



# Carbon Finance in Oil & Gas

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Carbon Finance Business  
The World Bank

**Methane to Markets Ministerial Meeting**  
Washington, DC, November 15, 2004

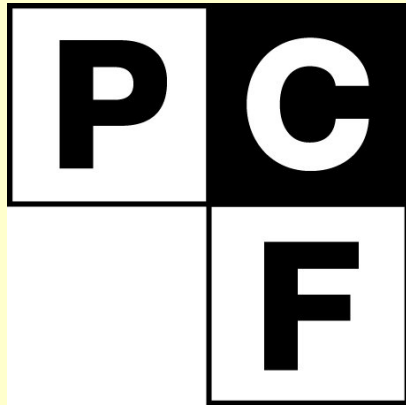


# Outline

- **Impact of carbon finance**
- **Securing financing**



# World Bank Carbon Funds



Netherlands  
Facilities



*BioCarbon Fund*

\$470m to date; \$290m in process for 2 new funds



# Impact of Carbon Finance

- Emission reductions are calculated relative to a **baseline**
- Key elements:
  - CO<sub>2</sub> reduced by displacing **fossil fuels**
  - Mitigation of **methane, nitrous oxide**, other GHGs
- Impact depends on technology, ER price
- Price depends on:
  - Risk and risk-sharing
  - Supply and demand within market segment



# Impact by Technology

Energy Sector	Fossil fuel displacement	Methane mitigation
Renewables	✓	
Energy efficiency	✓	
Biomass cogeneration	✓	( ✓ )
Gas flaring reduction	✓	
Gas venting reduction	( ✓ )	✓
Coalmine methane	( ✓ )	✓
Landfill gas (to energy)	( ✓ )	✓



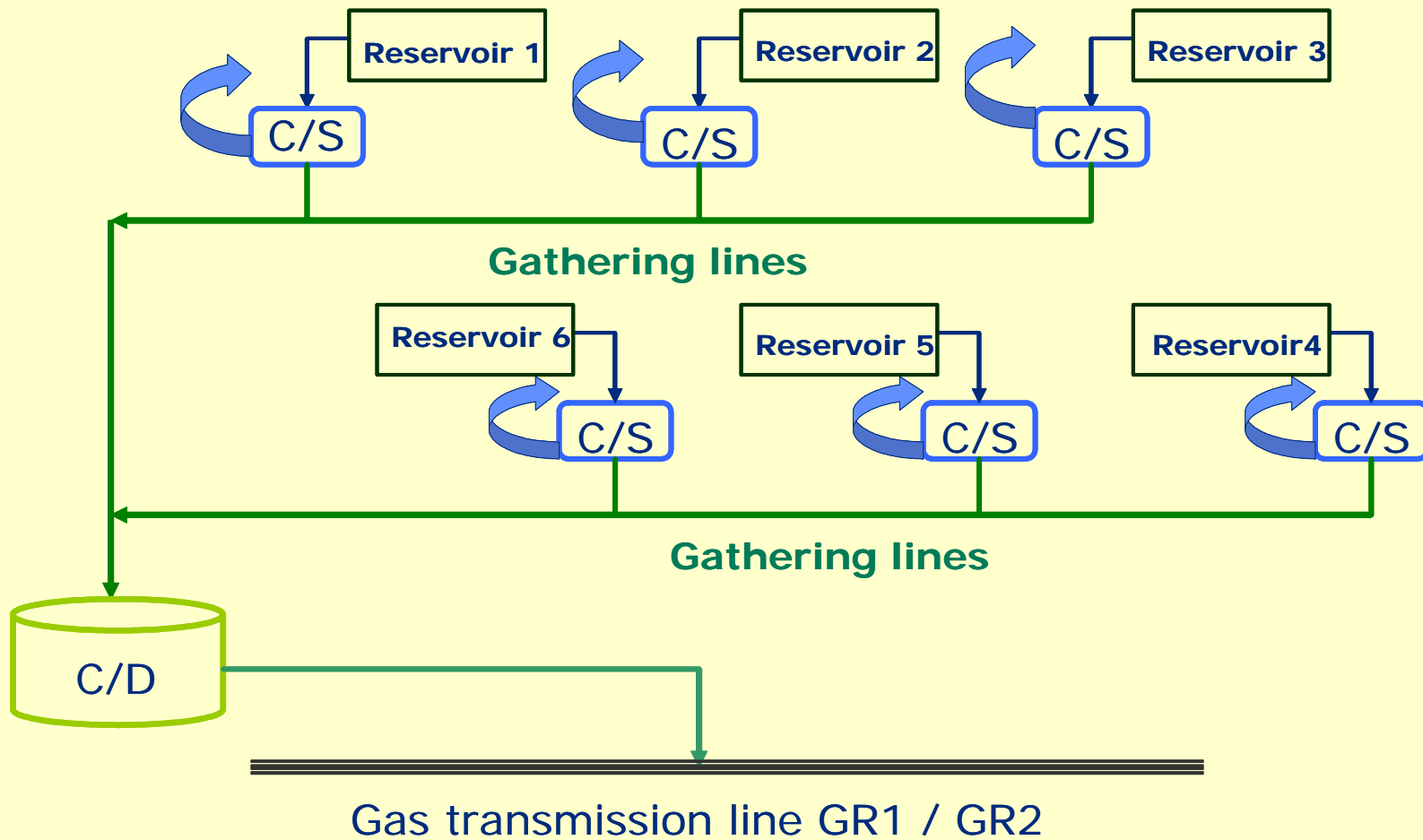
# Fossil Fuel Displacement

<b>Fuel Displaced</b>	<b>Generic Emissions Factor (tCO<sub>2</sub>e/MWh)</b>	<b>Carbon Revenue at US\$4/tCO<sub>2</sub>e (US\$/MWh)</b>
Gas	0.40	\$1.60
Coal	0.85-1.0	\$3.40-\$4.00
Diesel	0.75-1.50	\$3.00-\$6.00

