Carbon Beta™ of Securities and their Impacts on Equity Portfolios
Companies’ “sustainability” characteristics are becoming increasingly critical to their competitiveness, profitability, and share price performance.

Sustainability analysis can provide additional insights about companies’ strategic management capabilities, organizational agility, and therefore their financial performance potential.

Climate change is emerging as the #1 global sustainability risk driver.

Climate risk exposure varies widely, between and even within industry sectors; yet those exposures are not fully priced into asset values.

Robust climate risk/opportunity data and analysis are scarce and difficult to obtain; this can create a major information advantage for investors.

Those opportunities can be exploited through a portfolio of major global companies with superior “carbon risk” management, as well as particularly strong exposure to the opportunities being created by climate change.

Combining world-class fundamental and/or quantitative analysis with institutional-quality carbon risk research creates optimal portfolio performance.
“Carbon Beta™” Varies Widely – Both Between and Within Sectors

CO₂ Regulatory Cost of Compliance as Percentage of EBITDA

Cost of Compliance as EBITDA%

Electric Power Companies - N. America
Multi-Utilities & Unregulated Power
Diversified Chemicals
Specialty Chemicals
Metals & Mining
Surface Transport
Pharmaceuticals

Max case
Min case
What are the Investment Risks?

- Physical
- Litigation
- Regulatory
- Competitive
- Reputational

Each of these can affect:

- CAPEX
- Operating Costs
- Cash Flow
- Cost of Capital
What Drives Companies’ “Carbon Beta”?

- Strategic governance (the extent to which companies integrate climate change factors into their business planning impact overall risk)
- Product mix – direct, indirect, and embedded carbon intensity (i.e. value chain emissions profile)
- Energy intensity, consumption patterns and electricity source mix
- Geographic distribution of production assets relative to specific regulatory and tax-related considerations
- Business regimes that determine the ability of companies to recoup carbon-driven higher compliance and operating costs from customers
- Technology trajectory – level of progress achieved towards adapting and replacing production technologies (some companies can reduce emissions at much lower cost than others)
- Ability to identify and monetize revenue opportunities (manufacturing cost efficiencies, new product/service opportunities, emissions trading and clean technology)
Carbon BETA™ Multidimensional Analysis

CLIMATE RISK HAS FOUR DIMENSIONS, NOT ONE
It is sometimes (erroneously) assumed that companies’ “carbon footprint” is the paramount or even the only factor to be assessed in determining their risk for investors.

Scores

Carbon Management Strategy: Each company is assessed relative to peers on its carbon management strategy. In particular, we look at stated goals and policies to address climate change challenges.

Carbon Risk Exposure: Risk exposure trends related to climate change are assessed for the sector as a whole, and the company in particular. Three categories of risk are addressed: direct risk, indirect risk (upstream the supply chain) and market related (GHGs emissions related to product in use)

Strategic Carbon Opportunities: Each firm is assessed for its ability to develop and commercialize strategic carbon opportunities relevant for its sector. These may be comprised of anything from direct technical solutions to changes in services and operations management that address climate change and lower emissions.

Improvement Trend: The overall trend for the company vis-à-vis climate change risks and opportunities is assessed.
AES Corp.

Industry: Electric Power Companies - N. America  
Country: United States  
Rating Outlook: Steady  
Ticker: AES-N  
Analyst: TBD

Carbon Beta™ Rating: BBB

Carbon Intensity (a): 1918.57
Carbon Direct Intensity: 5
Carbon Indirect Intensity: 4
Carbon Market Sensitivity: 5
2005 Sales (USD millions): $8,363
Carbon Improvement Vector: ▲

AES's above average CO2 emissions rate for its generating capacity in the United States exposes the company to future federal legislation on climate change. Furthermore, AES has significant generating capacity in Europe and in areas of the US with greenhouse gas (GHG) emissions schemes in place or under development. In an effort to mitigate the company's risk and capitalize on growing profit opportunities in this area, AES continues to develop GHG emission offset projects under the Clean Development Mechanism of the Kyoto Protocol. The company has announced a planned partnership with GE Energy Financial Services. The partnership would seek to create 10 million tonnes of greenhouse gas offsets annually by 2010. These offsets would be achieved primarily through the reduction of emissions of methane. Additional offsets would be created through energy efficiency projects and renewable energy development. AES's strategy and disclosure in this area are in line with the sector average practices.
Carbon BETA™: Compliance Cost

Elements that integrate the compliance cost model:

- **Weighted Average Country Carbon Reduction Target (WACCRT©)**, represents the aggregate extent of emissions reductions over the full range of a firm’s industrial activities according to applicable legislations, domestically and internationally.

- **Industry Discount Rate**, is calculated from the Weighed Average Cost of Capital (WACC) from each specific industry.

- **Carbon Cost**, is the weighted price for three different scenarios (expected, maximum and minimum price) per emission allowance ($ per ton of CO₂ equivalent).

- **Net Present Value** of costs of meeting emissions reduction targets. For calculating this figure we estimate the abatement compliance cost for each year during the commitment period.

<table>
<thead>
<tr>
<th>Compliance Cost</th>
<th>Exp. Case</th>
<th>Min. Case</th>
<th>Max. Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>WACCRT™ (b)</td>
<td>$28</td>
<td>$18</td>
<td>$45</td>
</tr>
<tr>
<td>Carbon Cost ($/ton CO₂)</td>
<td>$311,497</td>
<td>$190,693</td>
<td>$499,932</td>
</tr>
<tr>
<td>NPV costs to meet target year ($1000)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposure (% of EBITDA)</td>
<td>17.19%</td>
<td>10.52%</td>
<td>27.59%</td>
</tr>
<tr>
<td>Industry discount rate (c)</td>
<td></td>
<td></td>
<td>9.16%</td>
</tr>
</tbody>
</table>
The “Disclosure Quality Premium” is Essentially Zero!
Disclosure is NOT Enough!

