

Multi-year Expert Meeting
On Transport and Trade Facilitation:

**Maritime Transport and
the Climate Change Challenge**

16-18 February 2009

**Promoting low-carbon technologies
via carbon markets: the EU-ETS and CCS**

Presentation by

Mr. Mark C. Lewis
Managing Director, Commodities Research
Deutsche Bank
mark-c.lewis@db.com

Deutsche Bank AG

Promoting low-carbon technologies via carbon markets: the EU-ETS and CCS

*Mark C. Lewis
Managing Director
Commodities Research
Deutsche Bank
mark-c.lewis@db.com*



*UNCTAD Conference
Geneva
February 2009*



Deutsche Bank AG/London

All prices are those current at the end of the previous trading session unless otherwise indicated. Prices are sourced from local exchanges via Reuters, Bloomberg and other vendors. Data is sourced from Deutsche Bank and subject companies. Deutsche Bank does and seeks to do business with companies covered in its research reports. Thus, 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. Independent, third-party research (IR) on certain companies covered by DBS's research is available to customers of DBSI in the United States at no cost. Customers can access this IR at <http://gm.db.com>, or call 1-877-208-6300 to request that a copy of the IR be sent to them.

DISCLOSURES AND ANALYST CERTIFICATIONS ARE LOCATED IN APPENDIX 1

Deutsche Bank 

Contents

- **THE POLICY OBJECTIVES OF THE EU-ETS**
- **WHY CCS MATTERS**
- **HOW THE ETS WORKS IN THEORY**
- **HOW THE ETS WORKS IN PRACTICE**
- **WILL EU CARBON PRICES RECOVER?**

The policy objectives of the EU-ETS

- The overriding objective of EU climate policy is to limit the increase in average global temperatures to $<2^{\circ}\text{C}$ above pre-industrial levels.
- The ETS is there to generate a 'clear, undistorted and long-term carbon price signal' and so help achieve this policy target.
- To this end, there are three main dimensions to the ETS' role:
 1. To help achieve the EU's 2020 GHG-emissions-reduction target
 2. To promote CCS technology in the power sector such that it becomes the new entrant of choice by 2020
 3. To help foster a genuinely global carbon market

Mark C. Lewis, mark-c.lewis@db.com
June 2008 - page 3

Deutsche Bank 

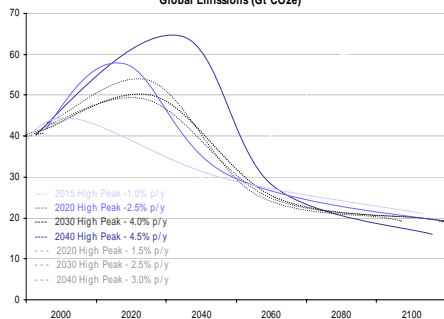
The importance of CCS

❖ Stern and the centrality of power generation in fighting climate change

Stabilizing GHG concentration levels at 450-550ppm CO₂e, implying

- below 5Gt of CO₂e/y (40Gt/y currently)
- -25% GHG emissions by 2050 to stabilize at or below 550ppm
-70% GHG emissions by 2050 to stabilize at or below 450ppm
- disproportionately large share of the burden for achieving the required cuts will have to be borne by the power-generation sector

Illustrative emissions paths to stabilize at 550ppm CO₂e by 2050
Global Emissions (Gt CO₂e)

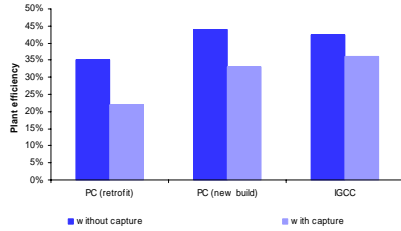


Source: Reproduced by the Stern Review based on Meinshausen, M. (2006): 'What does a 2°C target mean for greenhouse gas concentrations?'

