



World Bank Carbon Finance Business - Pricing and Finance

Workshop and Business Roundtable

Brazil, March 2004

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Pricing, Structures, & Impact on Projects

Informacoes limitadas de precos



- **JJ: Precos disponiveis apenas nas transacoes do PCF & ERUPT (representam 1/3 do volume negociado).**

Faixa: \$3.00-\$8.10

- **CDM: Precos disponiveis em grande parte no PCF; (representam apenas 1/6 do volume negociado).**

Faixa: \$1.48-\$3.50

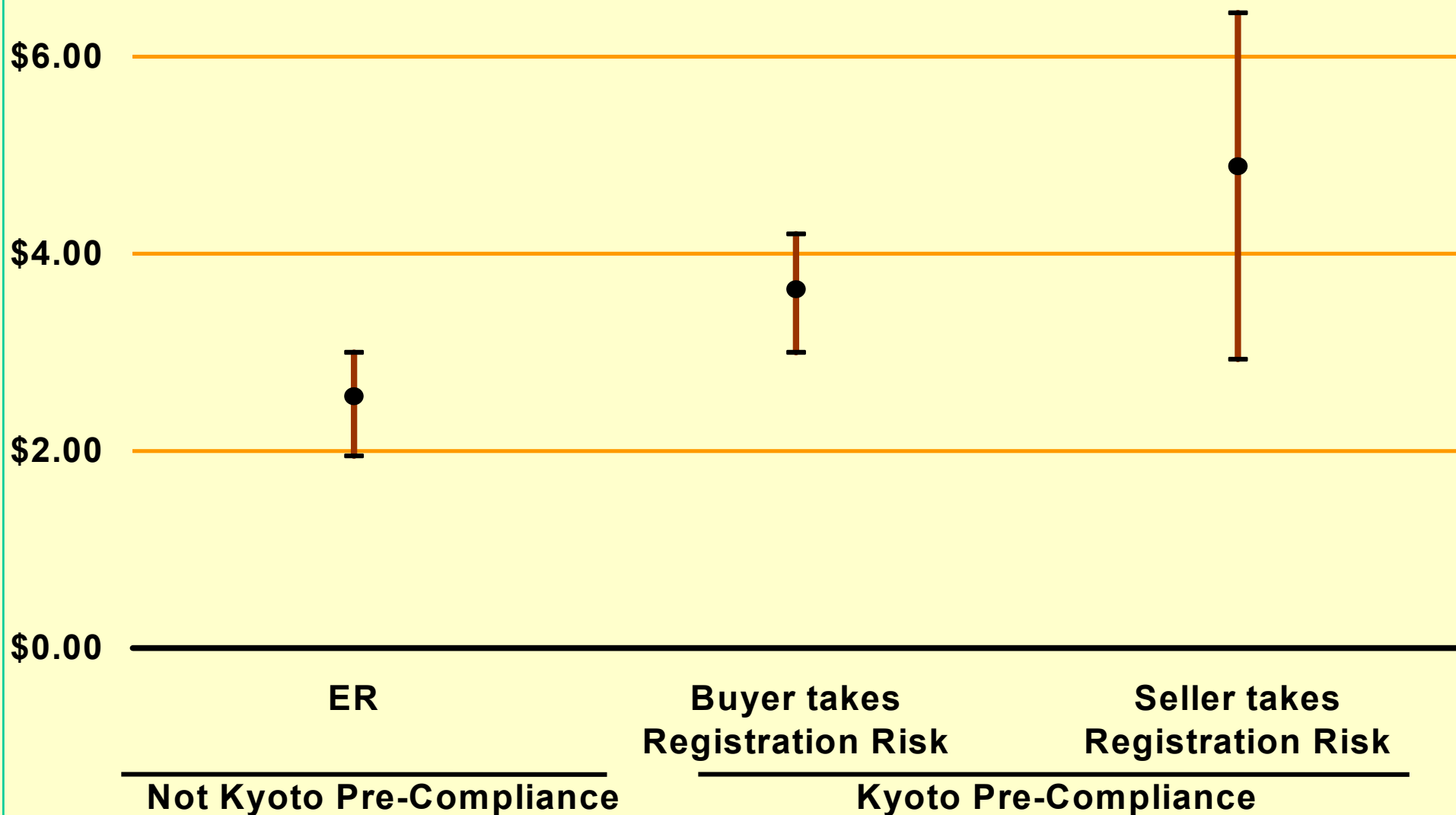
- **Anexo II: Precos disponiveis em apenas 37% das transacoes.**