- CLI Performers
- Innovest Carbon Performers

Difference ISVA Cbeta - CLI
Carbon Beta© Performers vs. Laggards Globally
Carbon Beta© Performers vs. Laggards in the Utilities Sector
Carbon Beta© Performers vs. Laggards in Asia-Pacific

[Graph showing total return differences between above average and below average Innovest ratings from June 2004 to June 2007.]
Carbon Price Impacts - Modeling a New Base Load Power Station

- NSW attempting to encourage new private sector investment in base-load power
- Compare two key contenders:
  - Ultra supercritical black coal
  - Combined cycle gas turbine
- What generator type is most cost competitive under emissions trading?
- How do changes in key variables change the picture from the perspective of a project financer?
  - e.g. - Price of emissions permits
    - Level of auctioning vs. free allocation of permits
Coal vs. gas under emissions trading – key assumptions

- Ten year time horizon has been used for modelling (from 2010 to 2020)
- Permit allocations fall by 20% between 2010 and 2020, representing a policy-induced reduction in emissions
- Carbon capture and storage is not modeled

<table>
<thead>
<tr>
<th></th>
<th>USC Coal</th>
<th>CCGT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction costs for 1000MW generator ($ million)</td>
<td>1,800</td>
<td>844</td>
</tr>
<tr>
<td>Fuel costs ($/MWh)</td>
<td>11.45</td>
<td>28.40</td>
</tr>
<tr>
<td>GHG emissions per MWh (tonnes)</td>
<td>0.84</td>
<td>0.35</td>
</tr>
</tbody>
</table>

Source: Connell Wagner (2007). Midpoints are used where a range of estimates are provided.
The switching price

What carbon price makes the cost of coal = the cost of gas-fired base load?

Gas Switching Price with 100% Auctioning of Permits

At a zero emissions price, coal costs $7.95/MWh more than gas.

At an emissions price of $50/tonne, coal costs $16.60/MWh more than gas.

At an emissions price of $100/tonne, coal costs $41.10/MWh more than gas.

Switching price = $16.20
Gas Switching Price Under Various Permit Allocations

Switching price ($/MWh)

Percentage of permits allocated free to generators
## Impact on financial ratios

### Interest cover:

<table>
<thead>
<tr>
<th>Pricing scenario</th>
<th>Level of free permit allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Case 1a: AUD10</td>
<td>coal</td>
</tr>
<tr>
<td>Case 1b: AUD35</td>
<td>coal</td>
</tr>
<tr>
<td>Case 2a: AUD10-AUD30</td>
<td>coal</td>
</tr>
<tr>
<td>Case 2b: EU ETS</td>
<td>coal</td>
</tr>
</tbody>
</table>

Note: The ~ symbol indicates a marginal preference for a particular fuel. eg. ~gas is a marginal preference for gas.

### Profit margin:

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Asymmetric risk profile

What if we make the wrong decision?

<table>
<thead>
<tr>
<th>Fuel Choice</th>
<th>Low carbon price</th>
<th>High carbon price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>Positive financial impact relative to gas</td>
<td>Negative financial impact relative to gas – unbounded as carbon price rises</td>
</tr>
<tr>
<td>Gas</td>
<td>Negative financial impact relative to coal – bounded by a strictly non-negative carbon price</td>
<td>Positive financial impact relative to coal</td>
</tr>
</tbody>
</table>
Thank you!

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What Have We Learned So Far?

- The global industrial restructuring towards a “low carbon” future has already begun.
- Risks are much more broadly—and unevenly—distributed than previously thought.
- Climate risk has **four** dimensions, not just one! Analysis must consider:
  - risk;
  - risk management;
  - market-driven *upside* opportunities;
  - Performance improvement vector.
- While more & more investors and corporates are now paying attention, most are a *long* way from integrating the net climate exposure of their assets into actual investment strategies.
- Investors *can* make money from climate change — and some are already doing so!
Monetizing Carbon Beta in the Fixed-Income Market

27 February 2007

Introducing the JENI-Carbon Beta Index
The first corporate bond index to address the risks related to climate change

JENI-Carbon Beta vs. JULI (spreads over benchmark Treasuries) bps

Source: JPMorgan. [update on Oct 2007]
Multi-factor Carbon Beta™ algorithms integrate over multiple data points, including:

Core Positioning Liabilities:
- Issues faced by industry as whole
- Geographic location issues

Operating Risk Exposure:
- Direct GHG emissions
- Indirect carbon risks
- Other regulatory issues
- Supply chain management risk

Future Sustainability Risk:
- Energy efficiency practices
- Carbon intensity per ton of product/$ sales
- Product life-cycle durability and recyclability
- Exposure to shifts in consumer values
- Competitive risks related to core business

Financial Risk Management Capacity:
- Balance sheet strength
- Insurance cover adequacy

Strategic Management Capacity:
- Climate change policy
- Mitigation strategy
- Core part of env. management systems strength
- 3rd party audit/accounting
- Emissions trading work
- Baseline measurement
- Supply chain issues
- Voluntary charters, working grps

Sustainable Profit Opportunities:
- CDM/JI project involvement
- New products, services based on low carbon profile
- Energy efficiency and broader related issues
4 Carbon Price Scenarios Modelled

Case 1a. AUD10
Case 1b. AUD35
Case 2a. AUD10-AUD30
Case 2b. EU ETS Projections

$/tonne CO₂e

Year


Case 1a. AUD10
Case 1b. AUD35
Case 2a. AUD10-AUD30
Case 2b. EU ETS Projections