Deutsche Bank 

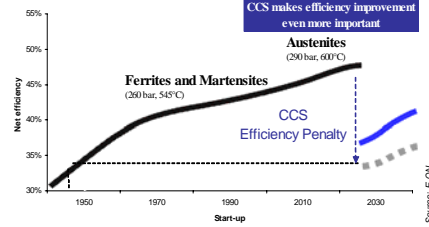
The Economics of CCS: Capture as the main cost-driver, efficiency rates crucial

Comparison of IGCC plants and PC plants in a CCS context



Source: IPCC, Deutsche Bank

Development of efficiency in coal fired PP in Germany



Source: E.ON

- capture costs ~75-90% of the total incremental cost of a CCS plant relative to a conventional thermal station
- storage costs ~10-15%
- transportation costs ~ 5% over distances of <100km

Barriers to the development of CCS:

Barrier	Comment
Cost	Both capital and operating costs need to be reduced, with efficiency rates the key swing factor
Security	Is there an issue with leakage and who would bears responsibility?
Public opinion	Could take time to convince electorates of the need for CCS
Legal/regulatory issues	Maritime sea law/UNFCCC attitude need clarification

Source: Kerns, 2007

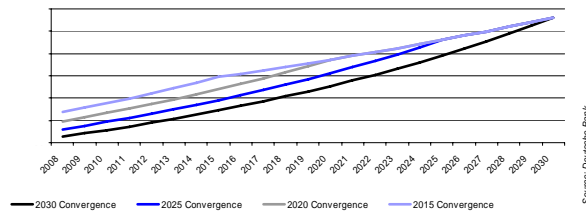
Deutsche Bank

The EUA forward curve: contango is the norm

Convergence is the long-run marginal-cost curve for the ETS

- the price implied today by the long-run abatement-supply curve represents a floor price
- in a rational and efficient market the EUA price should never fall below this level

Stylized EUA forward curves under different convergence scenarios at a given nominal 2008 CCS price



Source: Deutsche Bank

The longer it takes the EUA price to reach the convergence trajectory:

- the longer it will be before the signal is sent to incentivize investment in CCS
- the greater the amount of CCS capacity that will be required to meet the cap by the point of convergence
- the higher the cost of that capacity

... but backwardation is possible because installations cannot borrow allowances from future periods into the current period => NOT a ceiling on today's price level

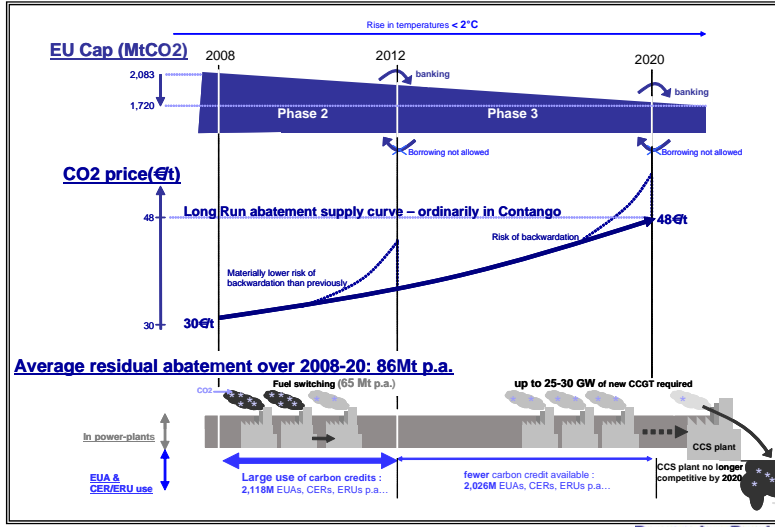


Source: Deutsche Bank

How the EUA forward curve would look if backwardation occurred at the end of Phase 2

