Emissions Trading Simulation

Markets by ChoiceResults by Design

Questions?

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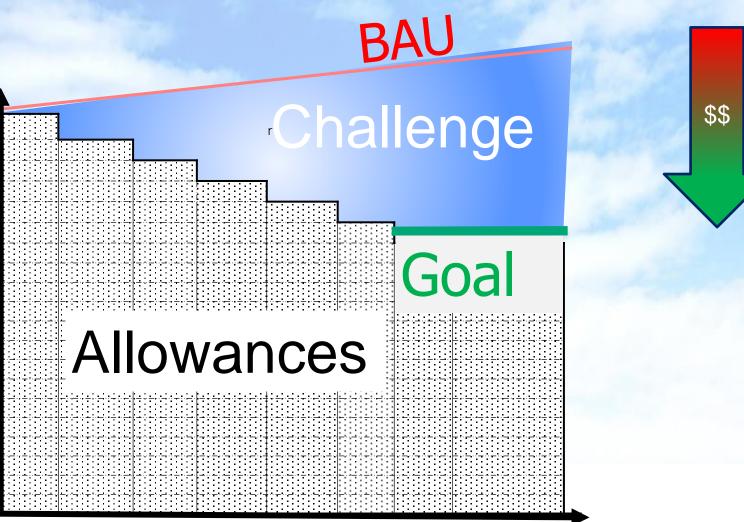
 China, Korea, Vietnam, Thailand, Japan, India, US, Dominican Republic, Colombia, Brazil, Mexico, Chile, Europe, Wharton, Lewis & Clark, Duke, Yale, Columbia, UCSB Bren, UC Santa Cruz, Georgia Tech, Northeastern, Newcastle Law, Universidad Jesuita de Guadalajara, Universidad de los Andes, University of Queensland, Vrije Universiteit Amsterdam, Saint Ignatius, Pacific Collegiate School

LET THE GAMES BEGIN!



Each team will manage a company participating in the emissions trading system. Objective: Comply at lowest cost.





Time

Emissions

Choices

Control

Auction

Exchange

552<u>5.</u>|L

Why Simulations?

Simulations can:

- Improve stakeholder ETS literacy
- Build capacity
- Build support for the policy / reduce opposition from stakeholders
- Facilitate the testing of design options
- Reduce ETS roll-out time

Caution - Simulations:

- Provide a simplified model
- May not accurately predict real-life ETS



KEY MESSAGES

Carbon market simulations are programs, models, virtual environments, and/or games that allow stakeholders to participate in a fictitious process of designing or participating in an emissions trading system (ETS).

Simulations can increase carbon pricing literacy and build support for the policy among stakeholders, helping to pave the way for an ETS roll-out. Later, once a government has decided to implement an ETS, simulations can help test design options, engage stakeholders and deepen knowledge on carbon markets.

However, simulations only provide a simplified model of a carbon market. Care should be taken with the results of any simulation exercise as they may not accurately predict how an ETS would play out in real life.

SUMMARY

An emissions trading system (ETS) is a market-based policy that mandates emissions reductions (through setting a cap) and provides covered entities with the flexibility to select the specific means to achieve the goal. By putting a price on carbon through an ETS, companies are incentrizzed to pursue the most cost-effective solutions and the overall environmental goal is achieved.

Worldwide, interest in carbon pricing and ETSs as key options for ambitious climate action is increasing and important lessons can be learned from their implementation in different contexts. In countries newly considering an ETS, however, simulations can be a useful tool to assist both policymakers and businesses to prepare for emissions trading.