***ER cash flows improve IRRs by 0.5 – 3.0%***



# Gas Flare Reduction



C/D: dehydration unit

C/S: compression facilities



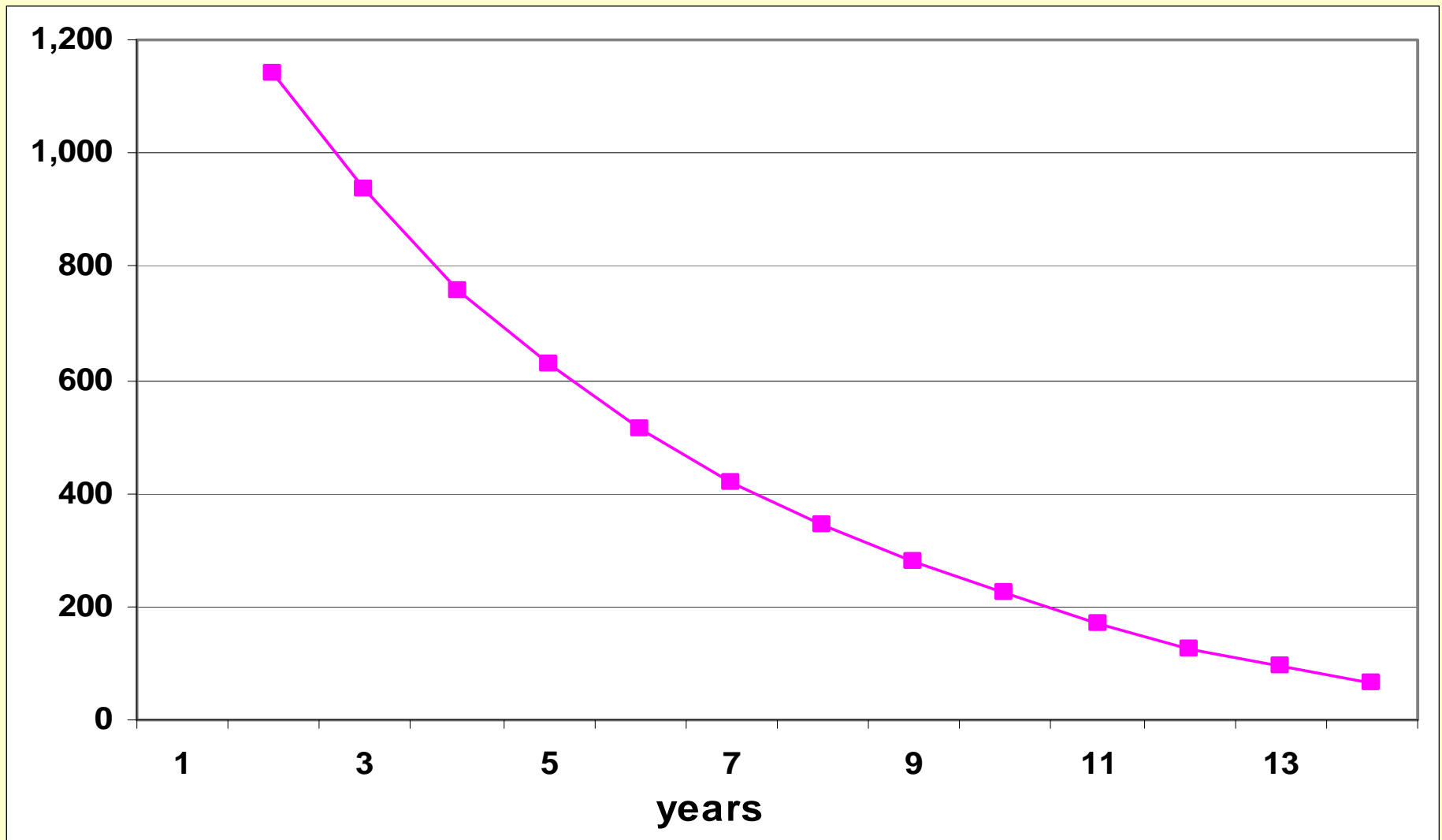
# Gas Flare Reduction: Sample Project

- \$25m cost
- 14 year useful life (tailing off production)
- Baseline: Project would displace gas in pipeline
- Additionality: Investment does not meet sponsor's hurdle rates





# Gas Flare Reduction: Sample Project





# Methane Mitigation

	Carbon Revenue* (methane only)	
	US\$/tcm CH4	US\$/MWh
Biomass cogen, landfill methane	up to \$60	up to \$16
Venting reduction, coalmine methane	up to \$52	up to \$14

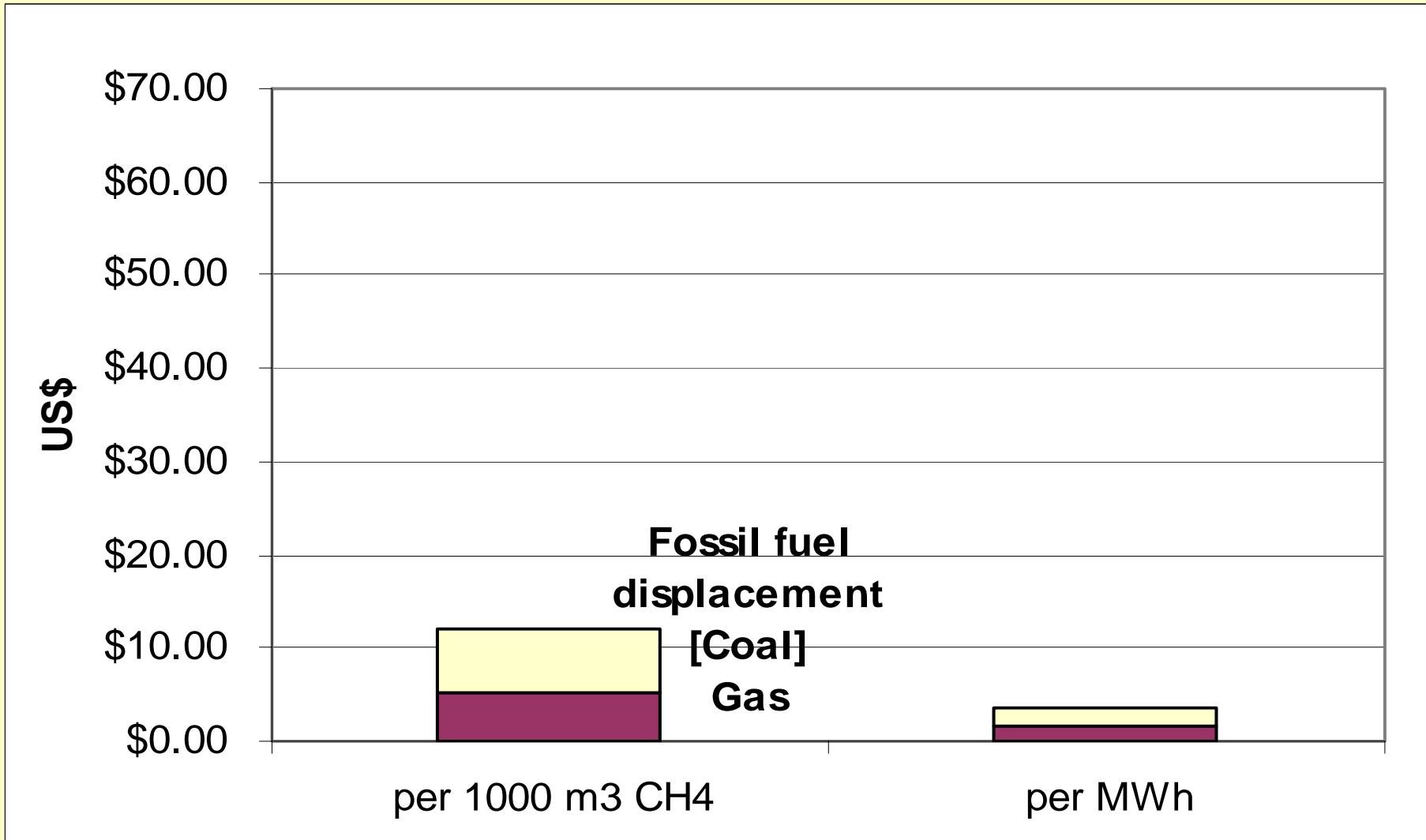
***Impact on IRR can be >15 percentage points***