Deutsche Bank

We previously saw EUA fair value at €30/t on a LRMC basis



But the recession has had a severe impact

Since December we have been factoring in a deeper EU recession over the next 12-18 months (impacting BAU and new renewable projects)

Revised DB estimates for Adjusted Emissions over Phase 2 (Mt)

	2008E	2009E	2010E	2011E	2012E
BAU emissions	2,165	2,054	2,074	2,116	2,158
Incremental CO ₂ savings from Energy-efficiency	7	2	3	5	8
Incremental CO ₂ savings from renewable energy	16	31	40	40	40
ETS Reported Emissions	2,148	2,020	2,031	2,071	2,110

Source: European Commission, Deutsche Bank

Revised DB estimates for Adjusted Emissions over Phase 3 (Mt)

	2013E	2014E	2015E	2016E	2017E	2018E	2019E	2020E
BAU emissions	2,191	2,213	2,224	2,235	2,246	2,257	2,268	2,280
Incremental CO ₂ savings from Energy-efficiency	16	28	45	60	90	100	110	117
Incremental CO ₂ savings from renewable energy	45	55	65	75	85	95	110	140
ETS Reported Emissions	2,130	2,130	2,114	2,100	2,071	2,062	2,048	2,023

Source: European Commission, Deutsche Bank

Revised DB estimates for adjusted emissions over Phase 2 versus pro-forma actual 2007 emissions (Mt)

	Pro-forma 2007E	2008E	2009E	2010E	2011E	2012E
ETS Reported Emissions	2,247	2,148	2,020	2,031	2,071	2,110
Change versus 2007 (Mt)	n/a	-99	-227	-216	-176	-137
Change versus 2007 (%)	n/a	-4.4	-10.1	-9.6	-7.8	-6.1

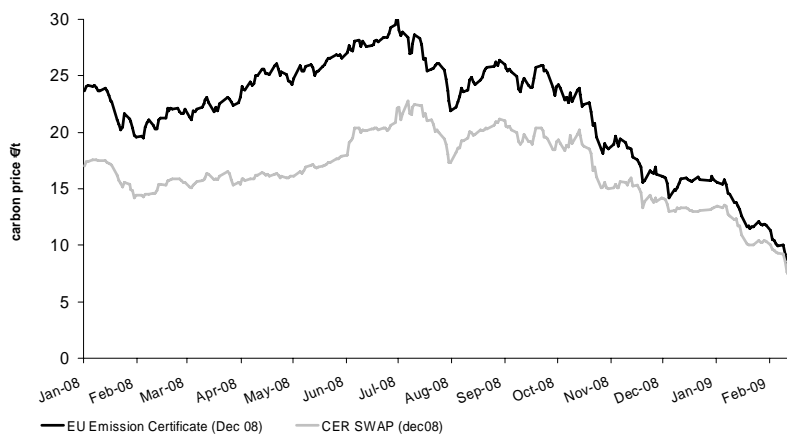
Source: European Commission, Deutsche Bank

Price action in the ETS over 2005-07



Source: Datastream

Price action in Phase-2 EUAs and CERs since Jan 2008



Source: Datastream

Why have EUA prices collapsed so much recently?

There are three main reasons why EUA prices have collapsed:

- **As a natural response to a fall in underlying ETS emissions**

Given the sharp deterioration in the macro-economic environment, it is perfectly normal for the price to adapt to lower demand – this shows the flexibility of a market mechanism relative to a tax.

