| UK summer 2007         | 11.85      | 14.52 | 20.66 | 21.95 | 30.37 | -18.4%         | -42.6% | -46.0% | -61.0% | 55%                  | 65%  | 110% | 72%  | 79%  |
| UK summer 2008         | 17.14      | 18.51 | 20.83 | 21.30 | 27.12 | -7.4%          | -17.7% | -19.5% | -36.8% | -8%                  | 2%   | 30%  | 33%  | 50%  |
| Germany, 2007          | 42.04      | 43.75 | 43.94 | 45.10 | 43.13 | -3.9%          | -4.3%  | -6.8%  | -2.5%  | 450%                 | 397% | 346% | 254% | 154% |
| Germany, 2008          | 42.87      | 44.37 | 45.44 | 47.16 | 45.68 | -3.4%          | -5.6%  | -9.1%  | -6.2%  | 130%                 | 145% | 184% | 195% | 153% |
| UK winter 2007/08      | 42.59      | 42.72 | 46.17 | 52.90 | 60.45 | -0.3%          | -7.7%  | -19.5% | -29.5% | 129%                 | 136% | 189% | 231% | 235% |
| UK winter 2008/09      | 38.68      | 38.68 | 36.73 | 41.96 | 45.79 | 0.0%           | 5.3%   | -7.8%  | -15.5% | 108%                 | 114% | 119% | 159% | 147% |

Source: Bloomberg, JPMorgan estimates.

## Appendix 2 – Experience from 2005

Too many permits were allocated. In effect 97mt of permits were allocated above those that were actually required, suggesting either (a) poor calculation methodologies up front and / or (b) gaming by governments in their allocations. It's notable that the only shortfall countries were Austria, Ireland, Italy and Spain (which saw weak hydro conditions) and the UK (which is arguably the only EU country seriously trying to deliver its climate change targets).

Table 16: 2005 permit allocations vs actual emissions

| Country           | Issued    | Verified emissions | Surplus | % surplus |
|-------------------|-----------|--------------------|---------|-----------|
| Total as reported | 1,999,805 | 1,902,730          | 97,075  | 4.9%      |
| Poland            | 151,048   | 121,542            | 29,506  | 19.5%     |
| Germany           | 494,979   | 469,468            | 25,511  | 5.2%      |
| France            | 150,366   | 131,238            | 19,128  | 12.7%     |
| Czech Republic    | 96,911    | 81,119             | 15,791  | 16.3%     |
| Finland           | 44,614    | 33,052             | 11,562  | 25.9%     |
| Denmark           | 37,304    | 26,469             | 10,835  | 29.0%     |
| Lithuania         | 13,503    | 6,604              | 6,900   | 51.1%     |
| Netherlands       | 86,452    | 80,351             | 6,101   | 7.1%      |
| Slovakia          | 30,471    | 25,232             | 5,239   | 17.2%     |
| Hungary           | 30,236    | 25,853             | 4,383   | 14.5%     |
| Estonia           | 16,742    | 12,622             | 4,121   | 24.6%     |
| Belgium           | 58,311    | 55,314             | 2,997   | 5.1%      |
| Sweden            | 22,278    | 19,311             | 2,967   | 13.3%     |
| Latvia            | 4,070     | 2,853              | 1,218   | 29.9%     |
| Portugal          | 36,896    | 36,413             | 483     | 1.3%      |
| Slovenia          | 9,138     | 8,704              | 434     | 4.8%      |
| Greece            | 71,135    | 71,067             | 68      | 0.1%      |
| Austria           | 32,413    | 33,373             | -960    | -3.0%     |
| Ireland           | 19,237    | 22,367             | -3,130  | -16.3%    |
| Italy             | 215,739   | 221,395            | -5,656  | -2.6%     |
| Spain             | 171,938   | 181,063            | -9,125  | -5.3%     |
| UK                | 206,023   | 237,320            | -31,297 | -15.2%    |

Source: EU Environment Commission, JPMorgan estimates

## Appendix 3 – A potted guide to CO<sub>2</sub> trading

### How did CO<sub>2</sub> credits come into existence?

Table 17: Kyoto targets

|                               |      |
|-------------------------------|------|
| EU-15                         | -8%  |
| Most other European countries | -8%  |
| US                            | -7%  |
| Canada                        | -6%  |
| Hungary                       | -6%  |
| Japan                         | -6%  |
| Poland                        | -6%  |
| New Zealand                   | 0%   |
| Russia                        | 0%   |
| Ukraine                       | 0%   |
| Norway                        | +1%  |
| Australia                     | +8%  |
| Iceland                       | +10% |

Source: UNFCCC. Targets are for all Greenhouse Gas emissions by 2008 – 2012 vs 1990 levels.

Since 1992, the international community has been working on the issue of climate change through the United National Framework Convention on Climate Change (UNFCCC). The UNFCCC is a response to the observed rise in global temperatures over the last hundred years, which is (likely) caused by emissions of greenhouse gasses (GHGs), primarily CO<sub>2</sub>.

The Kyoto Protocol was then signed in 1997. It is a binding commitment for 41 industrialized countries (known as Annex 1 countries) to reduce their GHG emissions to 5% below the 1990 level by 2010, with separate targets for each country. Developing countries outside this Annex 1 group were not assigned specific targets given low current per-capita emissions and limited financial resources to tackle the problem. However, signatories will monitor their emissions and can also participate in clean development mechanism projects (see below).

The protocol has now been converted into national law for all the countries that have ratified the treaty. Australia and the United States have failed to ratify the treaty and are not bound by the limits shown in Table 8. The US absence throws some doubts on the efficacy of Kyoto – the US emits 25% of all global GHGs – but Kyoto is a binding commitment for the signatories in any case.

Recognizing that there will be considerable costs in making these reductions, and that the market is a more efficient than government edict as a mechanism to achieve them, Kyoto provides for the possibility of emission trading.

### What is the EU Emission Trading Scheme?

The EU signed up to Kyoto as a bloc with a target of an 8% reduction in emissions. The reservoir of emissions was then divided up through a mechanism known as burden-sharing. In addition, the EU has established the Emission Trading Scheme (EU-ETS). The EU-ETS covers only emissions of CO<sub>2</sub> (not other gases) from **large, stationary** installations (ie not from transport or small installations).

Across the EU, some 11,500 installations are involved in the scheme, together accounting for 30% of total GHG emissions (45% of CO<sub>2</sub> emissions). The first period of the ETS runs from 2005-07 to establish the system and provide early reductions in emissions. There will be a second period from 2008-12.

In December 2005 the EU Commission confirmed its commitment to meeting its Kyoto targets, and requires all EU countries to set their allocations for 2008-12 to be consistent with this aim. More specifically, allocations for 2008-12 cannot be above those for 2005-07.

**Further data on the EU's requirements and projections can be found at the European Environment Agency's website at:**

**[http://reports.eea.eu.int/eea\\_report\\_2005\\_8/en](http://reports.eea.eu.int/eea_report_2005_8/en)**

## How does CO<sub>2</sub> trading work in practice?

The ETS is a "cap and trade" system – national governments/the EU sets the total number of CO<sub>2</sub> certificates that will be created and allocates them to installations.

Hence each installation has an "account" in the registry into which a certain quantity of permits is allocated for free at the start of the period. Over the course of the year, the installation is required to monitor its CO<sub>2</sub> emissions and at the end of the year it must have sufficient permits in its account to cover its emissions (although 2005, 2006 and 2007 permits are fungible an installation can "borrow" from future years within phase 1 to make up earlier year shortfalls or "bank" permits for later use).

An individual installation can operate up to the level of its "free" permits; operate more and buy permits, or operate less and sell permits. If it is technologically possible, it can also take action to abate the amount of CO<sub>2</sub> emitted at the same level of production. If, however, the installation fails to deliver the required number of permits, it is fined €40/t (rising to €100/t in phase 2) plus it has to deliver permits the following year. What happens, however, if there are physically no permits left in 2007, is unclear – on our reading there is no scope in the directive for 2008 permits to be substituted.

This scheme has the effect of spreading the cost of abatement across all CO<sub>2</sub> emitting installations while allowing the actual abatement to be done by the installations that have the lowest cost, as shown below (in the EU's example).

## How does the JI/CDM fit into all this?

Those Annex 1 countries that have ratified Kyoto must achieve reductions in GHG emissions primarily through domestic measures. However, it is also possible for an Annex 1 country to implement a Joint Initiative (JI) project in another Annex 1 country and count any reduction in emissions towards its own target.

In addition, it is possible for an Annex 1 country to implement Clean Development Mechanism (CDM) projects in developing countries and receive certified emission reduction certificates (CERs) which count towards the Annex 1 countries reductions.

To encourage companies to engage in emission reduction, the ETS allows for a company implementing a project that gains CERs to exchange these for ETS credits, which can then be sold. The first ever CERs were issued in October 2005 in relation to hydroelectric projects, and there are many more projects in the pipeline. Many of these projects relate to non- CO<sub>2</sub> greenhouse gases, which are converted into CO<sub>2</sub> tonnage equivalent (see table to right).

Table 18: CO<sub>2</sub> equivalent of other GHGs

|                     |             |
|---------------------|-------------|
| Carbon Dioxide      | 1           |
| Methane             | 21          |
| Nitrous Oxide       | 310         |
| HFCs                | 140-11,700  |
| PFCs                | 6,500-7,500 |
| Sulfur Hexafluoride | 23,900      |

Source: IEA

Chris Rogers  
(44-20) 7325-9069  
christopher.g.rogers@jpmorgan.com

European Corporate Research  
14 December 2006



Chris Rogers  
(44-20) 7325-9069  
christopher.g.rogers@jpmorgan.com

European Corporate Research  
14 December 2006



### Analyst Certification:

The research analyst(s) denoted by an “AC” on the cover of this report certifies (or, where multiple research analysts are primarily responsible for this report, the research analyst denoted by an “AC” on the cover or within the document individually certifies, with respect to each security or issuer that the research analyst covers in this research) that: (1) all of the views expressed in this report accurately reflect his or her personal views about any and all of the subject securities or issuers; and (2) no part of any of the research analyst’s compensation was, is, or will be directly or indirectly related to the specific recommendations or views expressed by the research analyst(s) in this report.

### Important Disclosures

---

#### Explanation of Credit Research Ratings:

**Ratings System:** JPMorgan uses the following sector/issuer portfolio weightings: Overweight (over the next three months, the recommended risk position is expected to outperform the relevant index, sector, or benchmark), Neutral (over the next three months, the recommended risk position is expected to perform in line with the relevant index, sector, or benchmark), and Underweight (over the next three months, the recommended risk position is expected to underperform the relevant index, sector, or benchmark). JPMorgan’s Emerging Market research uses a rating of Marketweight, which is equivalent to a Neutral rating.

**Valuation & Methodology:** In JPMorgan’s credit research, we assign a rating to each issuer (Overweight, Underweight or Neutral) based on our credit view of the issuer and the relative value of its securities, taking into account the ratings assigned to the issuer by credit rating agencies and the market prices for the issuer’s securities. Our credit view of an issuer is based upon our opinion as to whether the issuer will be able service its debt obligations when they become due and payable. We assess this by analyzing, among other things, the issuer’s credit position using standard credit ratios such as cash flow to debt and fixed charge coverage (including and excluding capital investment). We also analyze the issuer’s ability to generate cash flow by reviewing standard operational measures for comparable companies in the sector, such as revenue and earnings growth rates, margins, and the composition of the issuer’s balance sheet relative to the operational leverage in its business.

#### JPMorgan Credit Research Ratings Distribution, as of September 29, 2006

|                               | Overweight | Neutral | Underweight |
|-------------------------------|------------|---------|-------------|
| EMEA Credit Research Universe | 25%        | 53%     | 22%         |
| IB clients*                   | 51%        | 55%     | 58%         |

Represents Ratings on the most liquid bond or 5-year CDS for all companies under coverage.

\*Percentage of investment banking clients in each rating category.

**Price Charts for Compendium Reports:** Price charts are available for all companies under coverage for at least one year through the search function on JPMorgan's website <https://mm.jpmorgan.com/disclosures/company> or by calling this toll free number (1-800-477-0406).