\* at US\$4/tCO<sub>2</sub>e



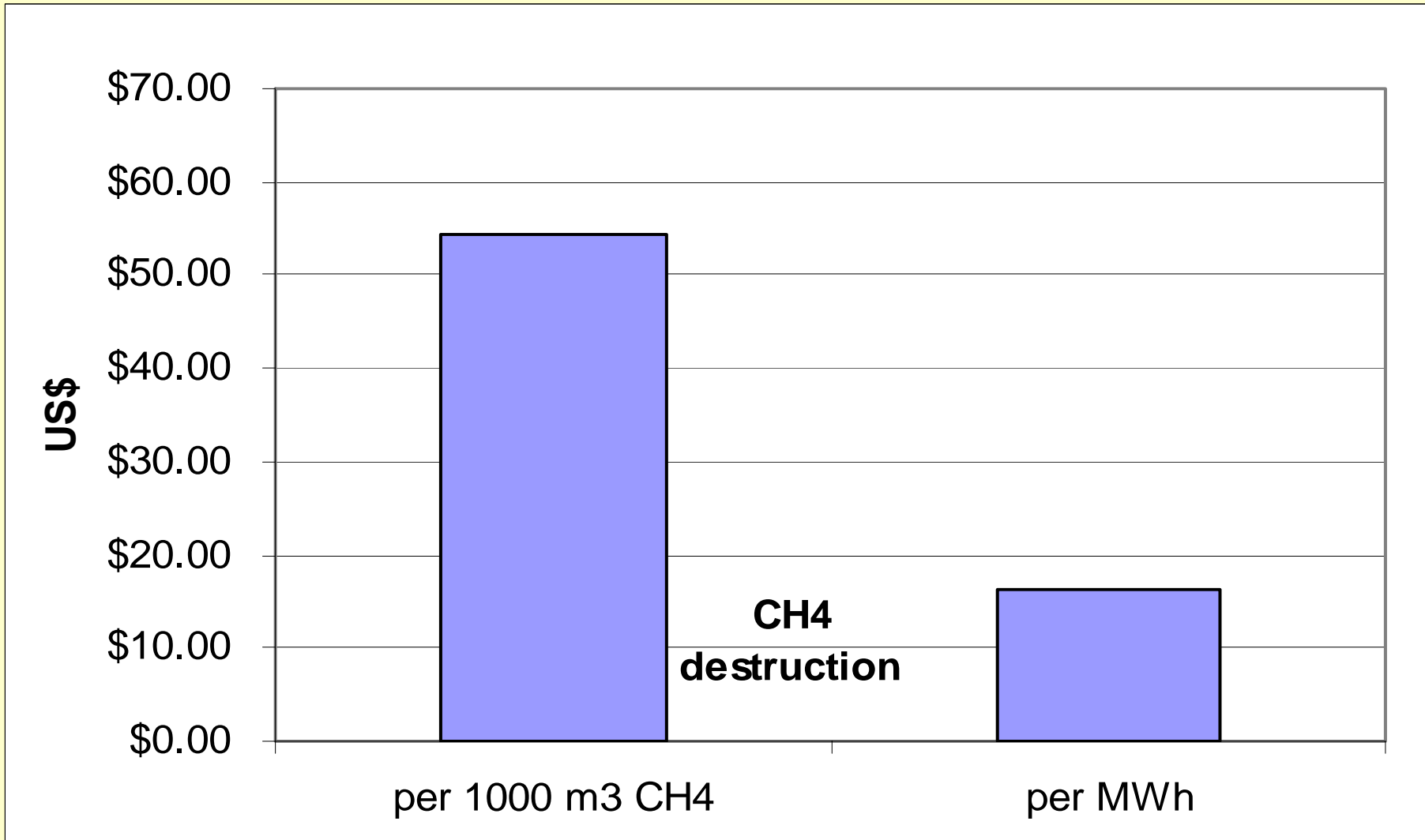
# Impact for *Flaring* Reduction

\$4/tCO<sub>2</sub>e



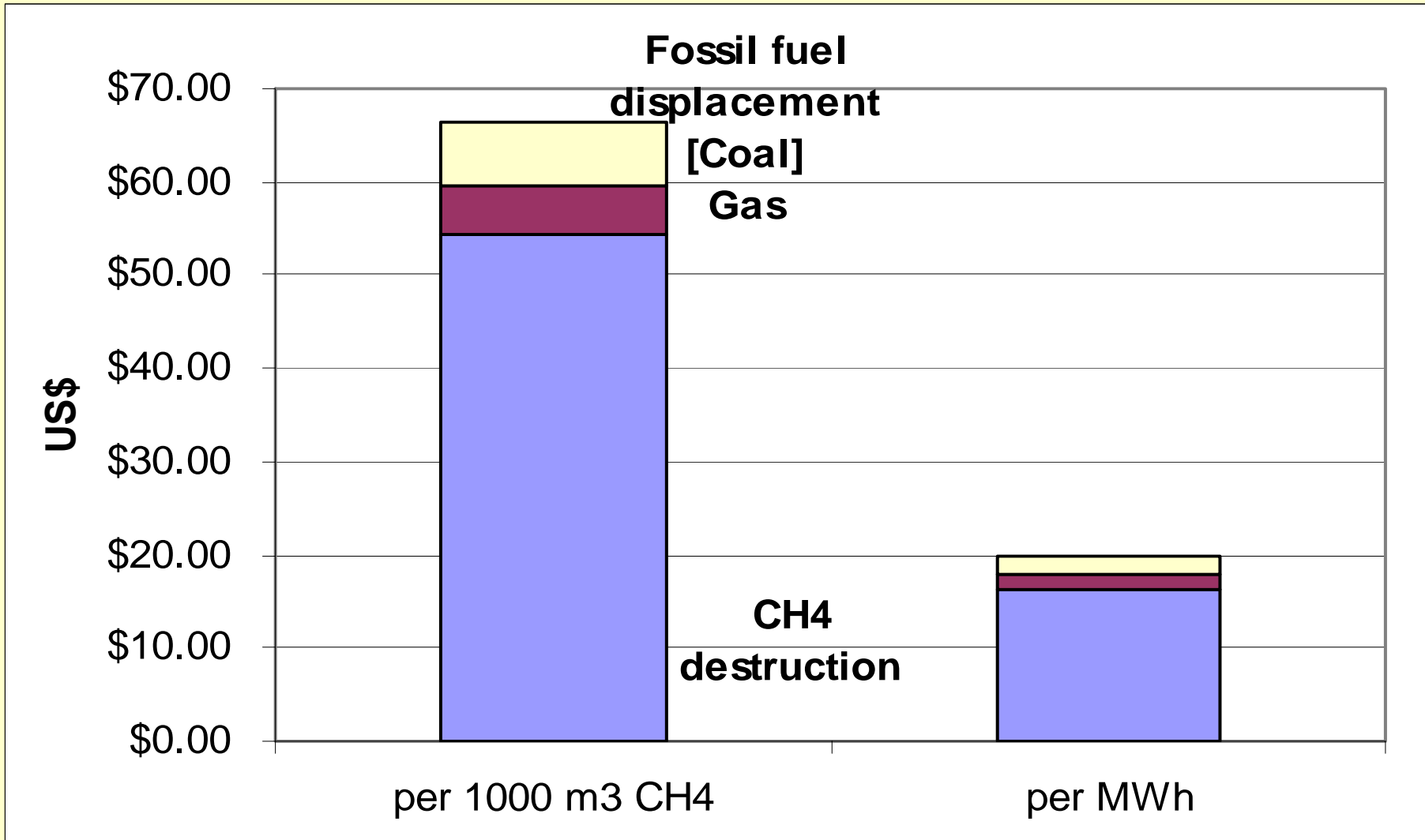


# Impact for *Venting* Reduction (flaring only), \$4/tCO<sub>2</sub>e





# Impact for *Venting* Reduction (commercial use), \$4/tCO<sub>2</sub>e



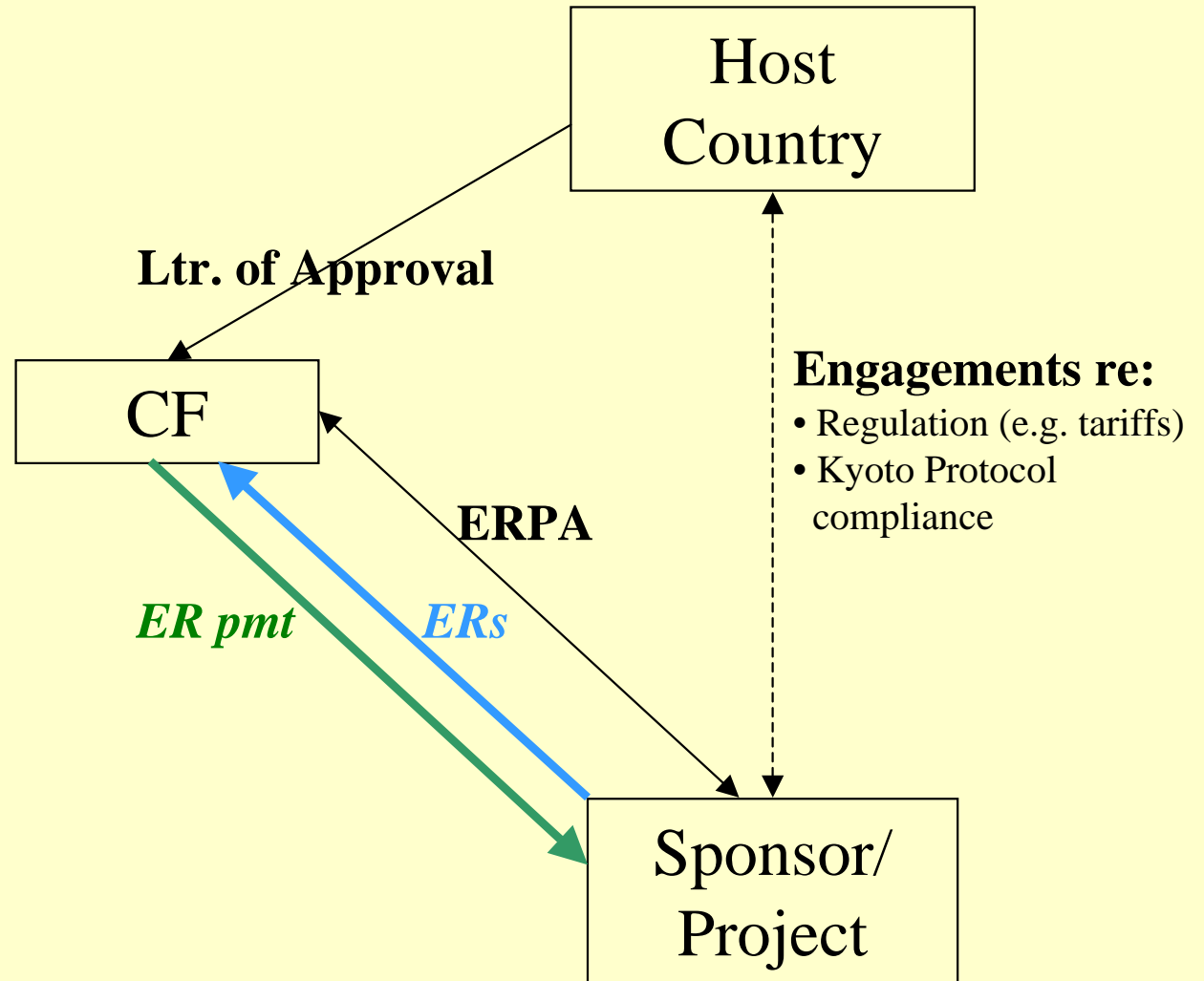


# Impact of Carbon Finance

- Revenue boost
  - \$3 to \$5 per MWh for renewables, EE
  - Up to \$20 per MWh /\$60/tcm for CH<sub>4</sub> mitigation
- High quality cash flow
  - OECD - sourced
  - Investment-grade payor
  - \$- or - denominated
    - Eliminate FX risk
    - Financial engineering helps tap capital