- **As a result of the fact that supply has been fixed long in advance**

The ETS cap has been fixed until 2020, so supply cannot react directly to the change in demand as it would in any other commodity market

- **As a result of the free allocation of EUAs over Phase 2**

With lower demand for allowances, companies can sell the EUAs that they have been given free of charge and thereby raise cash (this is an issue for some companies because of the credit crunch)

Three ways auctioning might improve market efficiency

There are three dimensions to market efficiency, and auctioning might improve the current situation across all three dimensions:

- **STATIC EFFICIENCY**

This is all about ensuring a the optimal short-term clearing price in the market

- **DYNAMIC EFFICIENCY**

This is all about ensuring a long-term price signal is sent for the correct investment decisions to be made

- **ALLOCATIVE EFFICIENCY**

This is all about ensuring the carbon price is fully reflected in end-user prices to ensure that consumers are faced with behavioural decisions

Static efficiency: clearing the market in the short run

- The free allocation of allowances to ETS operators means they effectively start off with a long position.
- This means that until their hedging systems tell them they need to buy for compliance purposes, they might not enter the market in size to buy the EUAs they need.
- As a result, there is a risk that the market will clear at a higher price than it would do if all operators had to buy 100% of their allowances from day one, because abatement opportunities might be missed early on in the trading period which would then have to be made up subsequently at higher cost.
- There is also the risk that many buyers come to the market at the same time to buy the marginal allowances they need, thereby creating a technical bull squeeze and increasing market volatility.
- In short, the free allocation of allowances distorts the short-run clearing price and thereby makes the market less efficient.
- **AUCTIONING WOULD IMPROVE STATIC EFFICIENCY**

Dynamic efficiency: sending a long-run price signal

- Large industrial infrastructure typically has a very long capital-investment cycle, as such assets (e.g. power stations) last 30-40 years.
- This means that in order to make the right investment choices for the low-carbon economy of the future, the price signal today needs to be sufficiently robust that companies are dissuaded from investing in CO₂-intensive infrastructure in favour of less CO₂-intensive alternatives. In other words, the cost of carbon needs to be fully reflected in the new-entrant price – i.e. the long-run marginal cost – for the industries covered by the cap.
- However, if allowances are allocated free of charge, the full cost of carbon may not be reflected in today's price, and the more CO₂-intensive infrastructure might get built as a consequence. This would be bad not only from a carbon perspective, but also from an economic perspective, as the less CO₂-intensive assets would ultimately still have to be built in order to meet the future cap.
- In short, the free allocation of allowances distorts the long-run price signal sent and thereby make the market less efficient.
- **AUCTIONING WOULD IMPROVE DYNAMIC EFFICIENCY**

Allocative efficiency: changing consumer behaviour

- The free allocation of allowances to ETS operators means that the cost of carbon may not be reflected in the price of the industrial products of the companies subject to the cap.
- This means that consumers may not see any change in the cost of CO₂-intensive products relative to less CO₂-intensive alternatives, and hence that they will not have an incentive to change their consumption patterns.
- By contrast, if allowances were fully auctioned and the cost of carbon thereby passed on fully to consumers, the price of CO₂-intensive products would increase relative to less CO₂-intensive products, thereby providing an incentive for consumers to change their consumption patterns and reduce their carbon footprint.
- In short, the free allocation of allowances distorts consumer behaviour and thereby make the market less efficient.
- **AUCTIONING WOULD IMPROVE ALLOCATIVE EFFICIENCY**

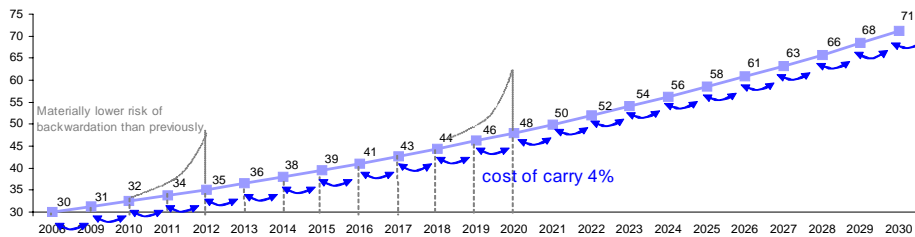
Mark C. Lewis, mark-c.lewis@db.com
June 2008 - page 15