#### Explanation of Equity Research Ratings and Analyst(s) Coverage Universe:

JPMorgan uses the following rating system: **Overweight** [Over the next six to twelve months, we expect this stock will outperform the average total return of the stocks in the analyst’s (or the analyst’s team’s) coverage universe.] **Neutral** [Over the next six to twelve months, we expect this stock will perform in line with the average total return of the stocks in the analyst’s (or the analyst’s team’s) coverage universe.] **Underweight** [Over the next six to twelve months, we expect this stock will underperform the average total return of the stocks in the analyst’s (or the analyst’s team’s) coverage universe.] The analyst or analyst’s team’s coverage universe is the sector and/or country shown on the cover of each publication. See below for the specific stocks in the certifying analyst(s) coverage universe.

Coverage Universe: **Chris Rogers:** E.ON (EONG.DE), EDF (EDF.PA), Fortum (FUM1V.HE), Gaz de France (GAZ.PA), RWE (RWE.G.F)

#### JPMorgan Equity Research Ratings Distribution, as of September 29, 2006

|                                     | Overweight<br>(buy) | Neutral<br>(hold) | Underweight<br>(sell) |
|-------------------------------------|---------------------|-------------------|-----------------------|
| JPM Global Equity Research Coverage | 42%                 | 41%               | 17%                   |
| IB clients*                         | 44%                 | 46%               | 35%                   |
| JPM SI Equity Research Coverage     | 38%                 | 48%               | 15%                   |
| IB clients*                         | 62%                 | 55%               | 47%                   |

\*Percentage of investment banking clients in each rating category.

For purposes only of NASD/NYSE ratings distribution rules, our Overweight rating falls into a buy rating category; our Neutral rating falls into a hold rating category; and our Underweight rating falls into a sell rating category.

**Valuation and Risks:** Please see the most recent JPMorgan research report for an analysis of valuation methodology and risks on any securities recommended herein. Research is available at <http://www.morganmarkets.com>, or you can contact the analyst named on the front of this note or your JPMorgan representative.

**Analysts' Compensation:** The research analysts responsible for the preparation of this report receive compensation based upon various factors, including the quality and accuracy of research, client feedback, competitive factors, and overall firm revenues, which include revenues from, among other business units, Institutional Equities, Fixed Income, and Investment Banking.

#### Other Disclosures

**Options related research:** If the information contained herein regards options related research, such information is available only to persons who have received the proper option risk disclosure documents. For a copy of the Option Clearing Corporation's Characteristics and Risks of Standardized Options, please contact your JPMorgan Representative or visit the OCC's website at <http://www.optionsclearing.com/publications/risks/riskstoc.pdf>.

#### Legal Entities Disclosures

**U.S.:** JPMSI is a member of NYSE, NASD and SIPC. J.P. Morgan Futures Inc. is a member of the NFA. J.P. Morgan Chase Bank, N.A. is a member of FDIC and is authorized and regulated in the UK by the Financial Services Authority. **U.K.:** J.P. Morgan Securities Ltd. (JPMSL) is a member of the London Stock Exchange and is authorised and regulated by the Financial Services Authority. **South Africa:** J.P. Morgan Equities Limited is a member of the Johannesburg Securities Exchange and is regulated by the FSB. **Hong Kong:** J.P. Morgan Securities (Asia Pacific) Limited (CE number AAJ321) is regulated by the Hong Kong Monetary Authority and the Securities and Futures Commission in Hong Kong. **Korea:** J.P. Morgan Securities (Far East) Ltd, Seoul branch, is regulated by the Korea Financial Supervisory Service. **Australia:** J.P. Morgan Australia Limited (ABN 52 002 888 011/AFS Licence No: 238188) is regulated by ASIC and J.P. Morgan Securities Australia Limited (ABN 61 003 245 234/AFS Licence No: 238066) is a Market Participant with the ASX and regulated by ASIC. **Taiwan:** J.P. Morgan Securities (Taiwan) Limited is a participant of the Taiwan Stock Exchange (company-type) and regulated by the Taiwan Securities and Futures Commission. **India:** J.P. Morgan India Private Limited is a member of the National Stock Exchange of India Limited and The Stock Exchange, Mumbai and is regulated by the Securities and Exchange Board of India. **Thailand:** JPMorgan Securities (Thailand) Limited is a member of the Stock Exchange of Thailand and is regulated by the Ministry of Finance and the Securities and Exchange Commission. **Indonesia:** PT J.P. Morgan Securities Indonesia is a member of the Jakarta Stock Exchange and Surabaya Stock Exchange and is regulated by the BAPEPAM. **Philippines:** This report is distributed in the Philippines by J.P. Morgan Securities Philippines, Inc. **Brazil:** Banco J.P. Morgan S.A. is regulated by the Comissao de Valores Mobiliarios (CVM) and by the Central Bank of Brazil. **Japan:** This material is distributed in Japan by JPMorgan Securities Japan Co., Ltd., which is regulated by the Japan Financial Services Agency (FSA). **Singapore:** This material is issued and distributed in Singapore by J.P. Morgan Securities Singapore Private Limited (JPMS) [mica (p) 069/09/2006 and Co. Reg. No.: 199405335R] which is a member of the Singapore Exchange Securities Trading Limited and is regulated by the Monetary Authority of Singapore (MAS) and/or JPMorgan Chase Bank, N.A., Singapore branch (JPMCB Singapore) which is regulated by the MAS. **Malaysia:** This material is issued and distributed in Malaysia by JPMorgan Securities (Malaysia) Sdn Bhd (18146-x) which is a Participating Organization of Bursa Malaysia Securities Bhd and is licensed as a dealer by the Securities Commission in Malaysia

#### Country and Region Specific Disclosures

**U.K. and European Economic Area (EEA):** Issued and approved for distribution in the U.K. and the EEA by JPMSL. Investment research issued by JPMSL has been prepared in accordance with JPMSL's Policies for Managing Conflicts of Interest in Connection with Investment Research which can be found at <http://www.jpmorgan.com/pdfdoc/research/ConflictManagementPolicy.pdf>. This report has been issued in the U.K. only to persons of a kind described in Article 19 (5), 38, 47 and 49 of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2001 (all such persons being referred to as "relevant persons"). This document must not be acted on or relied on by persons who are not relevant persons. Any investment or investment activity to which this document relates is only available to relevant persons and will be engaged in only with relevant persons. In other EEA countries, the report has been issued to persons regarded as professional investors (or equivalent) in their home jurisdiction. **Germany:** This material is distributed in Germany by J.P. Morgan Securities Ltd. Frankfurt Branch and JPMorgan Chase Bank, N.A., Frankfurt Branch who are regulated by the Bundesanstalt für Finanzdienstleistungsaufsicht. **Australia:** This material is issued and distributed by JPMSAL in Australia to "wholesale clients" only. JPMSAL does not issue or distribute this material to "retail clients." The recipient of this material must not distribute it to any third party or outside Australia without the prior written consent of JPMSAL. For the purposes of this paragraph the terms "wholesale client" and "retail client" have the meanings given to them in section 761G of the Corporations

Act 2001. **Hong Kong:** The 1% ownership disclosure as of the previous month end satisfies the requirements under Paragraph 16.5(a) of the Hong Kong Code of Conduct for persons licensed by or registered with the Securities and Futures Commission. (For research published within the first ten days of the month, the disclosure may be based on the month end data from two months' prior.) J.P. Morgan Broking (Hong Kong) Limited is the liquidity provider for derivative warrants issued by J.P. Morgan International Derivatives Ltd and listed on The Stock Exchange of Hong Kong Limited. An updated list can be found on HKEx website: <http://www.hkex.com.hk/prod/dw/Lp.htm>. **Korea:** This report may have been edited or contributed to from time to time by affiliates of J.P. Morgan Securities (Far East) Ltd, Seoul branch. **Singapore:** JPMSI and/or its affiliates may have a holding in any of the securities discussed in this report; for securities where the holding is 1% or greater, the specific holding is disclosed in the Legal Disclosures section above. **India:** For private circulation only not for sale. **New Zealand:** This material is issued and distributed by JPMSAL in New Zealand only to persons whose principal business is the investment of money or who, in the course of and for the purposes of their business, habitually invest money. JPMSAL does not issue or distribute this material to members of "the public" as determined in accordance with section 3 of the Securities Act 1978. The recipient of this material must not distribute it to any third party or outside New Zealand without the prior written consent of JPMSAL.

**General:** Additional information is available upon request. Information has been obtained from sources believed to be reliable but JPMorgan Chase & Co. or its affiliates and/or subsidiaries (collectively JPMorgan) do not warrant its completeness or accuracy except with respect to any disclosures relative to JPMSI and/or its affiliates and the analyst's involvement with the issuer that is the subject of the research. All pricing is as of the close of market for the securities discussed, unless otherwise stated. Opinions and estimates constitute our judgment as of the date of this material and are subject to change without notice. Past performance is not indicative of future results. This material is not intended as an offer or solicitation for the purchase or sale of any financial instrument. The opinions and recommendations herein do not take into account individual client circumstances, objectives, or needs and are not intended as recommendations of particular securities, financial instruments or strategies to particular clients. The recipient of this report must make its own independent decisions regarding any securities or financial instruments mentioned herein. JPMSI distributes in the U.S. research published by non-U.S. affiliates and accepts responsibility for its contents. Periodic updates may be provided on companies/industries based on company specific developments or announcements, market conditions or any other publicly available information. Clients should contact analysts and execute transactions through a JPMorgan subsidiary or affiliate in their home jurisdiction unless governing law permits otherwise.

Revised December 11, 2006.

---

**Copyright 2006 JPMorgan Chase & Co. All rights reserved. This report or any portion hereof may not be reprinted, sold or redistributed without the written consent of JPMorgan.**

The tables below outline our views on how the EU arrived at its decisions on the 9 NAPs reported on November 29, 2006, and our projection for the announcements yet to be made assuming this pattern is continued.

Table 19: How were the NAP2 decisions calculated?

| CO <sub>2</sub> , kt equiv | 2005           |              |               | 2010 Basic allowance | EU adjustments | EU allowed NAP | Requested adjustment | Requested NAP  |
|----------------------------|----------------|--------------|---------------|----------------------|----------------|----------------|----------------------|----------------|
|                            | emissions      | % growth     | % efficiency  |                      |                |                |                      |                |
| Germany                    | 474,000        | 9.6%         | -13.1%        | 457,410              | -0.9%          | 453,100        | 1.7%                 | 465,000        |
| Greece                     | 71,300         | 19.9%        | -13.1%        | 76,148               | -9.3%          | 69,100         | -0.9%                | 75,500         |
| Ireland                    | 22,400         | 27.2%        | -13.1%        | 25,558               | -17.2%         | 21,150         | -11.4%               | 22,640         |
| Latvia                     | 2,900          | 50.0%        | -13.1%        | 3,970                | -16.9%         | 3,300          | 93.9%                | 7,700          |
| Lithuania                  | 6,600          | 37.4%        | -13.1%        | 8,204                | 7.3%           | 8,800          | 102.3%               | 16,600         |
| Luxembourg                 | 2,600          | 27.2%        | -13.1%        | 2,967                | -9.0%          | 2,700          | 33.1%                | 3,950          |
| Malta                      | 1,980          | 11.9%        | -13.1%        | 1,956                | 7.3%           | 2,100          | 51.1%                | 2,956          |
| Slovak Republic            | 25,200         | 32.4%        | -13.1%        | 30,064               | 2.8%           | 30,900         | 37.4%                | 41,300         |
| Sweden                     | 19,300         | 16.6%        | -13.1%        | 19,976               | 14.1%          | 22,800         | 26.2%                | 25,200         |
| UK                         | 242,400        | 14.3%        | -13.1%        | 245,309              | 0.4%           | 246,200        | 0.4%                 | 246,200        |
| <b>Total</b>               | <b>868,680</b> | <b>13.4%</b> | <b>-13.1%</b> | <b>871,561</b>       | <b>-1.3%</b>   | <b>860,150</b> | <b>4.1%</b>          | <b>907,046</b> |