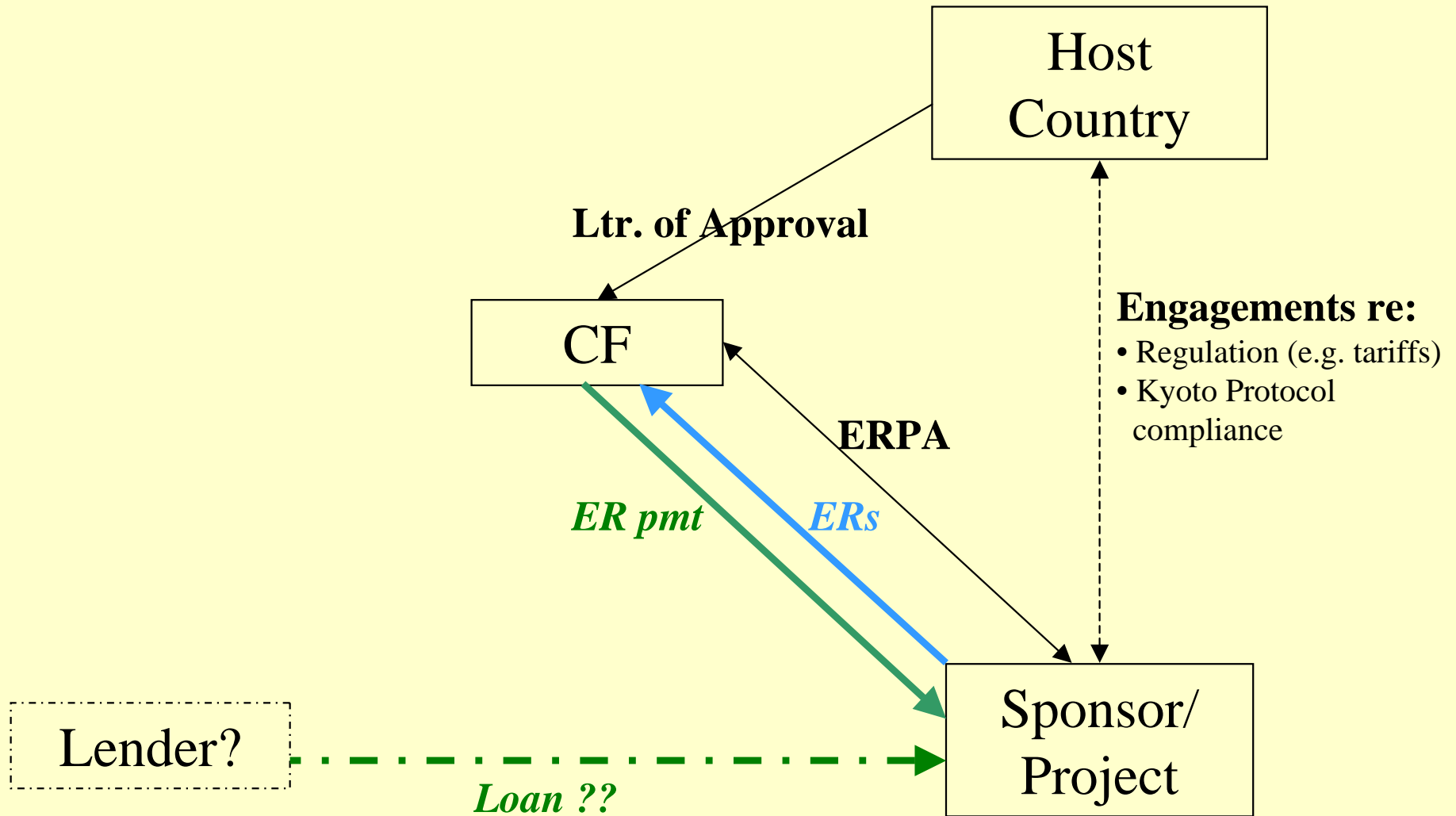


# Securing Underlying Finance





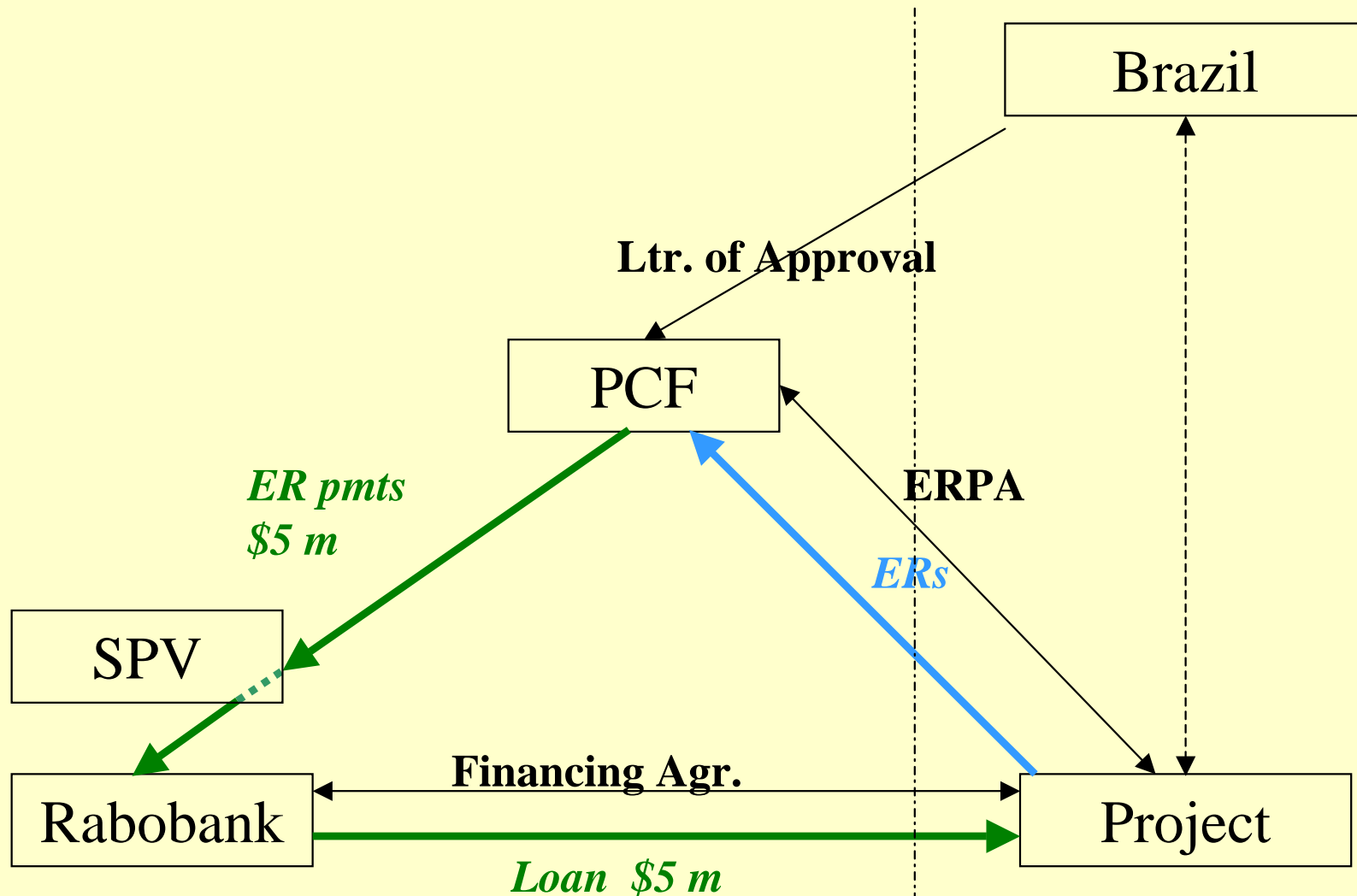
# Securing Underlying Finance







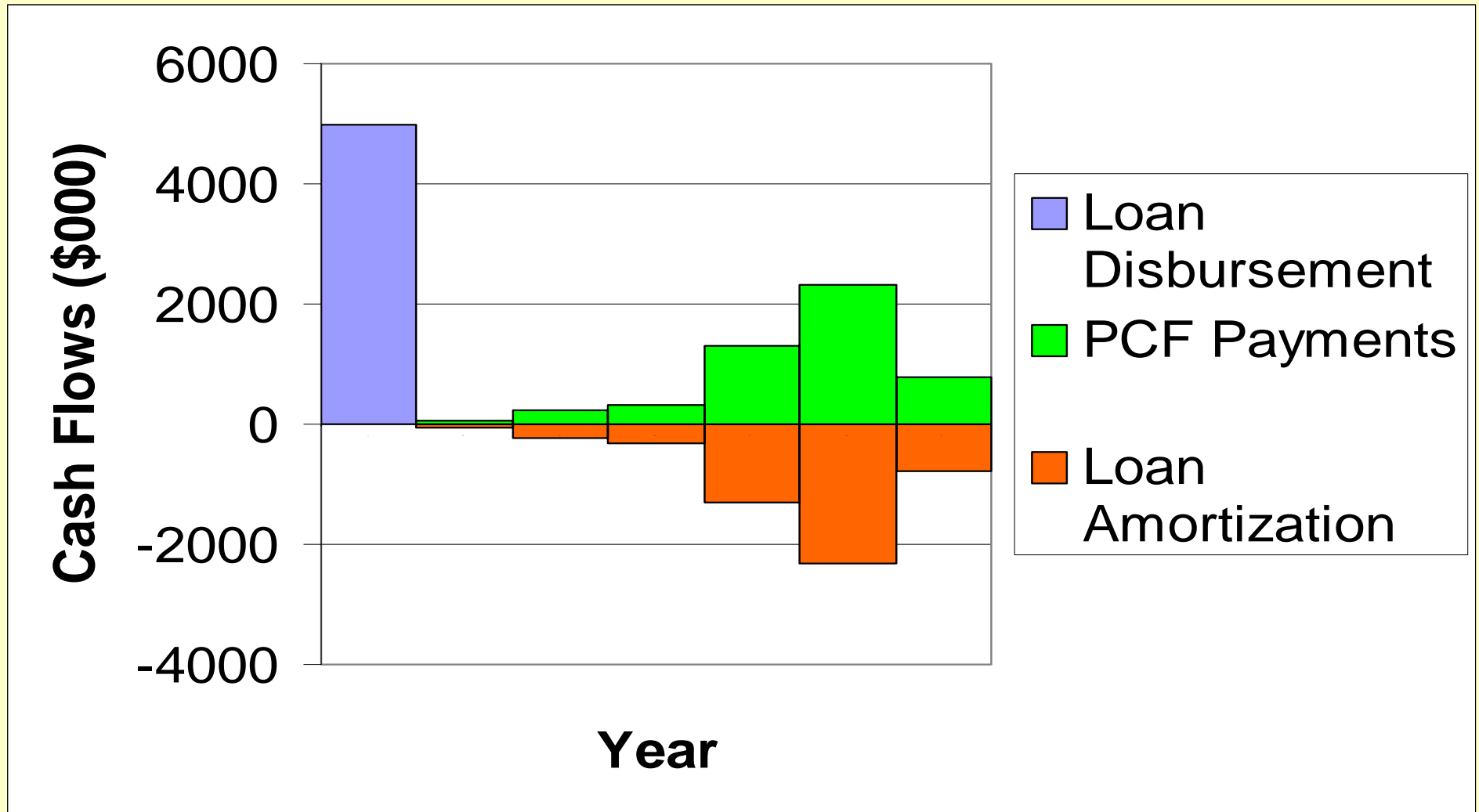
# Future flow structure: Plantar



*ER payments placed in offshore escrow*



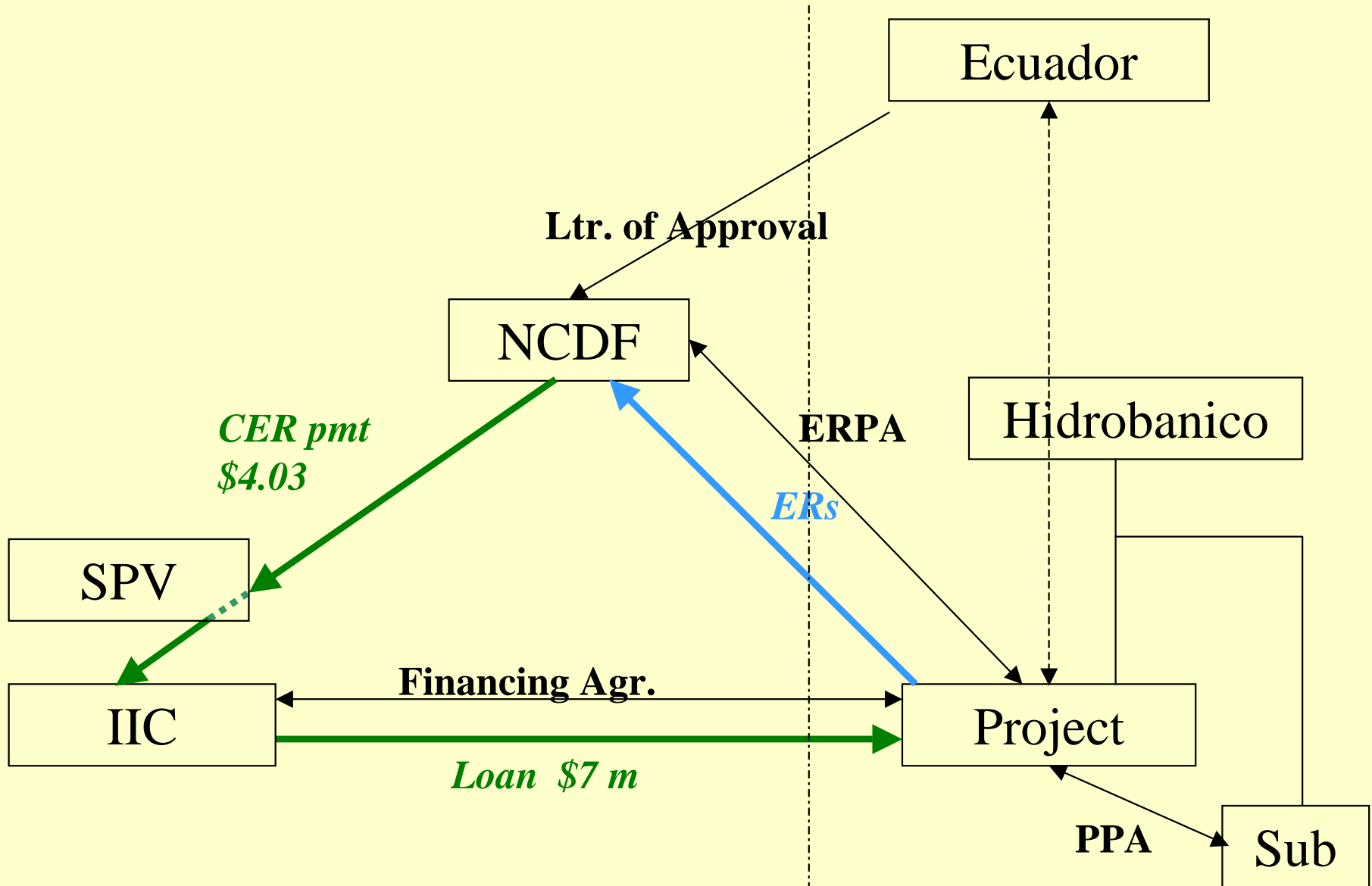
# Brazil Plantar Sust. Fuelwood



*ER payments amortized 100% of commercial loan principal*