Deutsche Bank 

Over the longer term, it still takes CO₂ to contango

... and ultimately, new power-generation capacity will probably still be needed, which implies a carbon price of €30/t already today based on a long-term oil price forecast of \$85/bbl, and a long-term coal-price forecast of \$125/t

carbon price (€/t)



Source: Deutsche Bank

Deutsche Bank 

Appendix 1

Important Disclosures
Additional Information Available upon Request

K IN
**
T
ND
ENT

Special Disclosures
N/A

Analyst Certification

The views expressed in this report accurately reflect the personal views of the undersigned lead analyst(s). In addition, the undersigned lead analyst(s) has not and will not receive any compensation for providing a specific recommendation or view in this report. **Mark Lewis**

For disclosures pertaining to recommendations or estimates made on a security mentioned in this report, please see the most recently published company report or visit our global disclosure look-up page on our website at <http://qm.db.com>.

Equity Rating Key

Buy: Based on a current 12-month view of total shareholder return (TSR = percentage change in share price from current price to projected target price plus projected dividend yield), we recommend that investors buy the stock.

Sell: Based on a current 12-month view of total shareholder return, we recommend that investors sell the stock.

Hold: We take a neutral view on the stock 12 months out and, based on this time horizon, do not recommend either a Buy or Sell.

Notes:

1. Newly issued research recommendations and target prices always supersede previously published research.

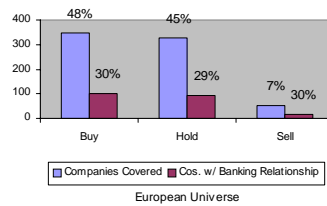
2. Ratings definitions prior to 27 January, 2007 were:

Buy: Expected total return (including dividends) of 10% or more over a 12-month period

Hold: Expected total return (including dividends) between -10% and 10% over a 12-month period

Sell: Expected total return (including dividends) of -10% or worse over a 12-month period

Equity Rating Dispersion and Banking Relationships



Regulatory Disclosures

SOLAR Disclosure

For select companies, Deutsche Bank equity research analysts may identify shorter-term trade opportunities that are consistent or inconsistent with Deutsche Bank's existing longer-term ratings. This information is made available only to Deutsche Bank clients, who may access it through the SOLAR stock list, which can be found at <http://gm.db.com>.

Disclosures required by United States laws and regulations

See company-specific disclosures above for any of the following disclosures required for covered companies referred to in this report: acting as a financial advisor, manager or co-manager in a pending transaction; 1% or other ownership; compensation for certain services; types of client relationships; managed/comanaged public offerings in prior periods; directorships; market making and/or specialist role.

The following are additional required disclosures:

Ownership and Material Conflicts of Interest: DBSI prohibits its analysts, persons reporting to analysts and members of their households from owning securities of any company in the analyst's area of coverage.

Analyst compensation: Analysts are paid in part based on the profitability of DBSI, which includes investment banking revenues.

Analyst as Officer or Director: DBSI policy prohibits its analysts, persons reporting to analysts or members of their households from serving as an officer, director, advisory board member or employee of any company in the analyst's area of coverage.

Distribution of ratings: See the distribution of ratings disclosure above.

Price Chart: See the price chart, with changes of ratings and price targets in prior periods, above, or, if electronic format or if with respect to multiple companies which are the subject of this report, on the DBSI website at <http://gm.db.com>.

Additional disclosures required under the laws and regulations of jurisdictions other than the United States

The following disclosures are those required by the jurisdiction indicated, in addition to those already made pursuant to United States laws and regulations.

Analyst compensation: Analysts are paid in part based on the profitability of Deutsche Bank AG and its affiliates, which includes investment banking revenues

Australia: This research, and any access to it, is intended only for "wholesale clients" within the meaning of the Australian Corporations Act.

EU: A general description of how Deutsche Bank AG identifies and manages conflicts of interest in Europe is contained in our public facing policy for managing conflicts of interest in connection with investment research. Disclosures relating to the firm's obligations under MiFID can be found at <http://globalmarkets.db.com/riskdisclosures>.

