World Bank Carbon Finance Business - Pricing and Finance

Workshop and Business Roundtable

Brazil, March 2004

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Pricing, Structures, & Impact on Projects
Informações limitadas de preços

• **JI**: Precos disponíveis apenas nas transações do PCF & ERUPT (representam 1/3 do volume negociado).
  
  Faixa: $3.00-$8.10

• **CDM**: Precos disponíveis em grande parte no PCF; (representam apenas 1/6 do volume negociado).
  
  Faixa: $1.48-$3.50

• **Anexo II**: Precos disponíveis em apenas 37% das transações.
  
  Faixa: $0.40-$7.30
  
  Media: $1.00/tCO2e
Premium for Compliance
U.S.$ per metric t of CO$_2$e in 2003

- $0.00
- $2.00
- $4.00
- $6.00

ER Buyer takes Registration Risk
Seller takes Registration Risk

Not Kyoto Pre-Compliance
Kyoto Pre-Compliance
Key Price Determinants

- Guarantee of delivery of registered ERs (42% >)
- Creditworthiness of project sponsor
- Viability of underlying project, and liabilities of seller in case it underperforms
- ER vintage: pre or post 2012
- Cost of validation and potential certification
- Host country support
- Additional environment and social benefits
Pricing and Risk

ASSET QUALITY
- AAUs
- ETS ERs
- ERUs
- CERs

COMPLIANCE QUALITY
- VERs

DELIVERY RISK
- ERs

High Quality

Small, risky asset

Price

Penalty for non-delivery

Contract for CERs

No Penalty for non-delivery

Contract for VERs
PCF Carbon Prices

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uganda small hydro (5&amp;1.5 MW) remote area</td>
<td>$3.00</td>
</tr>
<tr>
<td>Chile: 25 MW hydro run-of-river</td>
<td>$3.50 [ +option]</td>
</tr>
<tr>
<td>Brazil sustainable charcoal replacing coal/coke</td>
<td>$3.50</td>
</tr>
<tr>
<td>Poland District Heating Fuel Switch – Coal to Geothermal and Biomass</td>
<td>$3.50</td>
</tr>
<tr>
<td>C. America small wind/hydro</td>
<td>$3.50</td>
</tr>
<tr>
<td>Romania Afforestation</td>
<td>$3.60 [+option]</td>
</tr>
<tr>
<td>Colombia wind farm</td>
<td>$3.50 + 0.5</td>
</tr>
<tr>
<td>South Africa Durban waste management</td>
<td>$3.75 + 0.2</td>
</tr>
<tr>
<td>Czech small-scale energy efficiency</td>
<td>$4.00</td>
</tr>
</tbody>
</table>
Lessons from PCF: Benefits of Carbon Finance

- High quality cash flow reduces risk
- Increased cash flow boosts returns:

<table>
<thead>
<tr>
<th>Technology</th>
<th>ΔIRR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydro, Wind, Geothermal</td>
<td>0.5 - 2.5</td>
</tr>
<tr>
<td>Crop / Forest Residues</td>
<td>3 - 7</td>
</tr>
<tr>
<td>Biomass, MSW - “methane kick”</td>
<td>5 - 15 &gt;</td>
</tr>
</tbody>
</table>

Contribution to project IRRs at $4/tCO2e
## Impact for Renewables

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Gas</td>
<td>0.50</td>
<td>$2.00</td>
</tr>
<tr>
<td>Coal</td>
<td>0.85</td>
<td>$3.40</td>
</tr>
<tr>
<td>Diesel</td>
<td>1.50</td>
<td>$6.00</td>
</tr>
</tbody>
</table>
Impact on LFGTE

Assumptions:
- 6m$^3$ LFG/ton waste/ann
- LFG = 50% methane
- 33% generation efficiency
- 10.02 kWh / tonne waste

ERs (tCO2e):