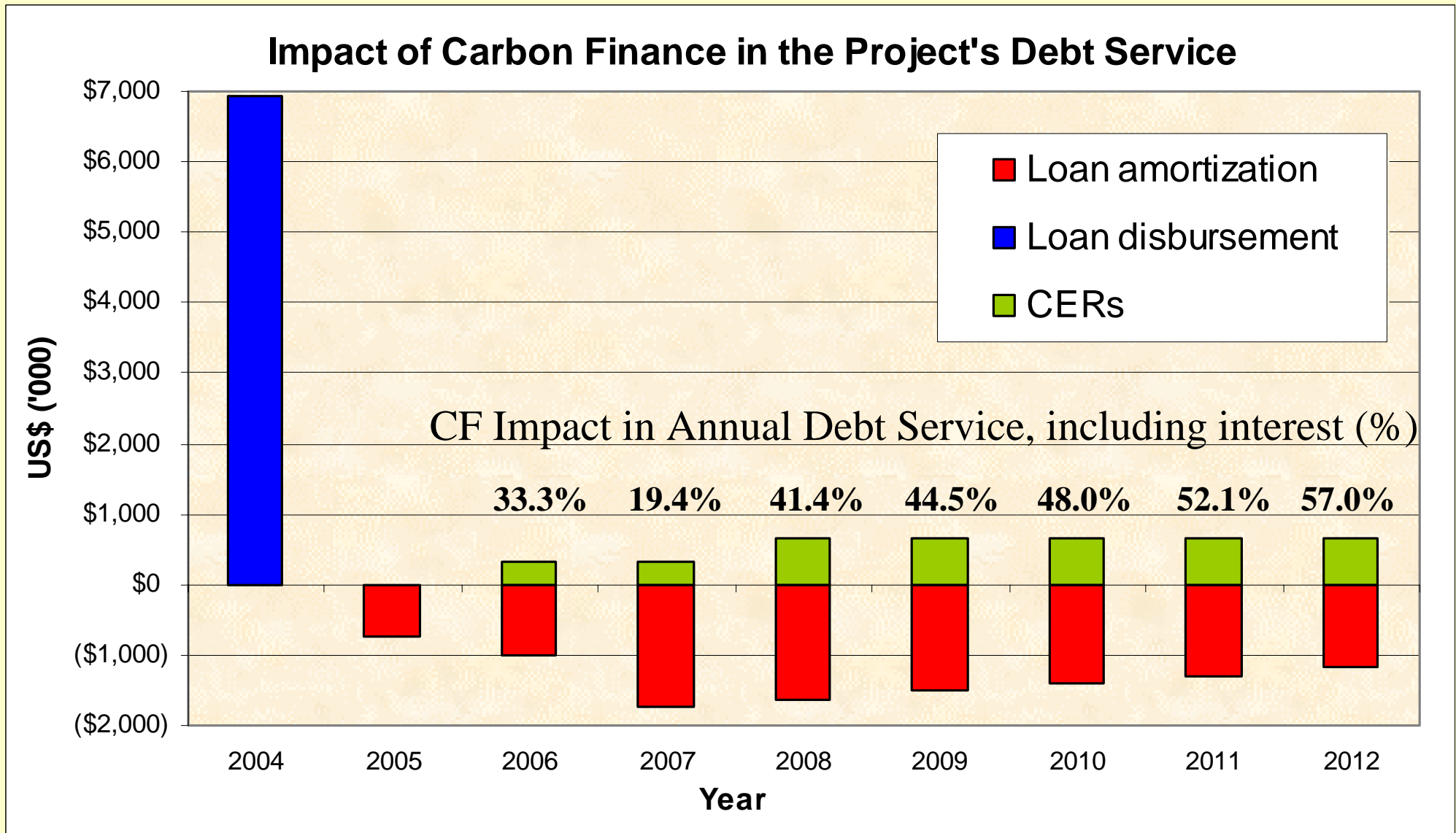
# Future flow structure: Abanico



*CER payments placed in offshore escrow*



# Abanico Cash Flows



*CER payments helped project meet IIC's investment criteria*



# Abanico Project

- Carbon finance enabled project to:
    - Meet IIC's investment criteria
    - Lower interest rate by 100 bp
    - Expedite financial closure
- ...In one of L. America's riskiest countries