Faixa: \$0.40-\$7.30

Media: \$1.00/tCO₂e

Premium for Compliance

U.S.\$ per metric t of CO₂e in 2003

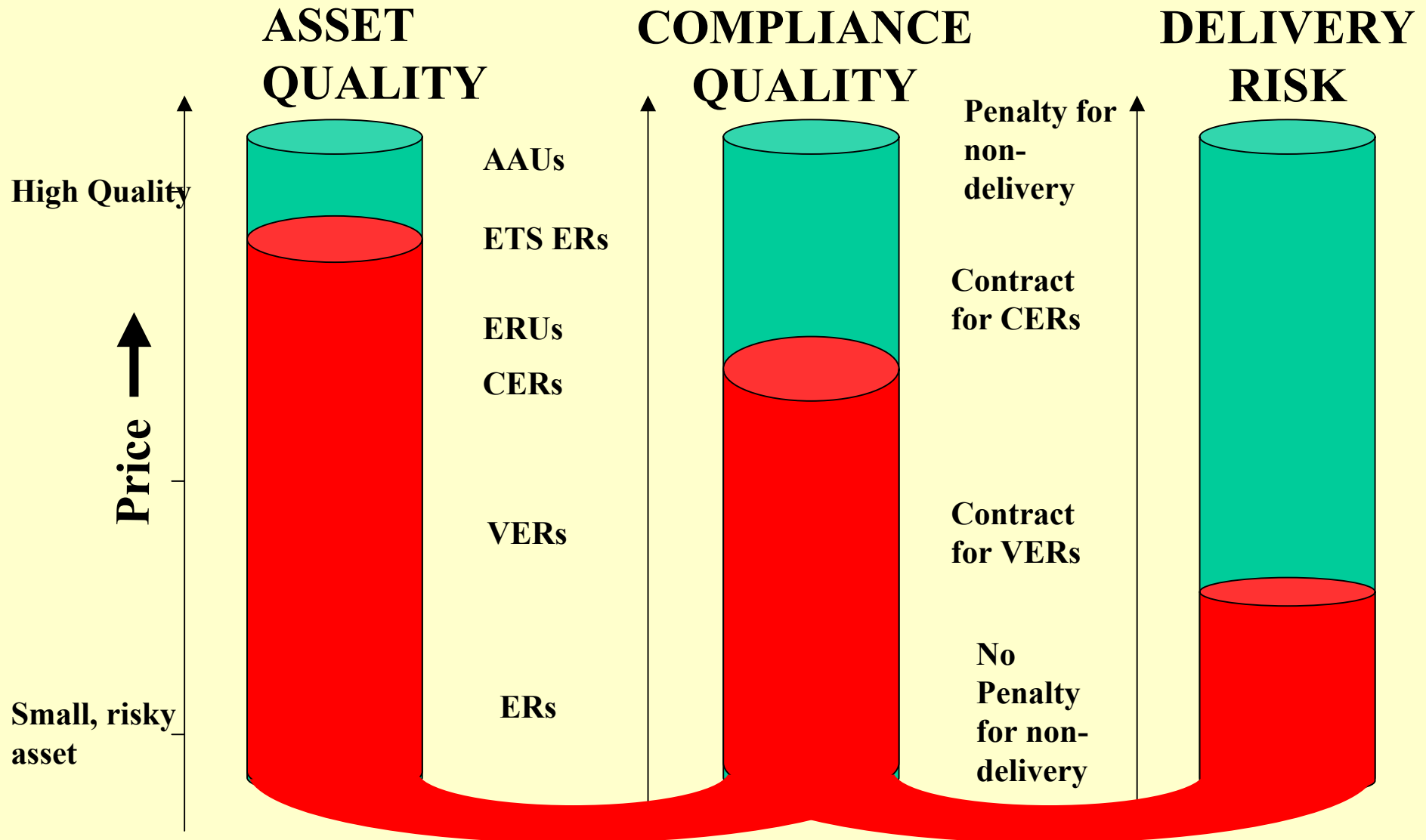


Key Price Determinants



- **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



PCF Carbon Prices



Uganda small hydro (5&1.5 MW) remote area	\$3.00
Chile: 25 MW hydro run-of-river	\$3.50 [+option]
Brazil sustainable charcoal replacing coal/coke	\$3.50
Poland District Heating Fuel Switch – Coal to Geothermal and Biomass	\$3.50
C. America small wind/hydro	\$3.50
Romania Afforestation	\$3.60 [+option]
Colombia wind farm	\$3.50 + 0.5
South Africa Durban waste management	\$3.75 + 0.2
Czech small-scale energy efficiency	\$4.00

Lessons from PCF: Benefits of Carbon Finance



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

Technology	ΔIRR (%)
Hydro, Wind, Geothermal	0.5 - 2.5
Crop / Forest Residues	3 - 7
Biomass, MSW - “methane kick”	5 - 15 >