Source: JPMorgan estimates. European Commission report from 29 November 2006

Table 20: Potential NAP2 under EU guidelines assuming average -1.3% adjustment factor

|                                       | 2005             |              |               | 2010 Basic allowance | EU adjustments | EU allowed NAP   | % ch vs phase 1 | % vs Requested phase 2 |
|---------------------------------------|------------------|--------------|---------------|----------------------|----------------|------------------|-----------------|------------------------|
|                                       | emissions        | % growth     | % efficiency  |                      |                |                  |                 |                        |
| Belgium                               | 55,314           | 11.5%        | -13.1%        | 54,426               | -1.3%          | 53,719           | -13.4%          | -14.9%                 |
| France                                | 131,238          | 11.0%        | -13.1%        | 128,417              | -1.3%          | 126,747          | -19.0%          | -15.3%                 |
| Cyprus                                | 6,671            | 21.1%        | -13.1%        | 7,203                | -1.3%          | 7,110            | 24.6%           | 10.2%                  |
| Estonia                               | 12,622           | 49.7%        | -13.1%        | 17,238               | -1.3%          | 17,014           | -10.2%          | -30.8%                 |
| Finland                               | 33,052           | 13.7%        | -13.1%        | 33,248               | -1.3%          | 32,816           | -27.9%          | -17.1%                 |
| Netherlands                           | 80,351           | 13.7%        | -13.1%        | 80,828               | -1.3%          | 79,778           | -10.3%          | -13.8%                 |
| Poland                                | 121,542          | 26.4%        | -13.1%        | 137,728              | -1.3%          | 135,938          | -42.9%          | -47.0%                 |
| Slovenia                              | 8,704            | 24.6%        | -13.1%        | 9,706                | -1.3%          | 9,580            | 9.4%            | 15.4%                  |
| Austria                               | 33,373           | 11.0%        | -13.1%        | 32,655               | -1.3%          | 32,231           | -3.2%           | -1.7%                  |
| Czech Republic                        | 81,119           | 25.8%        | -13.1%        | 91,434               | -1.3%          | 90,245           | -7.5%           | -11.4%                 |
| Denmark **                            | 26,469           | 11.5%        | -13.1%        | 26,044               | -1.3%          | 25,705           | -23.1%          | -23.1%                 |
| Spain                                 | 181,063          | 17.6%        | -13.1%        | 189,257              | -1.3%          | 186,797          | 2.6%            | 22.4%                  |
| Hungary                               | 25,853           | 14.2%        | -13.1%        | 26,150               | -1.3%          | 25,810           | -13.8%          | -16.3%                 |
| Italy                                 | 221,395          | 7.2%         | -13.1%        | 208,330              | -1.3%          | 205,622          | -7.4%           | -1.6%                  |
| Portugal                              | 36,413           | 8.8%         | -13.1%        | 34,845               | -1.3%          | 34,392           | -9.9%           | 1.3%                   |
| <b>Total</b>                          | <b>1,055,179</b> | <b>15.2%</b> | <b>-13.1%</b> | <b>1,077,511</b>     | <b>-1.3%</b>   | <b>1,063,504</b> | <b>-15.7%</b>   | <b>-13.9%</b>          |
| <b>Total including decisions made</b> | <b>1,923,859</b> | <b>14.4%</b> | <b>-13.1%</b> | <b>1,949,073</b>     | <b>-1.3%</b>   | <b>1,923,735</b> | <b>-12.9%</b>   | <b>-10.2%</b>          |

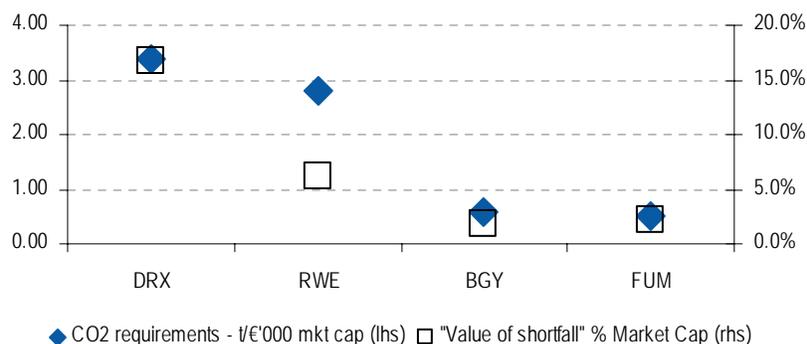
Source: JPMorgan estimates. \*\* Note that Denmark has not proposed a NAP yet, nor have we seen any press reports.

# All you ever wanted to know about carbon trading, vol 4 pt 2

## Equity trades on CO<sub>2</sub> - We like it clean

- **The EU cracks the whip:** On November 29 the EU tightened the requested NAPs (National Allocation Plans) of 9 countries by an average 5%. If repeated across the other countries we calculate this will generate a demand for permits of 155-219mt. On the basis of this range, we see the CO<sub>2</sub> price settling at around €20/t long term.
- **The utilities feel the pain:** We believe 100% of the cost of CO<sub>2</sub> permits is already priced into power and hence revenues of the utilities. The utilities currently benefit from the “double windfall” of higher power prices and free CO<sub>2</sub> permits. However, we believe any cut to the allocation of permits will fall on the utilities, and hence their profitability and valuation.
- **Be clean, not dirty:** As a consequence, we would prefer to orient portfolios towards “clean” generators that operate in floating price environments, such as Fortum and British Energy, and away from “dirty” generators, such as RWE and Drax.
- For further details regarding the CO<sub>2</sub> market, please see the accompanying report “All you ever wanted to know about carbon trading, vol 4 pt 1: Until you know everything, you know nothing”.

Figure 2: Exposure to CO<sub>2</sub> permits vs cost from a shortfall of permits allocated



Source: JPMorgan estimates.

### Electric Utilities, Independent Power Producers

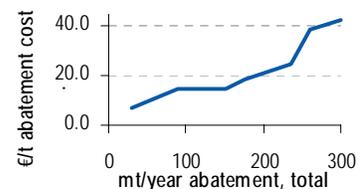
**Chris Rogers**<sup>AC</sup>  
(44-20) 7325-9069  
christopher.g.rogers@jpmorgan.com

**Ian Mitchell**  
(44-20) 7325-8623  
ian.e.mitchell@jpmorgan.com

**Alberto Gandolfi**  
(44 20) 7325-5742  
alberto.x.gandolfi@jpmorgan.com

**Sofia Savvantidou, CFA**  
(44-20) 7325-0650  
Sofia.Savvantidou@jpmorgan.com

Figure 1: CO<sub>2</sub> abatement cost "merit order"



Source: JPMorgan estimates.

J.P. Morgan Securities Ltd.

See page 14 for analyst certification and important disclosures, including investment banking relationships. JPMorgan does and seeks to do business with companies covered in its research reports. As a result, investors should be aware that the firm may have a conflict of interest that could affect the objectivity of this report. Investors should consider this report as only a single factor in making their investment decision.

## Investment thesis

*The CO<sub>2</sub> situation is tightening for the European utilities – enough to raise costs, but not enough to raise prices. We'd buy the “clean” generators in liberalised markets (Fortum, British Energy) and sell the “dirty” generators (Drax, RWE).*

### The CO<sub>2</sub> situation is tightening...

In the accompanying report “*All you ever wanted to know about carbon trading, vol 4 pt 1*” we detail our views on the CO<sub>2</sub> market currently.

On November 29 the EU made initial announcements on 2008-12 allocations for 9 countries representing 45% of the ETS (Emission Trading Scheme). They cut allowances relative to requested NAPs by 5%, and tightened up a number of specific issues on: access to UN flexmex permits; ex-post adjustment potential; Germany's “4+14” rule.

If this move is repeated for the rest of the NAPs (and we won't know for sure until mid next year we believe) then we calculate the “demand” for permits could run at around 155-219mt/year.

Aside from a harsher attitude from the EU, we also see competition for permits coming from potential trading schemes from outside of the EU. We are steadily seeing the emergence of trading schemes in the US (RGGI and California) and Australia, and significant government purchases by Japan. In total we estimate these could absorb 50-60% of UN flexmex (ie CDM/JI) permits, pushing up EU permit prices potentially.

Despite this, though, our assessment of the “abatement merit order” leads us to maintain our €20/t phase 2 CO<sub>2</sub> permit assumption.

### ...enough to raises costs, but not enough to raise prices

Given the tightening of allowances we believe the utilities face potentially significant extra costs from CO<sub>2</sub> permits during phase 2. We'd value the overall “cost” of CO<sub>2</sub> permit shortfalls at between 1.6% and 23% of market cap, with an average amongst the generators we cover of 4.8%.

Given our assessment of the CO<sub>2</sub> abatement merit order and the experience of recent power price moves we believe that a significantly larger shortfall than what we currently expect is needed to push CO<sub>2</sub> prices and power prices higher. Without this boost the cost of extra permits will be offset directly against profits and value.

### Buy the “clean” generators, sell the “dirty” generators

Given the uncertainty on carbon permits, but the tendency towards ongoing tightening, we believe investors would be better positioned in low-CO<sub>2</sub> intensity generators in liberalized price environments. These avoid the risks of higher costs whilst still having upside optionality should CO<sub>2</sub> and power prices begin to rise once more. We would therefore overweight Fortum and Drax in a utilities portfolio relative to British Energy and RWE.

**Fortum (OW, Target Price €24.3)**

Fortum has the fourth lowest CO<sub>2</sub> intensity in the group as a result of its high exposure to hydro and nuclear. The Finnish NAP should only need marginal adjustment, and the Swedish NAP has already been announced.

The Nordic market is fully liberalized, and we believe there is upside in convergence with Central European prices as well as optionality on CO<sub>2</sub> pricing. For more information please see our report "*Head North for Growth*", August 31, 2006.

**British Energy (OW, Target Price 560p)**

British Energy's ownership of Eggborough means it is not entirely "clean", but it is in the bottom quintile by carbon intensity despite the harsh UK NAP. The UK liberalized market should give upside optionality assuming output can be returned to normalized levels.

The stock looks undervalued to us, and should be a beneficiary from any new UK-specific CO<sub>2</sub> policies relative to the other generators. For more information, please see our report "*Upgrade to overweight - worth a crack*", November 22, 2006.

**Drax (N, Target Price 845p)**

As a mono-line coal power plant, Drax has the second highest carbon exposure in the group. The UK NAP has already been approved, limiting fundamental downside risk, but we'd still see the stock trading as a "carbon proxy".

We'd also see further downside should the UK follow a more unilateralist approach to environment policy. The stock valuation looks fairly valued currently, but we would trade it against British Energy. For more information, please see our report "*Still Nifty at Fifty*", September 20, 2006.

**RWE (N, Target Price €1.7)**

RWE is the biggest polluter in Europe in absolute terms and is the third most CO<sub>2</sub> exposed utility we cover. It operates in arguably the two toughest CO<sub>2</sub> markets – the UK and Germany. Given ongoing competition authority pressure on pricing, we see clear downside risk to profits from incremental negative CO<sub>2</sub> news.

Aside from significant negative news on commodities though, we'd expect the market's willingness to suspend its disbelief regarding M&A as being supportive for the shares. We would trade it against Fortum though as a CO<sub>2</sub> play. For more information, please see our report "*Moving to \$50/bbl oil in North Europe*", August 31, 2006.

## A summary of our CO<sub>2</sub> views

*In the accompanying report "All you ever wanted to know about carbon trading, vol 4 pt 1" we detail our view that the EU's recent moves suggest a significant tightening of stance towards phase 2 allocations vs phase 1 than we might have expected in the past.*

*Given the EU's moves so far, we find demand for permits could be 155-219mt/year in phase 2. We also find that given potential demand for UN flexmex permits from outside the EU, the CO<sub>2</sub> price should stay in the range of €20/t for phase 2.*

### Potential EU demand for permits

On November 29, 2006, the EU made initial announcements on the 2008-12 CO<sub>2</sub> national allocation plans of 9 states, accounting for c45% of the overall scheme. On average, the EU cut the requested allowances by 5%, giving an average cut vs 2005-07 of 9.2%. The EU also amended a number of country-specific items including access of UN flexmex permits, ex-post adjustments and Germany's infamous "4+14 rule".