# Conclusions

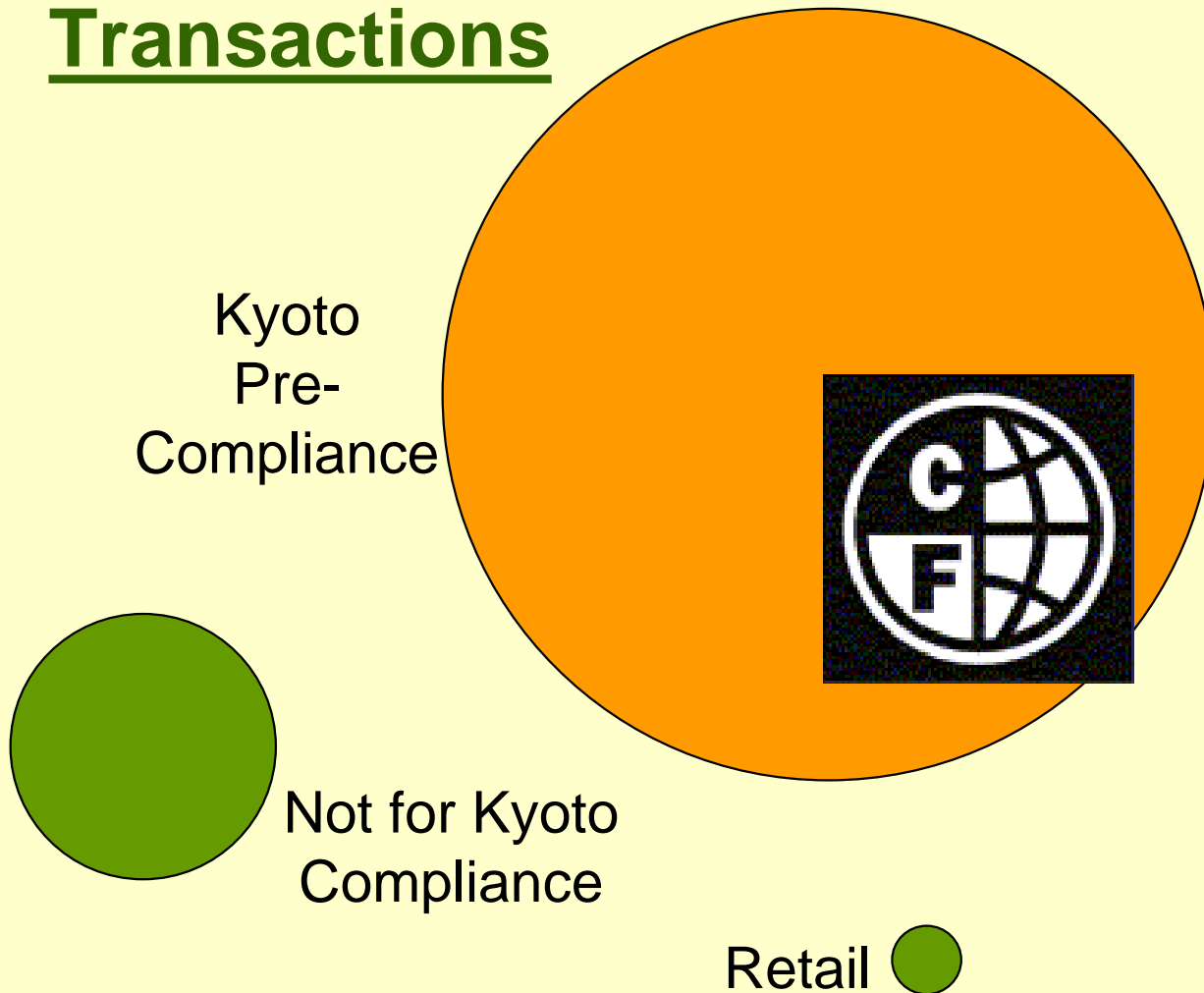
- Carbon finance:
  - ⇒ Lowers compliance costs
  - ⇒ Improves returns on climate-friendly projects
  - ⇒ Provides a bankable revenue stream
  - ⇒ Is taking off: Kyoto enters into force 1/4/05
- World Bank Group's role
  - ⇒ Support sustainable development in client countries
  - ⇒ Prepare the ground for the private sector
  - ⇒ Facilitate carbon market development