Contribution to project IRRs at \$4/tCO_{2e}

Impact for Renewables



Fuel Displaced	Generic Emissions Factor (tCO₂e/MWh)	Carbon Revenue US\$/MWh at US\$4/tCO₂e
Gas	0.50	\$2.00
Coal	0.85	\$3.40
Diesel	1.50	\$6.00



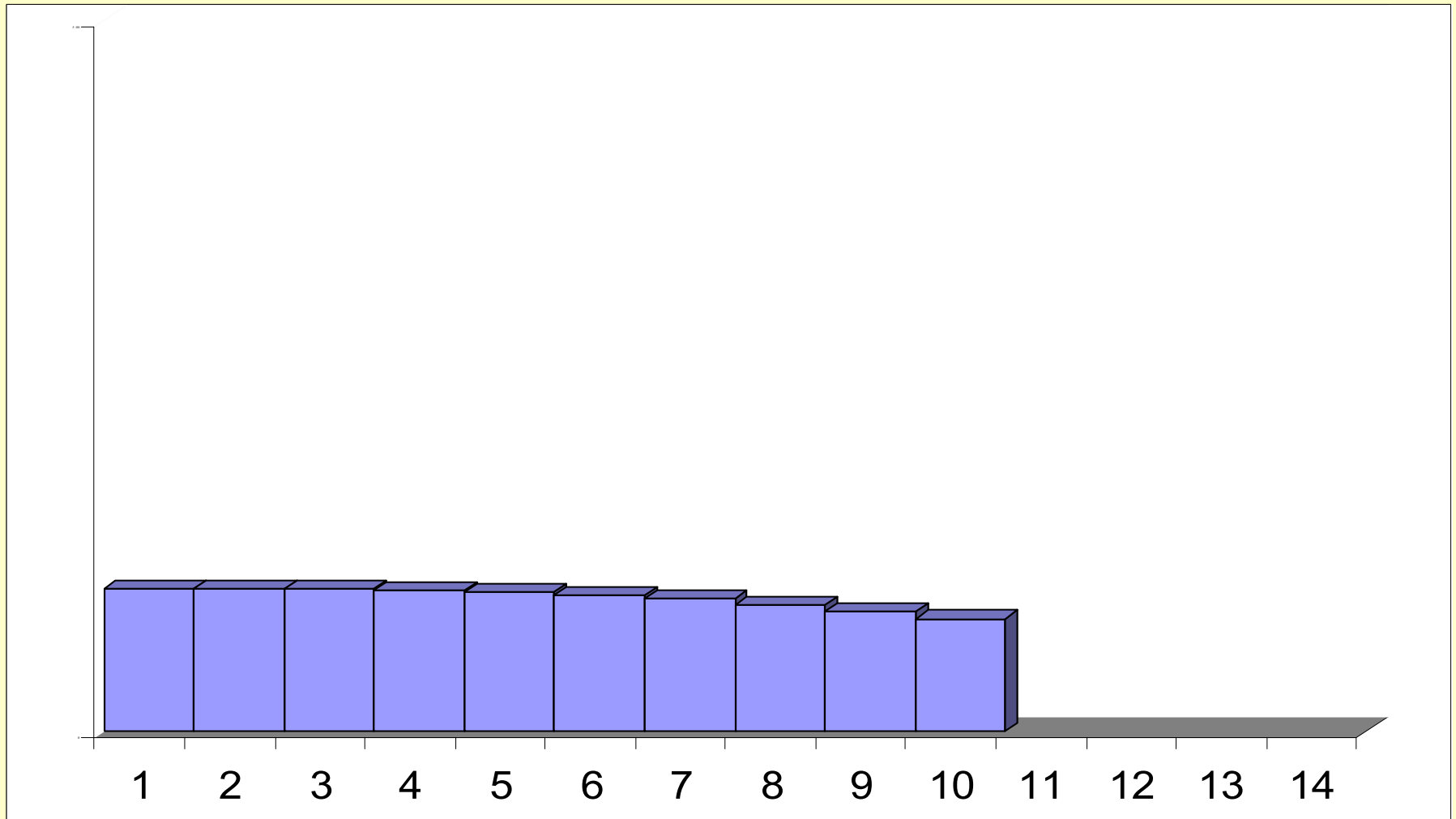
Impact on LFGTE

Assumptions:

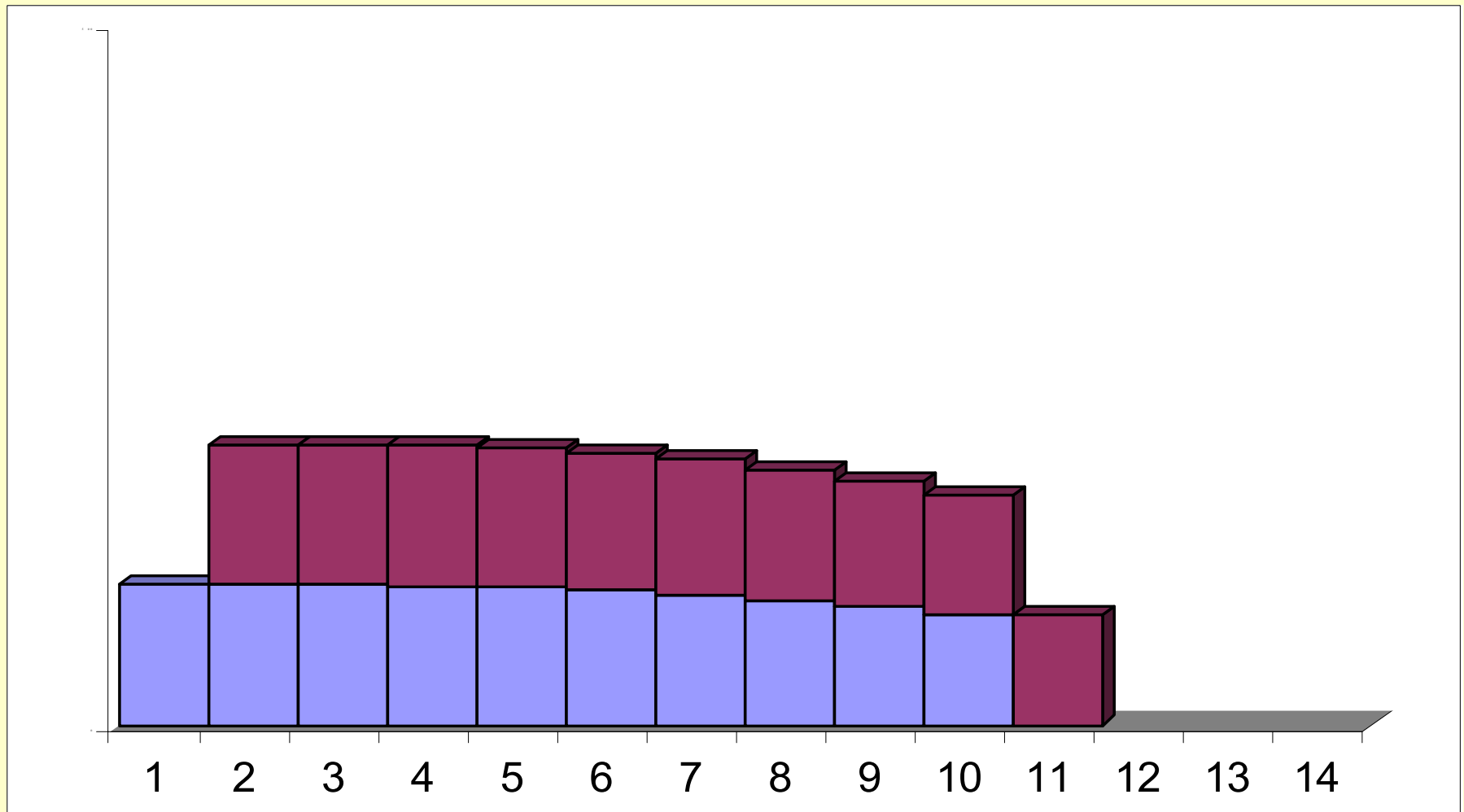
- 6m³ LFG/ton waste/ann
- LFG = 50% methane
- 33% generation efficiency
- 10.02 kWh / tonne waste

ERs (tCO₂e):	<u>Per 1000t waste</u>	<u>Per MWh</u>
– Flaring	41	4.06
– Power displacement	<u>4-10</u>	<u>0.4-1.0</u>
– Total	45-50	4.5-5.0
– Value at \$4/tCO ₂ e	\$180-\$200	\$18-\$20