Given the reaction of the CO<sub>2</sub> price, we believe this is significantly tougher than the market initially expected.

We believe that average "cuts vs requests" are going to run at around 9-14% for the remaining countries that the EU will report on, generating a shortfall vs requests of 155-219mt in aggregate per year.

The burning question, of course, is what the actual demand for permits might be. Given that 2005 was over-allocated to the tune of 94mt this might suggest the 155-219mt shortfall vs requests is the maximum "demand" level also if governments have repeated their apparent "gaming". However, we would wait until seeing 2006 data and final NAP2 approvals for all countries before being too definitive in this regard.

### Demand for permits outside the EU

We believe that we will, eventually, see the emergence of a global (or at least multi-regional) GHG cap-and-trade scheme. However, this is clearly a post-2012 proposition.

In the meantime, given Japan can take c10mt per year from next year at €10/t, RGGI could take 22mt of emissions at a price well below the current EU ETS post 2009, California as much as 70mt from 2011 before counting potential from other US states, Australia or China, we'd see at least 50% of UN permits going to other schemes.

Assuming that 50-60% of UN permits go to other schemes for 2008-12, we'd calculate that they would cover around 37-63% of the potential demand for permits in the EU scheme.

Whilst this is a somewhat vague range, it illustrates both the significance of CERs/ERUs and the concept that they probably won't be enough to cover demand for permits.

Figure 3: 2008 CO<sub>2</sub> permit prices, €/t since end October 2006



Source: Bloomberg

In turn this means that the CO<sub>2</sub> price should trade at a premium to the CER/ERU cost of <€10/t. How much more is largely function of the level of abatement that needs to be delivered, as discussed in the next chapter.

Table 1: UN permits available to cover the EU scheme demand

| Mt CO <sub>2</sub> equiv    | EU targets -10% NAP2 vs NAP1 | EU repeats average adjustment factor done so far = -13% NAP2 vs NAP1 |
|-----------------------------|------------------------------|----------------------------------------------------------------------|
| EU permit demand            | 155                          | 219                                                                  |
| UN permits available        | 200                          | 200                                                                  |
| Proportion going outside EU | 51%                          | 60%                                                                  |
| UN permits coming to EU     | 98                           | 80                                                                   |
| UN permits % demand         | 63%                          | 37%                                                                  |

Source: JPMorgan estimates.

## Potential permit price

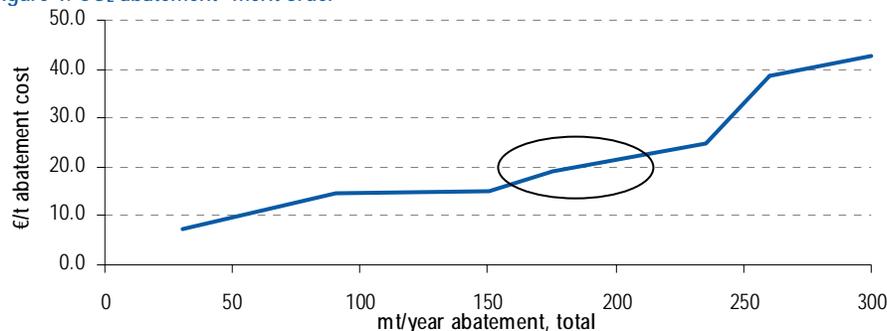
Phase 1 is effectively a write-off, we believe, but is of little consequence given that the biggest “shorts” (the power generators) should already have mostly fully contracted for 2007 already.

Looking into phase 2, the recent movement in CO<sub>2</sub> prices seems to support the idea that the EU’s tightening, combined with the emergence of other trading schemes over the next five years means we are more likely to be a “€20/t world” than a “€10/t world”. We believe a paradigm shift in EU opinion towards the NAPs is needed to move outside of the 155-219mt/year demand level we forecast before prices would move materially away from this €20/t level.

We therefore continue to use €20/t CO<sub>2</sub> assumptions in our financial forecasts for the utilities in Europe.

Going forward, though, we will need to continue to review these assumptions, and perhaps be able to tighten them up somewhat as we get more information on phase 2 NAPs from the EU, and further clarity on the development of schemes elsewhere in the world.

Figure 4: CO<sub>2</sub> abatement "merit order"



Source: JPMorgan estimates.

## Get the balance right – key CO<sub>2</sub> plays

*Taking a blend of carbon intensity (CO<sub>2</sub> requirements vs market cap) and exposure to shortfalls in allocations (extra costs times consensus P/E vs market cap) suggests we should avoid "dirty" generators including Drax and RWE, and invest in "clean" generators in variable price markets, such as Fortum and British Energy.*

### Who's exposed?

Basically all the generators (including the perceived "super-clean" generators like British Energy and EDF) have a CO<sub>2</sub> permit requirement. The table below summarises our views on:

- Our forecast of permits required for "business as usual" in 2008-12
- The allocations we expect for 2008-012, in light of the recent EU decisions
- The percentage shortfall of allocations vs requirements
- The shortfall we expect in millions of tonnes per year
- The value of the shortfall, calculated as the cost of shortfall per year at €20/t, multiplied by the stock's consensus P/E rating for 2008 as a percent of market capitalization.

Table 2: Exposure of European Utilities to CO<sub>2</sub> permit shortfalls

| mt/year               | Required, 2008 - 12 | Allocated, 2008E - 12E | Allocation vs Required | Shortfall | "Value" of shortfall % Market Cap |
|-----------------------|---------------------|------------------------|------------------------|-----------|-----------------------------------|
| <b>United Kingdom</b> |                     |                        |                        |           |                                   |
| Centrica              | 6.6                 | 4.8                    | -28%                   | 1.8       | 1.6%                              |
| Drax                  | 19.4                | 9.6                    | -50%                   | 9.8       | 16.8%                             |
| Brit Energy           | 6.7                 | 4.8                    | -29%                   | 1.9       | 1.9%                              |
| SSE                   | 24.6                | 16.2                   | -34%                   | 8.5       | 8.0%                              |
| ScottishPower         | 15.1                | 10.0                   | -33%                   | 5.0       | 6.1%                              |
| International Power   | 11.7                | 5.0                    | -57%                   | 6.7       | 14.5%                             |
| <b>North Europe</b>   |                     |                        |                        |           |                                   |
| E.ON                  | 80.4                | 67.6                   | -16%                   | 12.9      | 3.6%                              |
| RWE                   | 138.8               | 122.8                  | -12%                   | 16.0      | 6.2%                              |
| EDF                   | 53.6                | 45.4                   | -15%                   | 8.2       | 2.1%                              |
| Fortum                | 9.8                 | 7.4                    | -24%                   | 2.4       | 2.2%                              |
| Suez                  | 50                  | 45                     | -10%                   | 5.0       | 2.2%                              |
| <b>South Europe</b>   |                     |                        |                        |           |                                   |
| Endesa                | 35.4                | 19.8                   | -44%                   | 15.6      | 10.0%                             |
| Iberdrola             | 12.4                | 6.9                    | -44%                   | 5.5       | 3.8%                              |
| Union Fenosa          | 17.2                | 9.6                    | -44%                   | 7.6       | 11.9%                             |
| Gas Natural           | 6.8                 | 3.8                    | -44%                   | 3.0       | 5.1%                              |
| Enel                  | 54.2                | 44.2                   | -18%                   | 10.0      | 4.1%                              |
| EDP                   | 13.2                | 8.3                    | -37%                   | 4.9       | 6.2%                              |
| PPC                   | 52.3                | 52                     | -1%                    | 0.3       | 2.1%                              |

Source: JPMorgan estimates.

### Offset for fewer permits?

The impact of CO<sub>2</sub> is expressed in utility profits as a balance between the cost of buying extra permits and the revenue gained from higher power prices.

**Extra costs ...**

Clearly, fewer permits equate to higher costs for the utilities. Assuming the aggregate reduction from the EU of c5% vs requested NAPs is continued across the whole of the EU, this would cut allocations vs requests by 155-219mt. At our core €20/t assumption this is equivalent to €3.1-4.2bn/year of extra costs.

Given that the stocks we cover equate to around 43% of the power sector by emissions, and given that we expect almost all the shortfall to be passed onto the utilities, we could see these costs being equivalent to an incremental 2.5-3.5% off annual profits.

**... but not necessarily extra revenues**

We estimate that 100% of the price of a permit is costed into traders' power price bids, despite them only having to buy (roughly) 10% of their required permits in phase 1 and around 20% in phase 2.

This generates a theoretical "permit" windfall of c€2.4bn (1.4bn t/a emissions, of which 12% bought using €20/t) for the generating utilities.

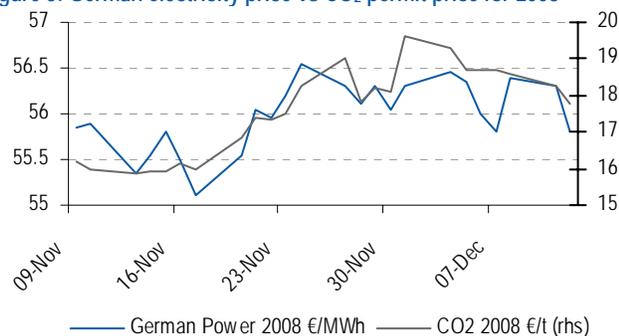
On top of this can be added the impact of higher prices on the non-thermal (ie nuclear and hydro) generation, which are price-takers in the market, which could be worth a further €5.6bn. This is based on 2005 nuclear & hydro output in UCTE, Nordel and UK, assuming a €20/t CO<sub>2</sub> price and based on coal-based price in UCTE/Nordel and gas-based in the UK.

Set in the context of this €50bn pa "benefit", the extra "cost" of €3.1-4.2bn per year looks trivial. However, the issue surely has to be one of earnings momentum – particularly with the sector trading at an all-time high FY2 (ie 2008) P/E ratio of c15x, on our estimates.

The projected shortfall range we expect should not (as shown in figure 2 above) lead to a material change in CO<sub>2</sub> prices. We therefore do not believe that the current EU moves are going to trigger another re-rating in power prices.

Indeed if anything since the announcements the "dirty" price (ie the power price less CO<sub>2</sub> permits) have come down. The charts below illustrate that whilst optically power and CO<sub>2</sub> have moved together, in reality the spread between the two has actually moved against the utilities.

Figure 5: German electricity price vs CO<sub>2</sub> permit price for 2008



Source: EEX, Bloomberg, JPMorgan estimates

Figure 6: "Dirty Price" = Power price less CO<sub>2</sub> price, 2008



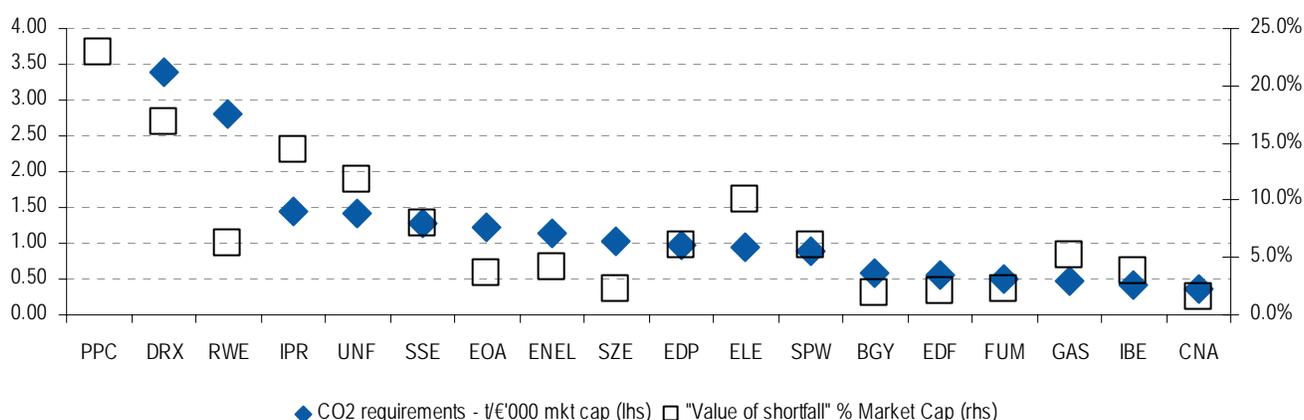
Source: JPMorgan estimates

## How would we trade CO<sub>2</sub> exposures?

The chart below compares:

- The companies' CO<sub>2</sub> requirements per €000 market cap to capture the overall CO<sub>2</sub> exposure of the stock to (the solid diamonds in the chart);
- The "value of shortfall" as a measure of the negative impact resulting from the under-allocation of permits (the empty boxes in the chart).