# Carbon Market Structure

## Project-Based Transactions

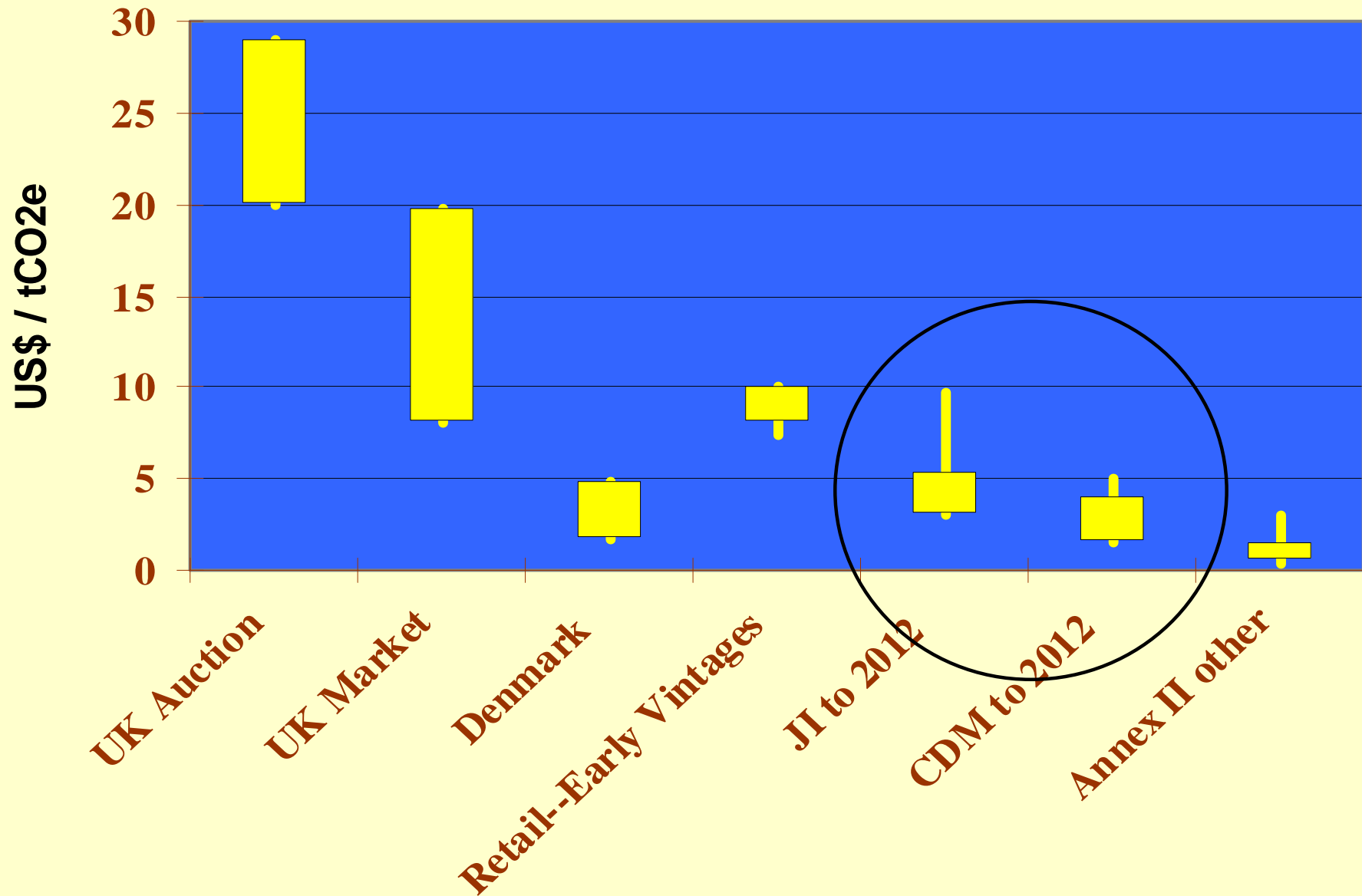
## Allowance Markets



- UK Emission Trading Scheme
- EU Emission Trading Scheme
- Chicago Climate Exchange
- New South Wales Certificates



# Carbon Prices



*Source: PCF estimates, based on database assembled with Natsource, Co2e.com and PointCarbon*





# Kyoto Protocol

- UN Framework Convention on Climate Change
- Industrialized countries (except US, Australia) commit to reduce GHG emissions by 5.2% on average in 2008-12 (vs. 1990)
- Target can be met by:
  - Reducing emissions: CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, SF<sub>6</sub>
  - CO<sub>2</sub> “sequestration” via land use change and forestry
  - Purchasing ERs from other ratifying countries
    - “Joint Implementation” – Industrialized countries (EEur, FSU)
    - “Clean Development Mechanism” – Developing countries
    - “International Emissions Trading”
- Enters into force on 1/4/05

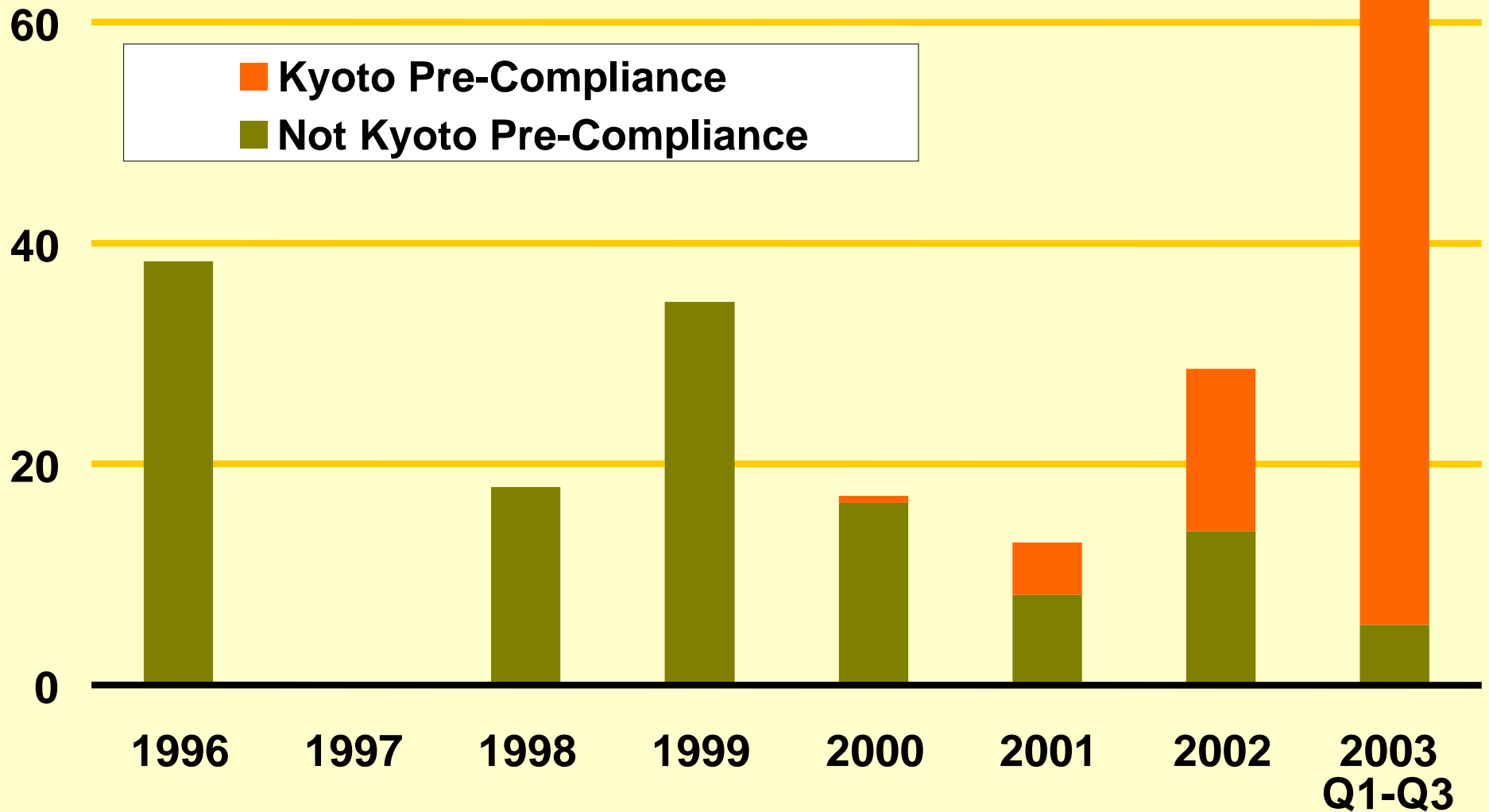


# Kyoto Compliance Market

- Internalizes the climate externality (partly)
  - “Polluter pays” principle
  - Modeled on US SO<sub>2</sub>, NO<sub>x</sub> market (Bush 41)
- Free trade lowers the cost of compliance:
  - OECD: \$25-150 per tonne CO<sub>2</sub>e (marginal abatement cost)
  - LDCs: <\$5 / tCO<sub>2</sub>e
- OECD shortfall of ~ 2.8-4.8 billion tCO<sub>2</sub>equiv.
- Funds established to diversify risk, share cost
- World Bank involvement: jump-start market, disseminate lessons, catalyze LDC investment



# Traded Volumes



Volume traded in project-based transactions, m tCO<sub>2</sub>e