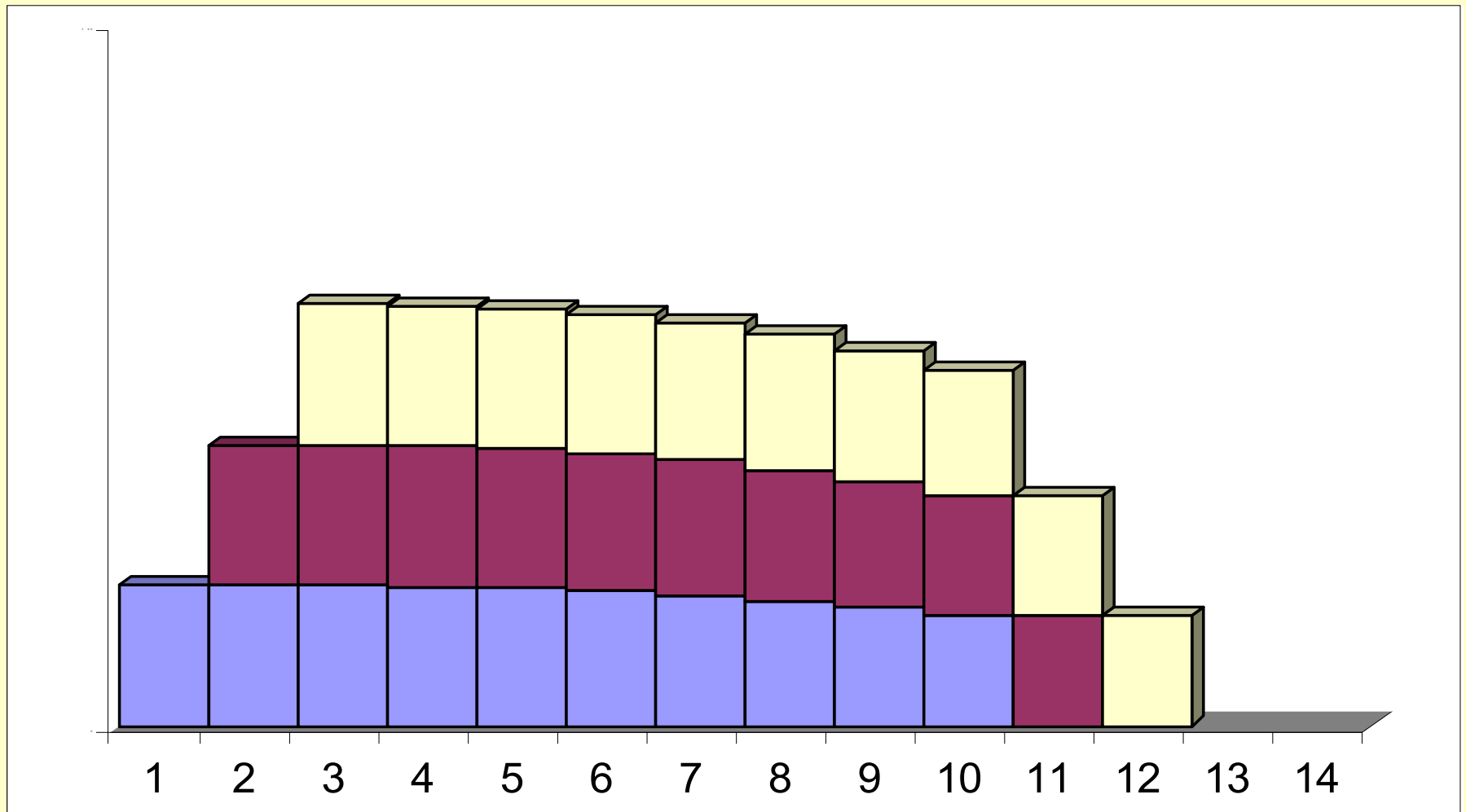
Impact on Biomass



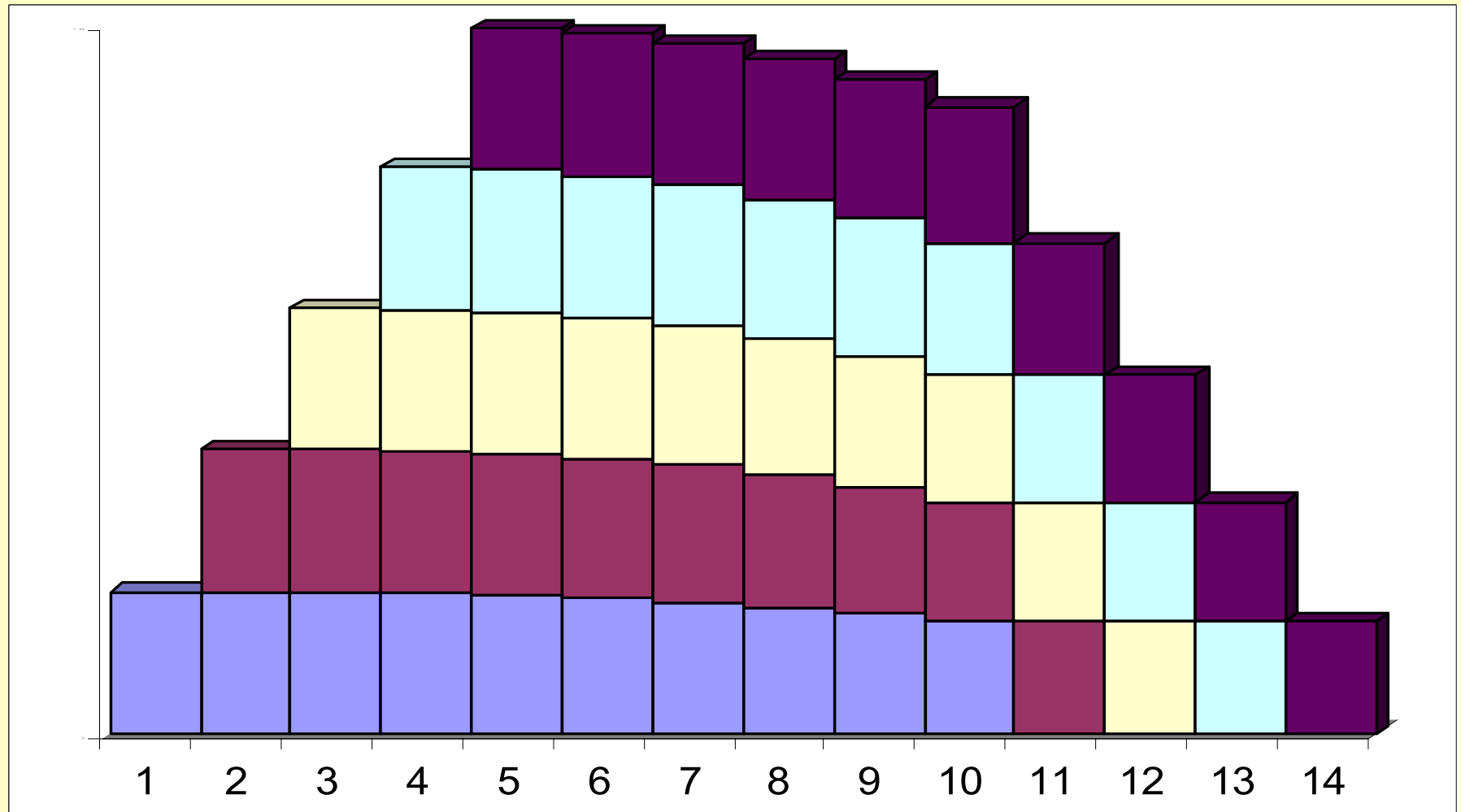
Impact on Biomass