<table>
<thead>
<tr>
<th></th>
<th>Per 1000t waste</th>
<th>Per MWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flaring</td>
<td>41</td>
<td>4.06</td>
</tr>
<tr>
<td>Power displacement</td>
<td>4-10</td>
<td>0.4-1.0</td>
</tr>
<tr>
<td>Total</td>
<td>45-50</td>
<td>4.5-5.0</td>
</tr>
<tr>
<td>Value at $4/tCO_2$e</td>
<td>$180-$200</td>
<td>$18-$20</td>
</tr>
</tbody>
</table>
Impact on Biomass
Impact on Biomass
Impact on Biomass
Impact on Biomass
Nature of Carbon Financing Contract

- **Investor**
  - Equity
- **Banks**
  - Debt
- **Power Purchase Agreement**
  - $\$\$
  - Electricity
- **Carbon Credits**
  - $\$\$
- **Emission Reduction Purchase Agreement**
  - $\$\$

- **Carbon Fund**
  - Industrialized
  - Developing
  - $Rs$
  - $Rs$
Brazil Plantar Sust. Fuelwood

ER payments are used to amortize commercial loan.
Carbon Transaction Structure

Host Country

Letter of Approval

CF

ER payment

SPV

Lender

ERs

Financing Agr.’s

Up-front finance

Sponsor/Project

Permits, etc.

Financing structure eliminates convertibility and transfer risk
Options on ERs - Key Principles

• **Maximize volume of cost-effective call options purchased**
  – From existing pipeline and in excess of ERs required for portfolio

• **Preference for zero-cost options**
  – Trade-off between premium and strike price

• **Path-dependent options**
  – PCF buys ERs if seller delivers and if PCF has funds available
  – Benefits: same cost as firm purchase, without need to allocate funds

• **Convertible commitments**
  – Firm commitment converts to call option in event of default
  – If project recovers, PCF can call ERs

• **No 3rd-party insurance products**
Other structures - Key Principles

• Late Crediting in JI projects
  – Options on ERs + AAUs for delivery after 2012 (ERPA)
  – Eligibility:
    • For PCF contracts with firm delivery in 1st commitment period
    • Projects are expected to continue to generate ERs after 2012
    • Host Country willing to back ERs with AAUs (i.e. headroom)

• Monitoring: quantify delivery risk
  – Investment risk: Payment, no delivery
    • Upfront payments; capitalized prep. costs
  – Reinvestment risk: No payment, no delivery
    • Projects that fail to deliver required ERs
  – Baseline risk: VERs > CER/ERUs
    • Projects with BL / MVP not accepted by EB
PCF Options Portfolio

• **Call options purchased:**
  – Chile Chacabuquito: 750,000 tCO2e
  – Bulgaria Svilosa: 500,000 tCO2e

• **Put options sold:**
  – Guatemala El Canada: 200,000 tCO2e

• **Path-dependent options: Hungary Pécs**
  – convertible to call option +
  – additional ERs to 2012, subject to funds
Impact of Carbon Finance

• **Increased cash flow boosts IRRs**
  – ~0.5% to 2% for renewables / EE
  – 5-15% for CH4

• **High quality cash flow and contract reduce risk**
  – OECD sourced (investment-grade payers)
  – $ or € denominated
  – Long-term contract with no price fluctuation guarantees flow

  ➢ Payments abroad eliminates currency convertibility and transfer risks

**Value added ER revenues + Financial engineering allow access to capital markets and boost project bankability by borrowing against ER streams**
Conclusions

• Damage as result of Climate Change is unquestionable
• Uncertainties in the carbon market are being solved
  ⇒ European obligations + Canadian and Japanese engagement assure demand
  ⇒ Preparation costs and “meth” risks are declining
  ⇒ ETS linking directives provides liquidity
• Carbon revenues + Financial engineering
  ⇒ Increase returns, especially for non-CO2 GHGs
  ⇒ Enhance project profile and boosts bankability

The carbon market is maturing regardless of Russian ratification and LFG has huge competitive advantage
Thank you!
www.carbonfinance.org