Figure 7: Comparison of exposure to CO<sub>2</sub> permits vs cost from a shortfall of permits allocated



Source: JPMorgan estimates.

We'd therefore pick our key plays as being:

### “Dirty” utilities to avoid

PPC, Drax and RWE have relatively high exposures to CO<sub>2</sub> per € of market cap, and face a relatively high cost associated with the shortfall in permit allocations they face.

We'd note that PPC has a high CO<sub>2</sub> intensity (off the scale at 11.4t/€000 market cap) and has a high level of potential costs from CO<sub>2</sub>. However, the oil price remains the key fuel cost for the company.

### “Clean” utilities to go for

Amongst the generators we'd see both Fortum and British Energy as being good plays as they have a relatively low CO<sub>2</sub> intensity (British Energy's only comes from Eggborough) and the costs they face from permit shortfalls are a relatively small part of their market capitalization. Additionally, both operate in floating price markets, so should the CO<sub>2</sub> price start to drive power prices higher they should see “upside optionality”.

EDF and the Spanish utilities operate in regulated or pseudo-regulated environments and therefore don't have this upside potential. We wouldn't play Centrica as there is “downside optionality” if power prices start to rise.

## That's great, but what's the bottom line?

**The EU decisions have “cost” the utilities something in the order of €3.1-4.2bn per year in extra costs, but this has not been offset by higher prices.** The EU has yet to complete its decisions on the 2008-12 NAPs. Until it has, and we believe that this process could take until well into next year, we think it makes sense to us to **retain our preference for "clean" generators such as Fortum and British Energy over the “dirty” ones such as Drax and RWE.**

## Key CO<sub>2</sub> investment ideas

*In light of our CO<sub>2</sub> views, on the positive side we like Fortum and British Energy, and would stay clear of RWE and Drax.*

### Fortum – OW, Target Price €24.3

For more information and financials on Fortum, please see “*Head North for Growth*”, August 31, 2006.

- **CO<sub>2</sub> positioning:** Fortum has the fourth lowest CO<sub>2</sub> intensity in the group under analysis as a result of the high proportion of nuclear and hydro output in its mix. We estimate its permit shortfall will only cost €47m/year, and the cost of this represents only around 2% of market capitalisation. Fortum retains, however, the upside optionality of higher power prices if CO<sub>2</sub> prices begin to rise.
- **Investment thesis:** In the short term we think Fortum remains a play on the weather. Long term, though, it should be able to generate significant earnings growth from the convergence of Nordic power prices with those of Central Europe. The company has a strong and proven strategy of reinvestment for growth and remains committed to returning value to shareholders.
- **Target price drivers and risks:** Our target price is based on a sum-of-parts using DCF with an average WACC of 6% and a 1% terminal growth rate. At our target price the stock would be trading only in line with the sector on P/E, but we believe the group’s relatively young assets, high growth rate, high returns and regearing potential justify perhaps a premium. Key risks stem from: further outages in the nuclear fleet; lower Nordpool power prices; taxation of nuclear / hydro profits in Sweden.

Table 3: Fortum - Valuation multiples at c-o-b December 12, 2006

| Share price €22.44 | 2007E | 2008E | 2009E | 2010E |
|--------------------|-------|-------|-------|-------|
| P/E                | 14.1x | 13.0x | 12.9x | 11.9x |
| EV/EBITDA          | 9.4x  | 8.9x  | 8.7x  | 7.9x  |
| Dividend yield     | 3.3%  | 4.0%  | 4.5%  | 4.7%  |

Source: Bloomberg, JPMorgan estimates.

For more information and financials on British Energy, please see “*Upgrade to overweight – worth a crack*”, November 22, 2006.

## British Energy – OW, Target Price 560p

- **CO<sub>2</sub> positioning:** Despite being mostly nuclear, British Energy’s ownership of Eggborough means it is only just in the bottom quintile by nuclear exposure. The UK permit shortfall exposure is relatively small at 2% of market cap. The UK market is a liberalized, and so BGY retains its upside optionality should CO<sub>2</sub> permits rise above our €20/t core scenario – assuming output can be returned to normalised levels.
- **Investment thesis:** Following the downward share price dislocation on output concerns we believe British Energy looks cheap both in absolute terms (16% upside to our Mar 08 target price) and relative to the other UK generators (particularly Drax). The possibility of a peer taking a strategic stake in the company, combined with the potential use of the company’s sites for new nuclear power plants suggests further upside is possible beyond our target price.
- **Target price drivers and risks:** We value British Energy using a DCF, using a 9% post-tax WACC and assuming 62TWh long-term output and a \$50/bbl oil long-term commodity forecast. Whilst we believe the stock should trade at a discount to the sector given its mono-line nature, the dividend yield of 10-12% per year that we forecast for the next three years makes for an attractive total return story. Key risks to our target price come from market electricity prices (and indirectly gas-oriented commodity prices) and plant outages.

Table 4: British Energy Valuation Multiples at c-o-b December 12, 2006

| Share price 489p | 2007E | 2008E | 2009E | 2010E |
|------------------|-------|-------|-------|-------|
| P/E              | 10.5x | 8.0x  | 6.9x  | 7.5x  |
| EV/EBITDA        | 4.6x  | 4.0x  | 4.3x  | 5.6x  |
| Dividend yield   | 8.0%  | 12.2% | 11.2% | 10.1% |

Source: Bloomberg, JPMorgan estimates.

For more information and financials on RWE, please see “Moving to \$50/bbl oil in North Europe”, August 31 2006.

## RWE – N, Target Price €71.7

- **CO<sub>2</sub> positioning:** RWE’s main operations are in arguably the two toughest CO<sub>2</sub> markets in Europe – Germany and the UK. We currently estimate RWE will be short of around 16.0mt/year in phase 2 – the highest amount in Europe – as well as being the third most CO<sub>2</sub> exposed utility we cover. When added to ongoing pressure from both the EU and the German competition authorities regarding market pricing we’d see most of the downside from lower emissions going straight to the bottom line.
- **Investment thesis:** RWE is currently trading at an 18% premium to our target price. We believe that the incrementalist approach to reinvestment is the right one to follow, but one that ultimately will be unlikely to generate further outperformance. Realistically, though, unless there is significant bad news regarding regulation of networks or competition policy, and in the context of the market’s ongoing willingness to suspend its disbelief regarding M&A we wouldn’t expect to see significant underperformance short term.
- **Target price drivers and risks:** Our target price is set using a sum of parts that is based on DCF. We use an average WACC of just under 6.0% and a terminal growth of c1%. The implied y/e 2007E EV/EBITDA is only 7.5x (a discount to the sector’s 9.2x) which we feel is deserved given (a) the relatively old asset base and (b) the low likelihood that the “regearing potential” will be unlocked. Key upside risks relate to the potential for new cost-cutting programmes and higher wholesale power prices. Key downside risks come from German network regulation and CO<sub>2</sub> allocations.

Table 5: RWE Valuation Multiples at c-o-b December 12 2006

| Share price €87.95 | 2007E | 2008E | 2009E | 2010E |
|--------------------|-------|-------|-------|-------|
| P/E                | 15.7x | 13.8x | 13.2x | 12.8x |
| EV/EBITDA          | 10.9x | 8.0x  | 7.6x  | 7.3x  |
| Dividend yield     | 5.2%  | 3.9%  | 4.1%  | 4.3%  |

Source: Bloomberg, JPMorgan estimates.

For more information and financials on Drax, please see “*Still Nifty at Fifty*”, September 20, 2006.

## Drax – N, Target Price 845p

- **CO<sub>2</sub> positioning:** Drax has the second highest carbon exposure in the group, but the second highest exposure to the cost of permit shortfalls. This results from it being a “mono-line” coal-power generating plant, and largely is at the mercy of government policy on CO<sub>2</sub> and the commodity markets. On the upside, the EU has approved the UK’s “holier-than-thou” phase 2 NAP, so downside surprises are more likely to come from unilateral measures such as carbon taxes than elsewhere.
- **Investment thesis:** We find Drax’s valuation unexciting even under our long-term electricity price assumption of £41/MWh – our target price implies just 3% upside, although the 12% annual yield for the next three years may be attractive to short-term total return funds. However, Drax is likely to remain (rationally or not) the main UK “carbon play”, and we would be wary of ongoing government policy with regards to the environment in light of the Stern report.
- **Target price drivers and risks:** Our target price is set using a DCF, with an 8% post-tax WACC. We think the stock should trade at a discount to the sector given the fixed-life nature of the business, and it is worth noting that the yield will fall significantly if output falls in phase 2. Key upside risks come from commodity prices (cold weather and tight winter gas markets are key here), which drive the electricity price, and the potential for higher CO<sub>2</sub> prices.

Table 6: Drax Valuation Multiples

| Share price 823p | 2007E | 2008E | 2009E | 2010E |
|------------------|-------|-------|-------|-------|
| P/E              | 6.2x  | 6.9x  | 6.5x  | 6.1x  |
| EV/EBITDA        | 5.2x  | 6.7x  | 7.0x  | 7.0x  |
| Dividend yield   | 15.7% | 11.5% | 13.4% | 4.8%  |

Source: Bloomberg, JPMorgan estimates.

### Analyst Certification:

The research analyst(s) denoted by an “AC” on the cover of this report certifies (or, where multiple research analysts are primarily responsible for this report, the research analyst denoted by an “AC” on the cover or within the document individually certifies, with respect to each security or issuer that the research analyst covers in this research) that: (1) all of the views expressed in this report accurately reflect his or her personal views about any and all of the subject securities or issuers; and (2) no part of any of the research analyst’s compensation was, is, or will be directly or indirectly related to the specific recommendations or views expressed by the research analyst(s) in this report.

### Important Disclosures

---

**Important Disclosures for Equity Research Compendium Reports:** Important disclosures, including price charts for all companies under coverage for at least one year, are available through the search function on JP Morgan’s website <https://mm.jpmorgan.com/disclosures/company> or by calling this U.S. toll-free number (1-800-477-0406)

### Explanation of Equity Research Ratings and Analyst(s) Coverage Universe:

JPMorgan uses the following rating system: **Overweight** [Over the next six to twelve months, we expect this stock will outperform the average total return of the stocks in the analyst’s (or the analyst’s team’s) coverage universe.] **Neutral** [Over the next six to twelve months, we expect this stock will perform in line with the average total return of the stocks in the analyst’s (or the analyst’s team’s) coverage universe.] **Underweight** [Over the next six to twelve months, we expect this stock will underperform the average total return of the stocks in the analyst’s (or the analyst’s team’s) coverage universe.] The analyst or analyst’s team’s coverage universe is the sector and/or country shown on the cover of each publication. See below for the specific stocks in the certifying analyst(s) coverage universe.

Coverage Universe: **Chris Rogers:** E.ON (EONG.DE), EDF (EDF.PA), Fortum (FUM1V.HE), Gaz de France (GAZ.PA), RWE (RWEG.F)

### JPMorgan Equity Research Ratings Distribution, as of September 29, 2006

|                                     | Overweight<br>(buy) | Neutral<br>(hold) | Underweight<br>(sell) |
|-------------------------------------|---------------------|-------------------|-----------------------|
| JPM Global Equity Research Coverage | 42%                 | 41%               | 17%                   |
| IB clients*                         | 44%                 | 46%               | 35%                   |
| JPMSI Equity Research Coverage      | 38%                 | 48%               | 15%                   |
| IB clients*                         | 62%                 | 55%               | 47%                   |

\*Percentage of investment banking clients in each rating category.

For purposes only of NASD/NYSE ratings distribution rules, our Overweight rating falls into a buy rating category; our Neutral rating falls into a hold rating category; and our Underweight rating falls into a sell rating category.