Germany: See company-specific disclosures above for (i) any net short position, (ii) any trading positions (iii) holdings of five percent or more of the share capital. In order to prevent or deal with conflicts of interests Deutsche Bank AG has implemented the necessary organisational procedures to comply with legal requirements and regulatory decrees. Adherence to these procedures is monitored by the Compliance-Department.

Hong Kong: See <http://gm.db.com> for company-specific disclosures required under Hong Kong regulations in connection with this research report. Disclosure #5 includes an associate of the research analyst. Disclosure #6, satisfies the disclosure of financial interests for the purposes of paragraph 16.5(a) of the SFC's Code of Conduct (the "Code"). The 1% or more interests is calculated as of the previous month end. Disclosures #7 and #8 combined satisfy the SFC requirement under paragraph 16.5(d) of the Code to disclose an investment banking relationship.

Japan: See company-specific disclosures as to any applicable disclosures required by Japanese stock exchanges, the Japanese Securities Dealers Association or the Japanese Securities Finance Company.

Disclosures under the Financial Instruments and Exchange Law
Company name: Deutsche Securities Inc.

Registration number: Registered as a financial instruments dealer by the Head of the Kanto Local Finance Bureau (Kinsho) No. 117

Member of associations: Japan Securities Dealers Association (JSDA), The Financial Futures Association of Japan

Commissions and risks involved in stock transactions: For stock transactions, we charge stock commissions and consumption tax by multiplying the transaction amount by the commission rate agreed with each customer. Stock transactions can lead to losses as a result of share price fluctuations and other factors. Transactions in foreign stocks can lead to additional losses stemming from foreign exchange fluctuations.

New Zealand: This research is not intended for, and should not be given to, "members of the public" within the meaning of the New Zealand Securities Markets Act 1988.

Russia: The information, interpretation and opinions submitted herein are not in the context of, and do not constitute, any appraisal or evaluation activity requiring a licence in the Russian Federation.

South Africa: Publisher: Deutsche Securities (Pty) Ltd, 3 Exchange Square, 87 Maude Street, Sandton, 2196, South Africa. Author: As referred to on the front cover. All rights reserved. When quoting, please cite Deutsche Securities Research as the source.

Turkey: The information, interpretation and advice submitted herein are not in the context of an investment consultancy service. Investment consultancy services are provided by brokerage firms, portfolio management companies and banks that are not authorized to accept deposits through an investment consultancy agreement to be entered into such corporations and their clients. The interpretation and advices herein are submitted on the basis of personal opinion of the relevant interpreters and consultants. Such opinion may not fit your financial situation and your profit/risk preferences. Accordingly, investment decisions solely based on the information herein may not result in expected outcomes.

United Kingdom: Persons who would be categorized as private customers in the United Kingdom, as such term is defined in the rules of the Financial Services Authority, should read this research in conjunction with prior Deutsche Bank AG research on the companies which are the subject of this research. Disclosures relating to the firm's obligations under MiFID can be found at <http://globalmarkets.db.com/riskdisclosures>.

Global Disclaimer

The information and opinions in this report were prepared by Deutsche Bank AG or one of its affiliates (collectively "Deutsche Bank"). The information herein is believed by Deutsche Bank to be reliable and has been obtained from public sources believed to be reliable. With the exception of information about Deutsche Bank, Deutsche Bank makes no representation as to the accuracy or completeness of such information.

This published research report may be considered by Deutsche Bank when Deutsche Bank is deciding to buy or sell proprietary positions in the securities mentioned in this report. For select companies, Deutsche Bank equity research analysts may identify shorter-term opportunities that are consistent or inconsistent with Deutsche Bank's existing, longer-term Buy or Sell recommendations. This information is made available on the SCLAS stock list, which can be found at <http://igw.db.com>.