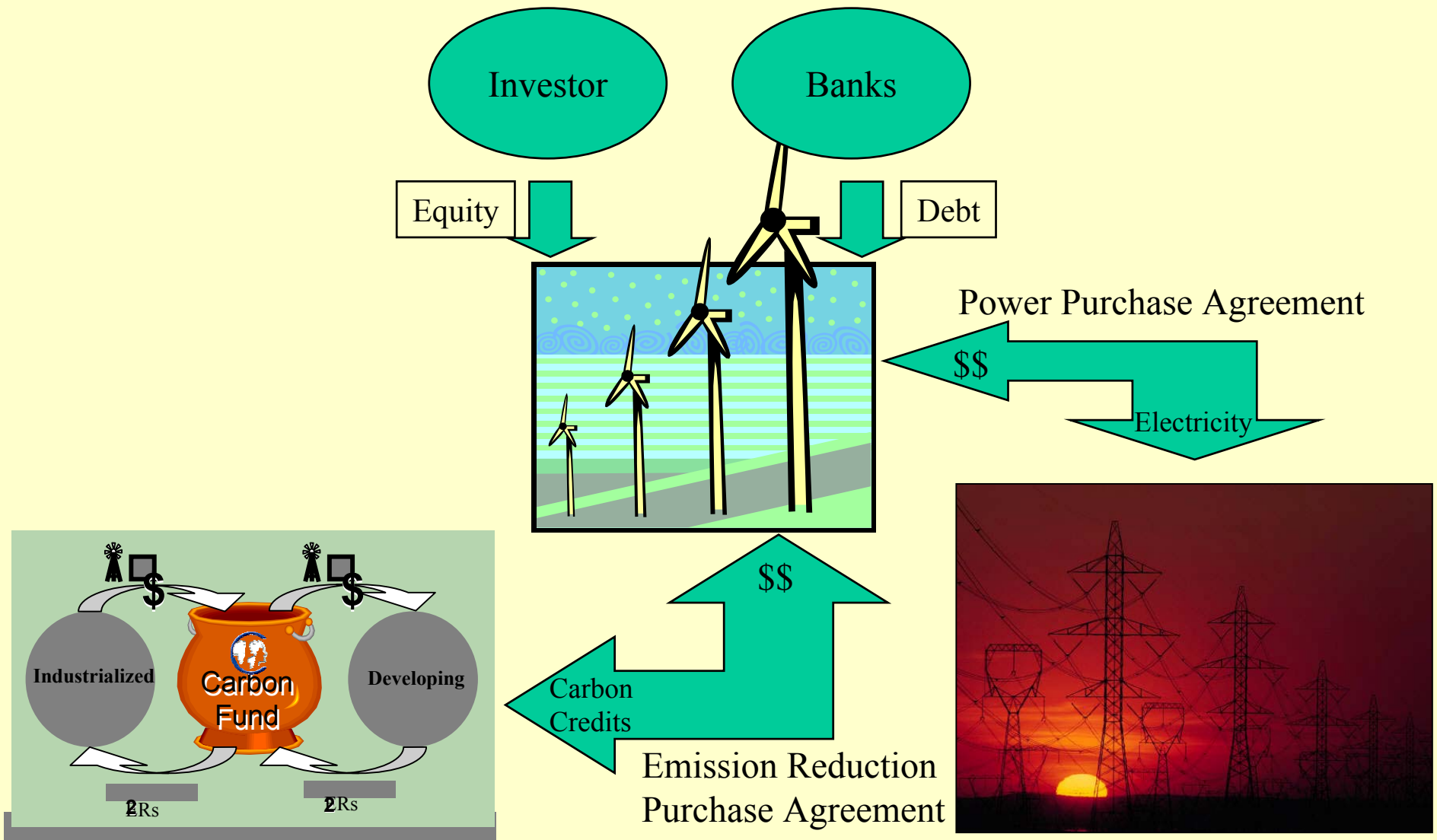
Impact on Biomass



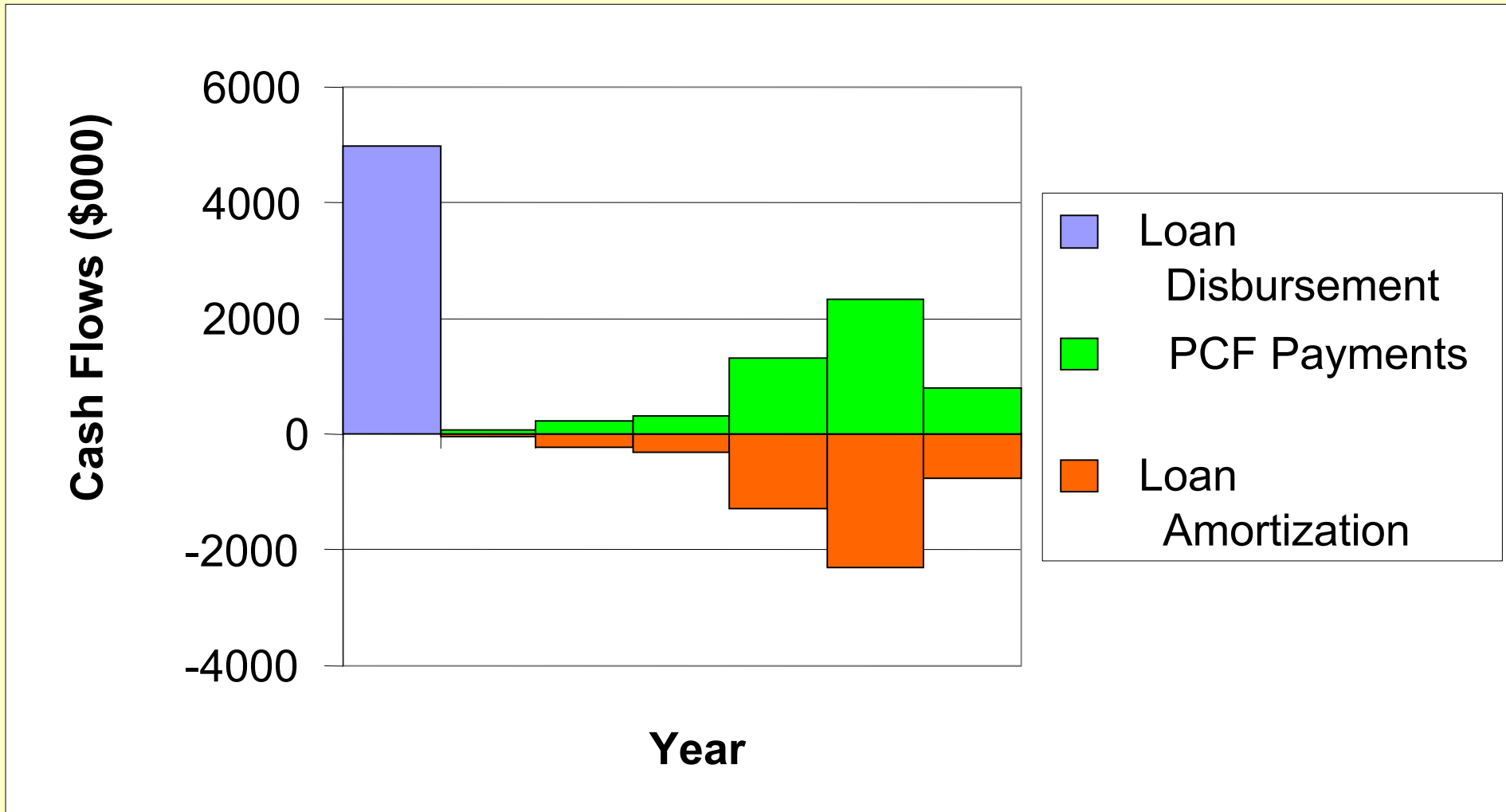
Impact on Biomass