**Valuation and Risks:** Please see the most recent JPMorgan research report for an analysis of valuation methodology and risks on any securities recommended herein. Research is available at <http://www.morganmarkets.com>, or you can contact the analyst named on the front of this note or your JPMorgan representative.

**Analysts’ Compensation:** The equity research analysts responsible for the preparation of this report receive compensation based upon various factors, including the quality and accuracy of research, client feedback, competitive factors, and overall firm revenues, which include revenues from, among other business units, Institutional Equities and Investment Banking.

### Other Disclosures

---

**Options related research:** If the information contained herein regards options related research, such information is available only to persons who have received the proper option risk disclosure documents. For a copy of the Option Clearing Corporation’s Characteristics and Risks of Standardized Options, please contact your JPMorgan Representative or visit the OCC’s website at <http://www.optionsclearing.com/publications/risks/riskstoc.pdf>.

### Legal Entities Disclosures

**U.S.:** JPMSI is a member of NYSE, NASD and SIPC. J.P. Morgan Futures Inc. is a member of the NFA. J.P. Morgan Chase Bank, N.A. is a member of FDIC and is authorized and regulated in the UK by the Financial Services Authority. **U.K.:** J.P. Morgan Securities Ltd. (JPMSL) is a member of the London Stock Exchange and is authorised and regulated by the Financial Services Authority. **South Africa:** J.P. Morgan Equities Limited is a member of the Johannesburg Securities Exchange and is regulated by the FSB. **Hong Kong:** J.P. Morgan Securities (Asia Pacific) Limited (CE number AAJ321) is regulated by the Hong Kong Monetary Authority and the Securities and Futures Commission in Hong Kong.

**Korea:** J.P. Morgan Securities (Far East) Ltd, Seoul branch, is regulated by the Korea Financial Supervisory Service. **Australia:** J.P. Morgan Australia Limited (ABN 52 002 888 011/AFS Licence No: 238188) is regulated by ASIC and J.P. Morgan Securities Australia Limited (ABN 61 003 245 234/AFS Licence No: 238066) is a Market Participant with the ASX and regulated by ASIC. **Taiwan:** J.P. Morgan Securities (Taiwan) Limited is a participant of the Taiwan Stock Exchange (company-type) and regulated by the Taiwan Securities and Futures Commission. **India:** J.P. Morgan India Private Limited is a member of the National Stock Exchange of India Limited and The Stock Exchange, Mumbai and is regulated by the Securities and Exchange Board of India. **Thailand:** JPMorgan Securities (Thailand) Limited is a member of the Stock Exchange of Thailand and is regulated by the Ministry of Finance and the Securities and Exchange Commission. **Indonesia:** PT J.P. Morgan Securities Indonesia is a member of the Jakarta Stock Exchange and Surabaya Stock Exchange and is regulated by the BAPEPAM. **Philippines:** This report is distributed in the Philippines by J.P. Morgan Securities Philippines, Inc. **Brazil:** Banco J.P. Morgan S.A. is regulated by the Comissao de Valores Mobiliarios (CVM) and by the Central Bank of Brazil. **Japan:** This material is distributed in Japan by JPMorgan Securities Japan Co., Ltd., which is regulated by the Japan Financial Services Agency (FSA). **Singapore:** This material is issued and distributed in Singapore by J.P. Morgan Securities Singapore Private Limited (JPMS) [mica (p) 069/09/2006 and Co. Reg. No.: 199405335R] which is a member of the Singapore Exchange Securities Trading Limited and is regulated by the Monetary Authority of Singapore (MAS) and/or JPMorgan Chase Bank, N.A., Singapore branch (JPMCB Singapore) which is regulated by the MAS. **Malaysia:** This material is issued and distributed in Malaysia by JPMorgan Securities (Malaysia) Sdn Bhd (18146-x) which is a Participating Organization of Bursa Malaysia Securities Bhd and is licensed as a dealer by the Securities Commission in Malaysia

#### Country and Region Specific Disclosures

**U.K. and European Economic Area (EEA):** Issued and approved for distribution in the U.K. and the EEA by JPMSL. Investment research issued by JPMSL has been prepared in accordance with JPMSL's Policies for Managing Conflicts of Interest in Connection with Investment Research which can be found at <http://www.jpmorgan.com/pdfdoc/research/ConflictManagementPolicy.pdf>. This report has been issued in the U.K. only to persons of a kind described in Article 19 (5), 38, 47 and 49 of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2001 (all such persons being referred to as "relevant persons"). This document must not be acted on or relied on by persons who are not relevant persons. Any investment or investment activity to which this document relates is only available to relevant persons and will be engaged in only with relevant persons. In other EEA countries, the report has been issued to persons regarded as professional investors (or equivalent) in their home jurisdiction. **Germany:** This material is distributed in Germany by J.P. Morgan Securities Ltd. Frankfurt Branch and JPMorgan Chase Bank, N.A., Frankfurt Branch who are regulated by the Bundesanstalt für Finanzdienstleistungsaufsicht. **Australia:** This material is issued and distributed by JPMSAL in Australia to "wholesale clients" only. JPMSAL does not issue or distribute this material to "retail clients." The recipient of this material must not distribute it to any third party or outside Australia without the prior written consent of JPMSAL. For the purposes of this paragraph the terms "wholesale client" and "retail client" have the meanings given to them in section 761G of the Corporations Act 2001. **Hong Kong:** The 1% ownership disclosure as of the previous month end satisfies the requirements under Paragraph 16.5(a) of the Hong Kong Code of Conduct for persons licensed by or registered with the Securities and Futures Commission. (For research published within the first ten days of the month, the disclosure may be based on the month end data from two months' prior.) J.P. Morgan Broking (Hong Kong) Limited is the liquidity provider for derivative warrants issued by J.P. Morgan International Derivatives Ltd and listed on The Stock Exchange of Hong Kong Limited. An updated list can be found on HKEx website: <http://www.hkex.com.hk/prod/dw/Lp.htm>. **Korea:** This report may have been edited or contributed to from time to time by affiliates of J.P. Morgan Securities (Far East) Ltd, Seoul branch. **Singapore:** JPMSI and/or its affiliates may have a holding in any of the securities discussed in this report; for securities where the holding is 1% or greater, the specific holding is disclosed in the Legal Disclosures section above. **India:** For private circulation only not for sale. **New Zealand:** This material is issued and distributed by JPMSAL in New Zealand only to persons whose principal business is the investment of money or who, in the course of and for the purposes of their business, habitually invest money. JPMSAL does not issue or distribute this material to members of "the public" as determined in accordance with section 3 of the Securities Act 1978. The recipient of this material must not distribute it to any third party or outside New Zealand without the prior written consent of JPMSAL.

**General:** Additional information is available upon request. Information has been obtained from sources believed to be reliable but JPMorgan Chase & Co. or its affiliates and/or subsidiaries (collectively JPMorgan) do not warrant its completeness or accuracy except with respect to any disclosures relative to JPMSI and/or its affiliates and the analyst's involvement with the issuer that is the subject of the research. All pricing is as of the close of market for the securities discussed, unless otherwise stated. Opinions and estimates constitute our judgment as of the date of this material and are subject to change without notice. Past performance is not indicative of future results. This material is not intended as an offer or solicitation for the purchase or sale of any financial instrument. The opinions and recommendations herein do not take into account individual client circumstances, objectives, or needs and are not intended as recommendations of particular securities, financial instruments or strategies to particular clients. The recipient of this report must make its own independent decisions regarding any securities or financial instruments mentioned herein. JPMSI distributes in the U.S. research published by non-U.S. affiliates and accepts responsibility for its contents. Periodic updates may be provided on companies/industries based on company specific developments or announcements, market conditions or any other publicly available information. Clients should contact analysts and execute transactions through a JPMorgan subsidiary or affiliate in their home jurisdiction unless governing law permits otherwise.

Revised December 11, 2006.

---

Copyright 2006 JPMorgan Chase & Co. All rights reserved. This report or any portion hereof may not be reprinted, sold or redistributed without the written consent of JPMorgan.

Table 7: European Utilities Valuation Screen at c-o-b December 12, 2006

| €bn / £bn             | Rec. | Price | T.P.  | % diff | Mkt Cap | EV    | P/E   |       | DPS Yield |       | EV/EBITDA |       |
|-----------------------|------|-------|-------|--------|---------|-------|-------|-------|-----------|-------|-----------|-------|
|                       |      |       |       |        |         |       | 2007E | 2008E | 2007E     | 2008E | 2007E     | 2008E |
| Sector - Pan-Europe   |      |       |       | -8%    | 645.5   | 964.2 | 16.9x | 14.9x | 3.8%      | 4.1%  | 9.0x      | 8.2x  |
| Sector - Europe ex UK |      |       |       | -8%    | 509.7   | 770.1 | 17.7x | 15.5x | 3.6%      | 3.8%  | 9.2x      | 8.3x  |
| Sector - UK           |      |       |       | -9%    | 135.8   | 194.1 | 13.8x | 12.5x | 4.8%      | 5.3%  | 8.3x      | 7.8x  |
| <b>Europe ex UK</b>   |      |       |       |        |         |       |       |       |           |       |           |       |
| EDF                   | UW   | 54.80 | 41.20 | -25%   | 102.1   | 156.8 | 23.7x | 18.6x | 2.2%      | 2.7%  | 10.0x     | 8.7x  |
| EDP                   | OW   | 3.73  | 3.55  | -5%    | 13.6    | 24.7  | 14.5x | 12.3x | 3.1%      | 3.3%  | 9.0x      | 8.0x  |
| Enagas                | N    | 20.08 | 18.80 | -6%    | 4.8     | 6.5   | 21.0x | 18.3x | 2.5%      | 2.9%  | 11.8x     | 10.8x |
| Enel                  | OW   | 7.79  | 7.90  | 1%     | 48.0    | 63.2  | 14.7x | 14.2x | 6.9%      | 6.8%  | 7.4x      | 7.2x  |
| Fortum                | OW   | 22.83 | 24.30 | 6%     | 19.6    | 24.8  | 14.4x | 13.3x | 3.3%      | 3.9%  | 9.6x      | 9.0x  |
| Gaz de France         | *    | 33.62 |       |        | 33.1    | 39.0  | 14.6x | 14.1x | 3.3%      | 3.6%  | 7.4x      | 7.3x  |
| PPC                   | UW   | 19.54 | 16.50 | -16%   | 4.5     | 8.9   | 32.6x | 22.5x | 2.9%      | 4.5%  | 9.8x      | 8.7x  |
| Red Electrica         | OW   | 35.36 | 33.40 | -6%    | 4.8     | 7.7   | 20.8x | 19.1x | 2.3%      | 2.6%  | 10.8x     | 10.2x |
| RWE                   | N    | 87.85 | 71.70 | -18%   | 49.4    | 89.0  | 15.7x | 13.7x | 5.2%      | 3.9%  | 10.9x     | 8.0x  |
| Suez                  | *    | 37.73 |       |        | 48.0    | 73.5  | 18.4x | 15.3x | 3.5%      | 4.0%  | 9.3x      | 8.3x  |
| Union Fenosa          | UW   | 39.26 | 35.50 | -10%   | 12.0    | 19.4  | 14.9x | 13.4x | 2.3%      | 2.8%  | 8.9x      | 8.2x  |
| Veolia                | OW   | 51.70 | 56.00 | 8%     | 21.0    | 42.5  | 20.5x | 17.7x | 2.4%      | 2.8%  | 9.6x      | 8.8x  |
| <b>UK</b>             |      |       |       |        |         |       |       |       |           |       |           |       |
| Brit Energy           | OW   | 489   | 560   | 15%    | 11.7    | 11.0  | 10.5x | 8.0x  | 8.0%      | 12.2% | 4.5x      | 4.0x  |
| Centrica              | OW   | 334   | 335   | 0%     | 17.9    | 20.2  | 12.7x | 11.1x | 4.0%      | 4.4%  | 5.2x      | 5.1x  |
| Drax                  | N    | 823   | 845   | 3%     | 4.9     | 5.6   | 6.2x  | 6.9x  | 15.7%     | 11.5% | 5.2x      | 6.7x  |
| Int Power             | OW   | 379   | 355   | -6%    | 8.3     | 16.5  | 14.1x | 12.7x | 2.6%      | 3.1%  | 9.1x      | 8.5x  |
| Kelda                 | UW   | 910   | 715   | -21%   | 4.8     | 7.8   | 17.5x | 16.7x | 3.6%      | 3.7%  | 8.6x      | 8.1x  |
| National Grid         | N    | 721   | 680   | -6%    | 28.9    | 46.7  | 12.4x | 12.0x | 4.2%      | 4.6%  | 8.5x      | 8.1x  |
| Pennon                | UW   | 548   | 400   | -27%   | 2.7     | 5.0   | 17.5x | 15.8x | 3.5%      | 3.7%  | 9.2x      | 8.7x  |
| Severn Trent          | N    | 1448  | 1200  | -17%   | 7.5     | 12.3  | 18.8x | 17.4x | 3.9%      | 4.1%  | 8.3x      | 7.9x  |
| Scot & South.         | OW   | 1509  | 1310  | -13%   | 19.2    | 22.6  | 14.7x | 12.8x | 4.0%      | 4.4%  | 9.5x      | 8.4x  |
| United Utilities      | N    | 784   | 635   | -19%   | 10.1    | 16.9  | 13.3x | 12.6x | 5.9%      | 6.0%  | 8.4x      | 7.9x  |

Source: Bloomberg, JPMorgan estimates.