Deutsche Bank may trade for its own account as a result of the short term trading suggestions of analysts and may also engage in securities transactions in a manner inconsistent with this research report and with respect to securities covered by this report, will sell to or buy from customers on a principal basis. Disclosures of conflicts of interest, if any, are discussed at the end of the text of this report or on the Deutsche Bank website at <http://gm.db.com>.

Opinions, estimates and projections in this report constitute the current judgment of the author as of the date of this report. They do not necessarily reflect the opinions of Deutsche Bank and are subject to change without notice. Deutsche Bank has no obligation to update, modify or amend this report or to otherwise notify a reader thereof in the event that any matter stated herein, or any opinion, projection, forecast or estimate set forth herein, changes or subsequently becomes inaccurate, except if research on the subject company is withdrawn. Prices and availability of financial instruments also are subject to change without notice. This report is provided for informational purposes only. It is not to be construed as an offer to buy or sell or a solicitation of an offer to buy or sell any financial instruments or to participate in any particular trading strategy in any jurisdiction or as an advertisement of any financial instruments.

The financial instruments discussed in this report may not be suitable for all investors and investors must make their own investment decisions using their own independent advisors as they believe necessary and based upon their specific financial situations and investment objectives. If a financial instrument is denominated in a currency other than an investor's currency, a change in exchange rates may adversely affect the price or value of, or the income derived from, the financial instrument, and such investor effectively assumes currency risk. In addition, income from an investment may fluctuate and the price or value of financial instruments described in this report, either directly or indirectly, may rise or fall. Furthermore, past performance is not necessarily indicative of future results.

Derivative transactions involve numerous risks including, among others, market, counterparty default and illiquidity risk. The appropriateness or otherwise of these products for use by investors is dependent on the investors' own circumstances including their tax position, their regulatory environment and the nature of their other assets and liabilities and as such investors should take expert legal and financial advice before entering into any transaction similar to or inspired by the contents of this publication. Trading in options involves risk and is not suitable for all investors. Prior to buying or selling an option investors must review the "Characteristics and Risks of Standardized Options," at <http://www.optionsclearing.com/publications/risks/riskchap1.jsp>. If you are unable to access the website please contact Deutsche Bank AG at +1 (212) 250-7994, for a copy of this important document. Furthermore, past performance is not necessarily indicative of future results. Please note that multi-leg options strategies will incur multiple commissions.

Unless governing law provides otherwise, all transactions should be executed through the Deutsche Bank entity in the investor's home jurisdiction. In the U.S. this report is approved and/or distributed by Deutsche Bank Securities Inc., a member of the NYSE, the NASD, NFA and SIPC. In Germany this report is approved and/or communicated by Deutsche Bank AG Frankfurt authorised by Bundesanstalt für Finanzdienstleistungsaufsicht. In the United Kingdom this report is approved and/or communicated by Deutsche Bank AG London, a member of the London Stock Exchange and regulated by the Financial Services Authority for the conduct of investment business in the UK and authorised by Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin). This report is distributed in Hong Kong by Deutsche Bank AG, Hong Kong Branch, in Korea by Deutsche Securities Korea Co. and in Singapore by Deutsche Bank AG, Singapore Branch. In Japan this report is approved and/or distributed by Deutsche Securities Inc. The information contained in this report does not constitute the provision of investment advice. In Australia, retail clients should obtain a copy of a Product Disclosure Statement (PDS) relating to any financial product referred to in this report and consider the PDS before making any decision about whether to acquire the product. Deutsche Bank AG, Jaharweg 15 is incorporated in the Federal Republic of Germany (Branch Register Number in South Africa: 1998/003298/10). Additional information relative to securities, other financial products or issuers discussed in this report is available upon request. This report may not be reproduced, distributed or published by any person for any purpose without Deutsche Bank's prior written consent. Please cite source when quoting.

Copyright © 2008 Deutsche Bank AG