Nature of Carbon Financing Contract

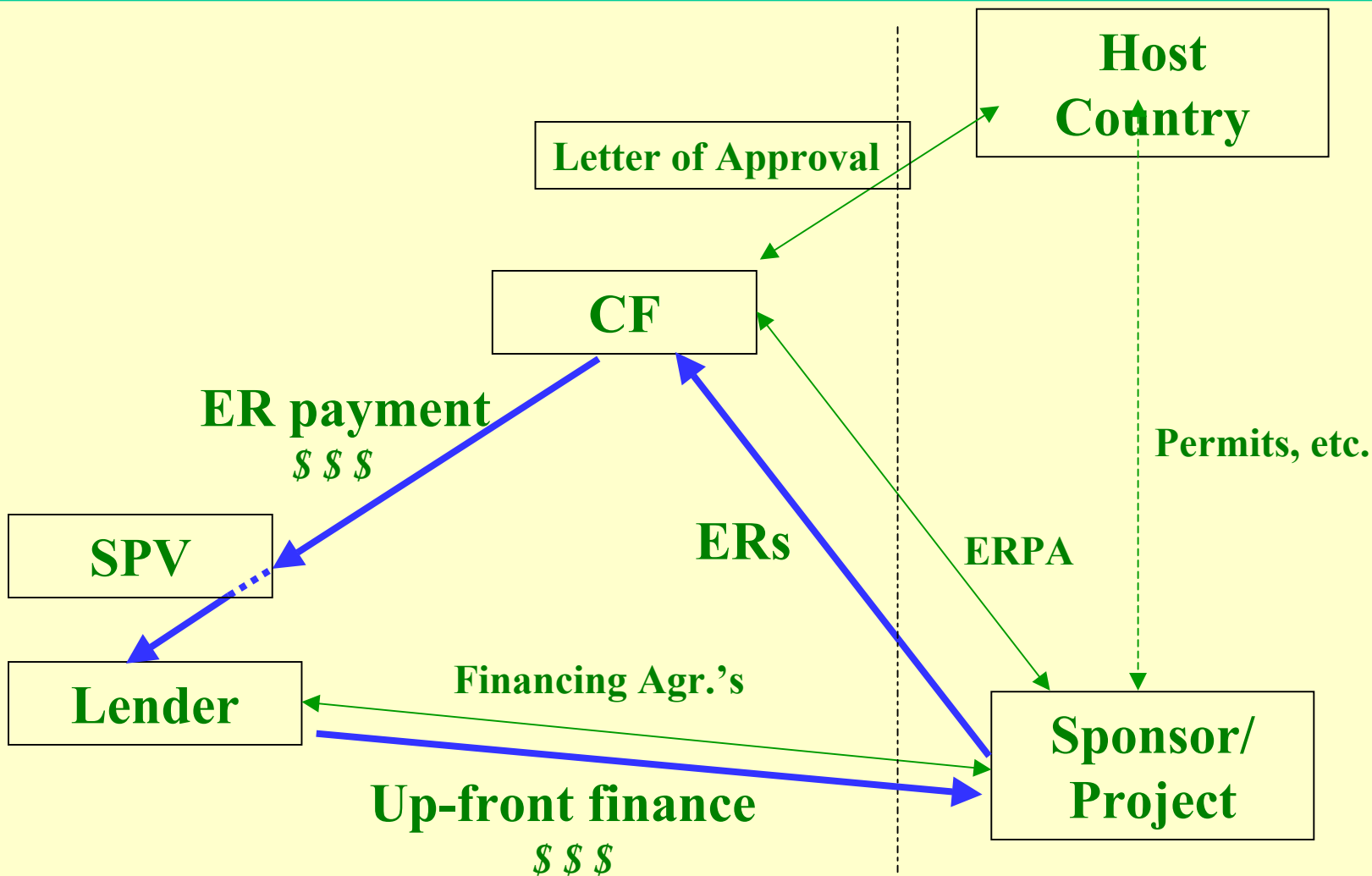


Brazil Plantar Sust. Fuelwood



ER payments are used to amortize commercial loan.

Carbon Transaction Structure



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