\* Under applicable law and/or J.P. Morgan & Co policy our recommendation for this company has been removed.

## All you ever wanted to know about carbon trading vol 4



### Utilities Research

#### Utilities Team Contacts

|                            |                                                  |                                                                                                                                                                              |
|----------------------------|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Chris Rogers <sup>AC</sup> | Germany / France / Nordic<br>☎ +44 20-7325 9069  |  <a href="mailto:christopher.g.rogers@jpmorgan.com">christopher.g.rogers@jpmorgan.com</a> |
| Benita Pollard, CFA        | Specialist Sales<br>☎ +44 20-7325 1546           |  <a href="mailto:benita.x.pollard@jpmorgan.com">benita.x.pollard@jpmorgan.com</a>         |
| Ian Mitchell               | UK Energy<br>☎ +44 20-7325 8623                  |  <a href="mailto:ian.e.mitchell@jpmorgan.com">ian.e.mitchell@jpmorgan.com</a>             |
| Alberto Gandolfi           | Iberia / Italy<br>☎ +44 20-7325 5742             |  <a href="mailto:alberto.x.gandolfi@jpmorgan.com">alberto.x.gandolfi@jpmorgan.com</a>     |
| Sofia Savvantidou, CFA     | France / Greece / UK Water<br>☎ +44 20-7325 0650 |  <a href="mailto:sofia.savvantidou@jpmorgan.com">sofia.savvantidou@jpmorgan.com</a>     |
| Olek Keenan, CFA           | Credit<br>☎ +44 20-7777 0017                     |  <a href="mailto:olek.keenan@jpmorgan.com">olek.keenan@jpmorgan.com</a>                 |

For more information see MorganMarkets at [mm.jpmorgan.com](http://mm.jpmorgan.com)

All prices at close of business January 5 2007

J.P. Morgan Securities Ltd.

See page 9 for analyst certification and important disclosures, including investment banking relationships.

JPMorgan does and seeks to do business with companies covered in its research reports. As a result, investors should be aware that the firm may have a conflict of interest that could affect the objectivity of this report. Investors should consider this report as only a single factor in making their investment decision.

## Carbon trading - a quick recap

### *Carbon trading - key weapon to fight climate change*

- EU commit to -8% 1990 - 2010 under Kyoto, with member state targets
- “Cap-and-trade” scheme implemented
- Each state allocates permits to emitters, which can be used or sold
- The Emissions Trading Scheme (ETS) Is the market for these permits
- The National Allocation Plans (NAPs) are set for 2005 - 2007 (phase 1) and 2008 - 2012 (phase 2)
- The NAPs for phase 2 are currently being assessed by the EU

## What has the EU said recently?

*Following mistakes in 2005-07, the EU is getting stricter*

- EU assessing 2008 - 12 plans
- EU wants to correct 2005 - 07 over-allocation & meet Kyoto targets
- Proposed schemes from 10 countries cut by 5% in November
- Needless to say, the individual states have complained
- Airline industry into the trading scheme from 2011

## What is the possible demand for CO2 permits?

### *Demand is EU consumption of permits vs EU NAP provision of permits*

- Calculated as 2005 baseline
  - + economic growth (average c2.75% CAGR)
  - - general efficiency factor (average c2.5% CAGR)
  - +/- country-specific adjustment factor (CSAF)
- CSAF -1.3% allowed vs 4.1% requested so far
- Same CSAF for all countries gives a 13% cut, or 210mt shortfall vs requests
- CSAF to meet a 10% cut vs phase 1 is +2.0%, giving 155mt shortfall
- Some countries gaming, but need '06 data to be sure
- **Demand for permits is therefore at least 155 - 210mt/year from current ETS**
- Airlines could add 85mt/year demand, we assume “self-abatement”

## What is the possible supply of carbon permits?

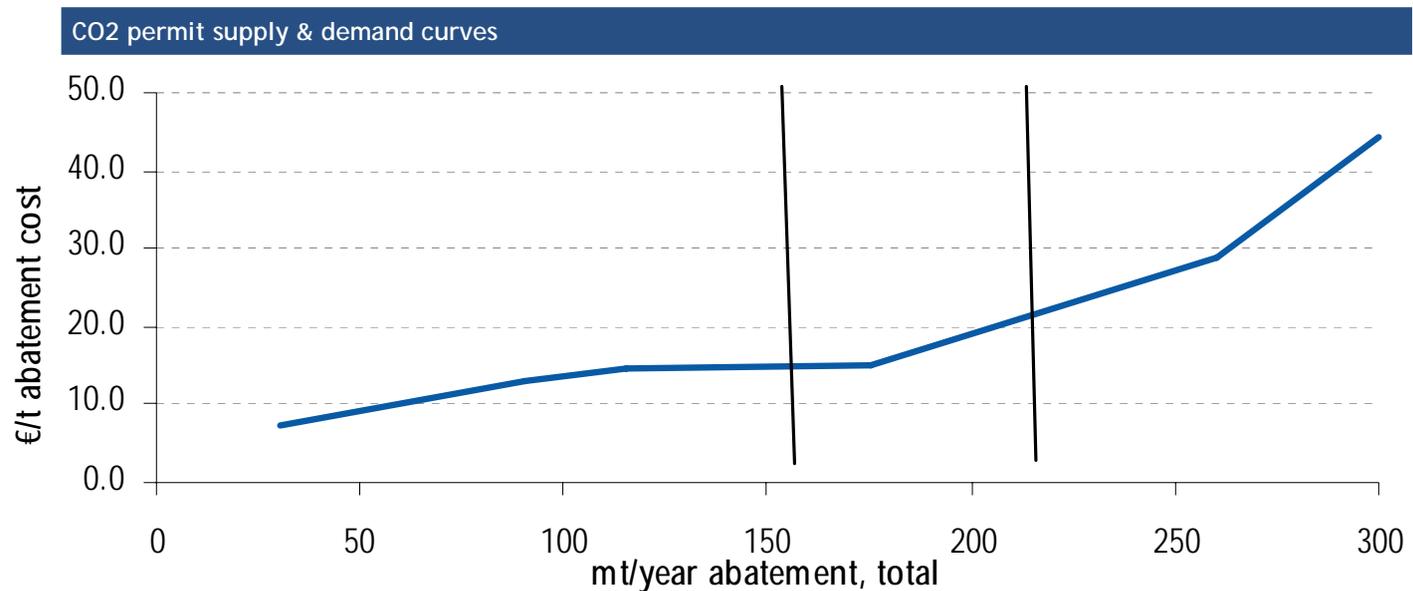
*We see three broad classifications of available permit supply*

- **Electricity abatement from high pollution to low**
  - UK switch from coal-to-gas
  - Germany switch from lignite-to-coal
  - Around 90mt/year of supply
- **Industrial abatement by shutting low profitability plant**
  - Cement, glass, oil refining, heavy chemicals
  - Around 120mt/year of supply
- **UN flexible mechanism permits from reducing emissions in emerging economies**
  - Around 200mt/year of supply
  - However, a large part of this (>100mt/year) could go to other schemes
    - US has emergent carbon trading schemes in California and North-East
    - Japanese government is a significant buyer of permits
    - Schemes underway in other areas including Australia and China
- **Supply therefore 300mt or more, but at a certain price**

## At what price should carbon permits trade?

*Break-even price for CO<sub>2</sub> at the top of our range for demand is c€20/t*

- Supply line based on ranking of abatement and UN permits by cost
- Demand line based on our 155 - 210mt assessment
- Suggests a clearing price of up to €20/t



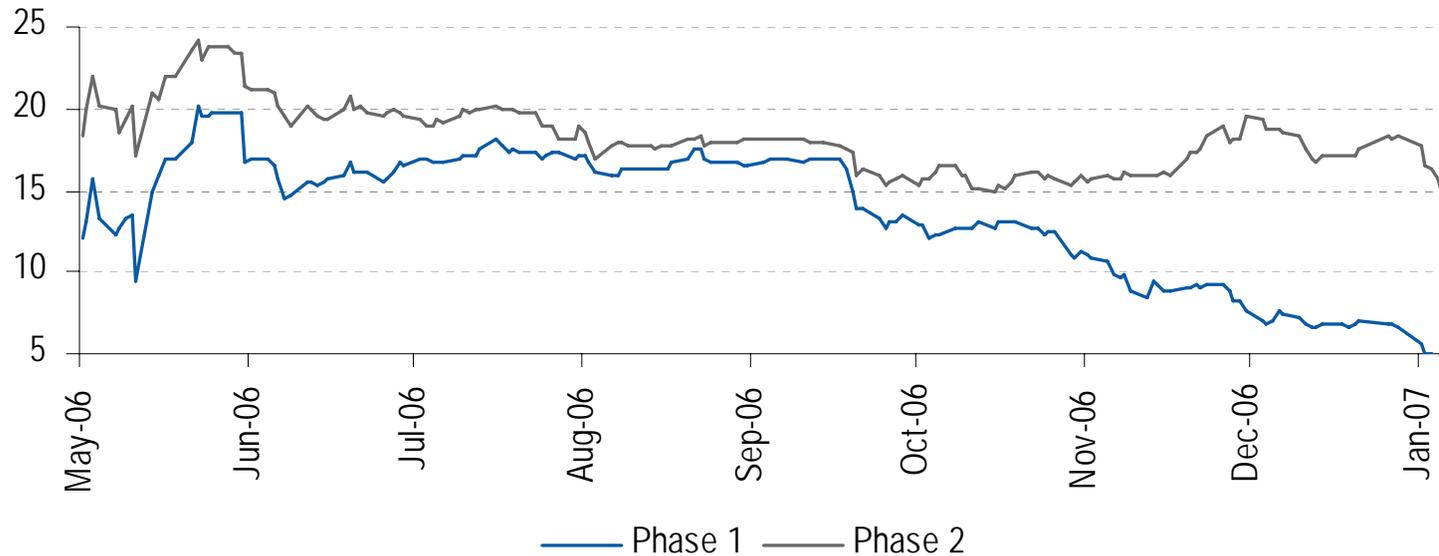
Source: JPMorgan estimates

## Where are carbon permits now?

*Driven by weather, commodities & its own supply/demand balance*

- Phase 1 crashed given obvious over supply
- Phase 2 prices rose on expectations of the EU getting tough, fallen due to lower gas prices
- Potential for recovery in the phase 2 price to €20/t

CO2 permit prices - €/t



Source: JPMorgan estimates

## What are the next events?

*CO2 will continue to be a volatile commodity, with unpredictable newsflow*

- Pronouncements on 8 countries due shortly
- A further 9 countries have yet to even notify the EU
- So “EU supply/demand” unknown for several months yet
- February - April see steady emergence of news on 2006 permit usage
- Steady emergence of US schemes during 2007
- November 2007 - next big UN conference to arrive at post 2012 targets?

For equity trades on our CO2 themes, please see our 14 December 2006 note

“All you ever wanted to know about carbon trading vol 4 pt 2:  
Equity trades on CO2 - We like it clean”

**Analyst Certification:**

The research analyst(s) denoted by an “AC” on the cover of this report certifies (or, where multiple research analysts are primarily responsible for this report, the research analyst denoted by an “AC” on the cover or within the document individually certifies, with respect to each security or issuer that the research analyst covers in this research) that: (1) all of the views expressed in this report accurately reflect his or her personal views about any and all of the subject securities or issuers; and (2) no part of any of the research analyst’s compensation was, is, or will be directly or indirectly related to the specific recommendations or views expressed by the research analyst(s) in this report.

**Important Disclosures****Explanation of Equity Research Ratings and Analyst(s) Coverage Universe:**

JPMorgan uses the following rating system: **Overweight** [Over the next six to twelve months, we expect this stock will outperform the average total return of the stocks in the analyst’s (or the analyst’s team’s) coverage universe.] **Neutral** [Over the next six to twelve months, we expect this stock will perform in line with the average total return of the stocks in the analyst’s (or the analyst’s team’s) coverage universe.] **Underweight** [Over the next six to twelve months, we expect this stock will underperform the average total return of the stocks in the analyst’s (or the analyst’s team’s) coverage universe.] The analyst or analyst’s team’s coverage universe is the sector and/or country shown on the cover of each publication. See below for the specific stocks in the certifying analyst(s) coverage universe.

**JPMorgan Equity Research Ratings Distribution, as of December 29, 2006**

|                                     | <b>Overweight</b><br>(buy) | <b>Neutral</b><br>(hold) | <b>Underweight</b><br>(sell) |
|-------------------------------------|----------------------------|--------------------------|------------------------------|
| JPM Global Equity Research Coverage | 42%                        | 41%                      | 17%                          |
| IB clients*                         | 45%                        | 47%                      | 36%                          |
| JPMSI Equity Research Coverage      | 37%                        | 48%                      | 15%                          |
| IB clients*                         | 63%                        | 57%                      | 47%                          |

\*Percentage of investment banking clients in each rating category.

For purposes only of NASD/NYSE ratings distribution rules, our Overweight rating falls into a buy rating category; our Neutral rating falls into a hold rating category; and our Underweight rating falls into a sell rating category.

**Valuation and Risks:** Please see the most recent JPMorgan research report for an analysis of valuation methodology and risks on any securities recommended herein. Research is available at <http://www.morganmarkets.com>, or you can contact the analyst named on the front of this note or your JPMorgan representative.

**Analysts’ Compensation:** The equity research analysts responsible for the preparation of this report receive compensation based upon various factors, including the quality and accuracy of research, client feedback, competitive factors, and overall firm revenues, which include revenues from, among other business units, Institutional Equities and Investment Banking.

**Other Disclosures**

**Options related research:** If the information contained herein regards options related research, such information is available only to persons who have received the proper option risk disclosure documents. For a copy of the Option Clearing Corporation’s Characteristics and Risks of Standardized Options, please contact your JPMorgan Representative or visit the OCC’s website at <http://www.optionsclearing.com/publications/risks/riskstoc.pdf>.

### Legal Entities Disclosures

**U.S.:** JPMSI is a member of NYSE, NASD and SIPC. J.P. Morgan Futures Inc. is a member of the NFA. J.P. Morgan Chase Bank, N.A. is a member of FDIC and is authorized and regulated in the UK by the Financial Services Authority. **U.K.:** J.P. Morgan Securities Ltd. (JPMSL) is a member of the London Stock Exchange and is authorised and regulated by the Financial Services Authority. **South Africa:** J.P. Morgan Equities Limited is a member of the Johannesburg Securities Exchange and is regulated by the FSB. **Hong Kong:** J.P. Morgan Securities (Asia Pacific) Limited (CE number AAJ321) is regulated by the Hong Kong Monetary Authority and the Securities and Futures Commission in Hong Kong. **Korea:** J.P. Morgan Securities (Far East) Ltd, Seoul branch, is regulated by the Korea Financial Supervisory Service. **Australia:** J.P. Morgan Australia Limited (ABN 52 002 888 011/AFS Licence No: 238188) is regulated by ASIC and J.P. Morgan Securities Australia Limited (ABN 61 003 245 234/AFS Licence No: 238066) is a Market Participant with the ASX and regulated by ASIC. **Taiwan:** J.P.Morgan Securities (Taiwan) Limited is a participant of the Taiwan Stock Exchange (company-type) and regulated by the Taiwan Securities and Futures Commission. **India:** J.P. Morgan India Private Limited is a member of the National Stock Exchange of India Limited and The Stock Exchange, Mumbai and is regulated by the Securities and Exchange Board of India. **Thailand:** JPMorgan Securities (Thailand) Limited is a member of the Stock Exchange of Thailand and is regulated by the Ministry of Finance and the Securities and Exchange Commission. **Indonesia:** PT J.P. Morgan Securities Indonesia is a member of the Jakarta Stock Exchange and Surabaya Stock Exchange and is regulated by the BAPEPAM. **Philippines:** This report is distributed in the Philippines by J.P. Morgan Securities Philippines, Inc. **Brazil:** Banco J.P. Morgan S.A. is regulated by the Comissao de Valores Mobiliarios (CVM) and by the Central Bank of Brazil. **Japan:** This material is distributed in Japan by JPMorgan Securities Japan Co., Ltd., which is regulated by the Japan Financial Services Agency (FSA). **Singapore:** This material is issued and distributed in Singapore by J.P. Morgan Securities Singapore Private Limited (JPMS) [mica (p) 069/09/2006 and Co. Reg. No.: 199405335R] which is a member of the Singapore Exchange Securities Trading Limited and is regulated by the Monetary Authority of Singapore (MAS) and/or JPMorgan Chase Bank, N.A., Singapore branch (JPMCB Singapore) which is regulated by the MAS. **Malaysia:** This material is issued and distributed in Malaysia by JPMorgan Securities (Malaysia) Sdn Bhd (18146-x) which is a Participating Organization of Bursa Malaysia Securities Bhd and is licensed as a dealer by the Securities Commission in Malaysia

### Country and Region Specific Disclosures

**U.K. and European Economic Area (EEA):** Issued and approved for distribution in the U.K. and the EEA by JPMSL. Investment research issued by JPMSL has been prepared in accordance with JPMSL's Policies for Managing Conflicts of Interest in Connection with Investment Research which can be found at <http://www.jpmorgan.com/pdfdoc/research/ConflictManagementPolicy.pdf>. This report has been issued in the U.K. only to persons of a kind described in Article 19 (5), 38, 47 and 49 of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2001 (all such persons being referred to as "relevant persons"). This document must not be acted on or relied on by persons who are not relevant persons. Any investment or investment activity to which this document relates is only available to relevant persons and will be engaged in only with relevant persons. In other EEA countries, the report has been issued to persons regarded as professional investors (or equivalent) in their home jurisdiction **Germany:** This material is distributed in Germany by J.P. Morgan Securities Ltd. Frankfurt Branch and JPMorgan Chase Bank, N.A., Frankfurt Branch who are regulated by the Bundesanstalt für Finanzdienstleistungsaufsicht. **Australia:** This material is issued and distributed by JPMSAL in Australia to "wholesale clients" only. JPMSAL does not issue or distribute this material to "retail clients." The recipient of this material must not distribute it to any third party or outside Australia without the prior written consent of JPMSAL. For the purposes of this paragraph the terms "wholesale client" and "retail client" have the meanings given to them in section 761G of the Corporations Act 2001. **Hong Kong:** The 1% ownership disclosure as of the previous month end satisfies the requirements under Paragraph 16.5(a) of the Hong Kong Code of Conduct for persons licensed by or registered with the Securities and Futures Commission. (For research published within the first ten days of the month, the disclosure may be based on the month end data from two months' prior.) J.P. Morgan Broking (Hong Kong) Limited is the liquidity provider for derivative warrants issued by J.P. Morgan International Derivatives Ltd and listed on The Stock Exchange of Hong Kong Limited. An updated list can be found on HKEx website: <http://www.hkex.com.hk/prod/dw/Lp.htm>. **Korea:** This report may have been edited or contributed to from time to time by affiliates of J.P. Morgan Securities (Far East) Ltd, Seoul branch. **Singapore:** JPMSI and/or its affiliates may have a holding in any of the securities discussed in this report; for securities where the holding is 1% or greater, the specific holding is disclosed in the Legal Disclosures section above. **India:** For private circulation only not for sale. **New Zealand:** This material is issued and distributed by JPMSAL in New Zealand only to persons whose principal business is the investment of money or who, in the course of and for the purposes of their business, habitually invest money. JPMSAL does not issue or distribute this material to members of "the public" as determined in accordance with section 3 of the Securities Act 1978. The recipient of this material must not distribute it to any third party or outside New Zealand without the prior written consent of JPMSAL.

**General:** Additional information is available upon request. Information has been obtained from sources believed to be reliable but JPMorgan Chase & Co. or its affiliates and/or subsidiaries (collectively JPMorgan) do not warrant its completeness or accuracy except with respect to any disclosures relative to JPMSI and/or its affiliates and the analyst's involvement with the issuer that is the subject of the research. All pricing is as of the close of market for the securities discussed, unless otherwise stated. Opinions and estimates constitute our judgment as of the date of this material and are subject to change without notice. Past performance is not indicative of future results. This material is not intended as an offer or solicitation for the purchase or sale of any financial instrument. The opinions and recommendations herein do not take into account individual client circumstances, objectives, or needs and are not intended as recommendations of particular securities, financial instruments or strategies to particular clients. The recipient of this report must make its own independent decisions regarding any securities or financial instruments mentioned herein. JPMSI distributes in the U.S. research published by non-U.S. affiliates and accepts responsibility for its contents. Periodic updates may be provided on companies/industries based on company specific developments or announcements, market conditions or any other publicly available information. Clients should contact analysts and execute transactions through a JPMorgan subsidiary or affiliate in their home jurisdiction unless governing law permits otherwise.

Revised December 29, 2006.

Copyright 2007 JPMorgan Chase & Co. All rights reserved. This report or any portion hereof may not be reprinted, sold or redistributed without the written consent of JPMorgan.

# All you ever wanted to know about carbon trading vol 4



## Utilities Research

### Utilities Team Contacts

|                            |                                                  |
|----------------------------|--------------------------------------------------|
| Chris Rogers <sup>AC</sup> | Germany / France / Nordic<br>☎ +44 20-7325 9069  |
| Benita Pollard, CFA        | Specialist Sales<br>☎ +44 20-7325 1546           |
| Ian Mitchell               | UK Energy<br>☎ +44 20-7325 8623                  |
| Alberto Gandolfi           | Iberia / Italy<br>☎ +44 20-7325 5742             |
| Sofia Savvantidou, CFA     | France / Greece / UK Water<br>☎ +44 20-7325 0650 |
| Olek Keenan, CFA           | Credit<br>☎ +44 20-7777 0017                     |

[christopher.g.rogers@jpmorgan.com](mailto:christopher.g.rogers@jpmorgan.com)  
**Carbon trading vol 4 pt 1**  
[ian.mitchell@jpmorgan.com](mailto:ian.mitchell@jpmorgan.com)  
**Carbon trading vol 4 pt 2**  
[alberto.gandolfi@jpmorgan.com](mailto:alberto.gandolfi@jpmorgan.com)  
[olek.keenan@jpmorgan.com](mailto:olek.keenan@jpmorgan.com)

For more information see MorganMarkets at [mm.jpmorgan.com](http://mm.jpmorgan.com)

All prices at close of business January 5 2007

J.P. Morgan Securities Ltd.

See page 9 for analyst certification and important disclosures, including investment banking relationships.

JPMorgan does and seeks to do business with companies covered in its research reports. As a result, investors should be aware that the firm may have a conflict of interest that could affect the objectivity of this report. Investors should consider this report as only a single factor in making their investment decision.