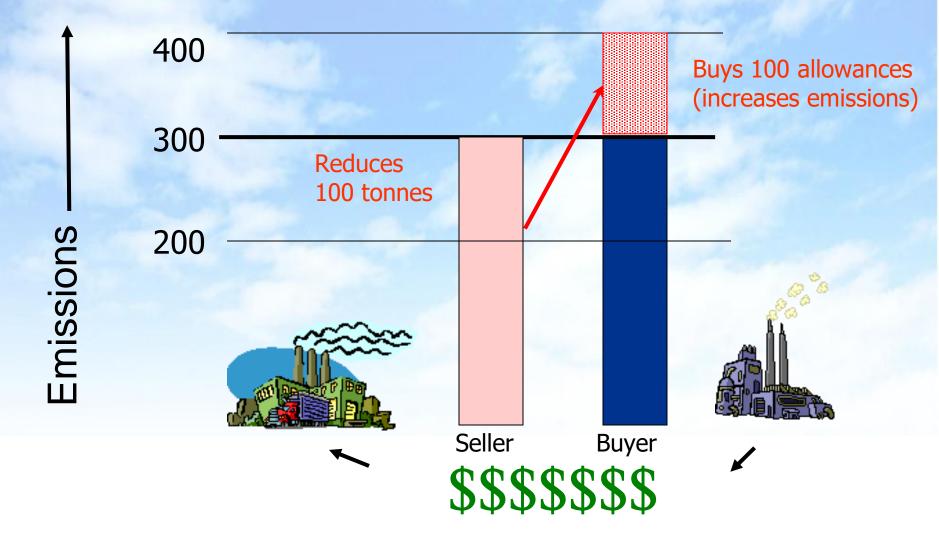
World Bank Simulation Report

Key terms

- Emissions cap
- Emissions trading/cap and trade
- Goals
- Compliance obligation
- Compliance instruments
 - Emission allowances
 - Emissions offsets
- Allocation
- Business as usual emissions
- Long/short position
- Marginal abatement control cost curves
- Auction market (primary market)
- Emissions exchange market (secondary market)
- Over-the-counter (OTC) trading market (secondary market)
- Compliance vs voluntary market

ETS Basics – The Cap

ETS Basics - Trade

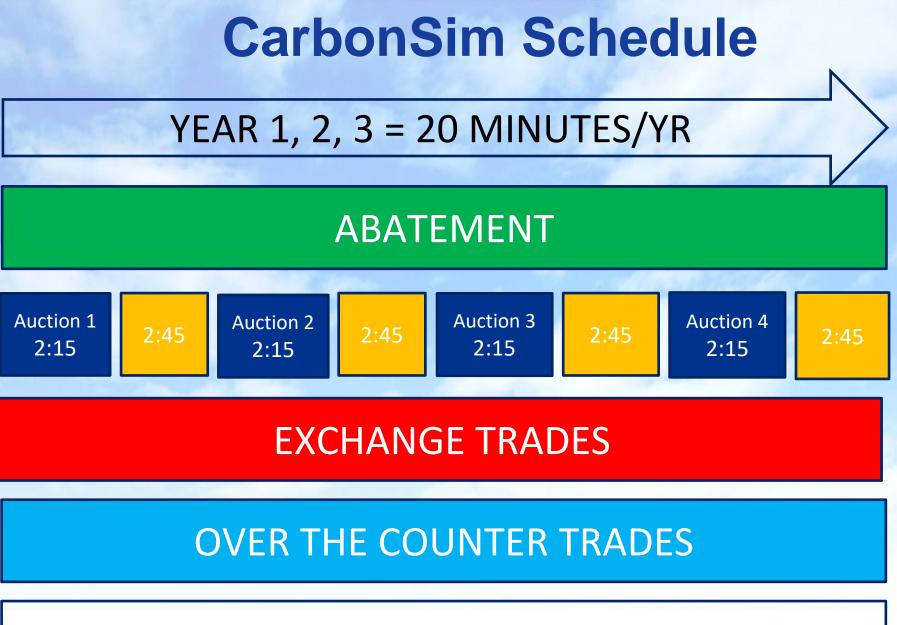


Why simulation? Decisions have outcomes



Better to be in the Kitchen than on the Menu





DISCUSSION – QUESTIONS – LESSONS LEARNED

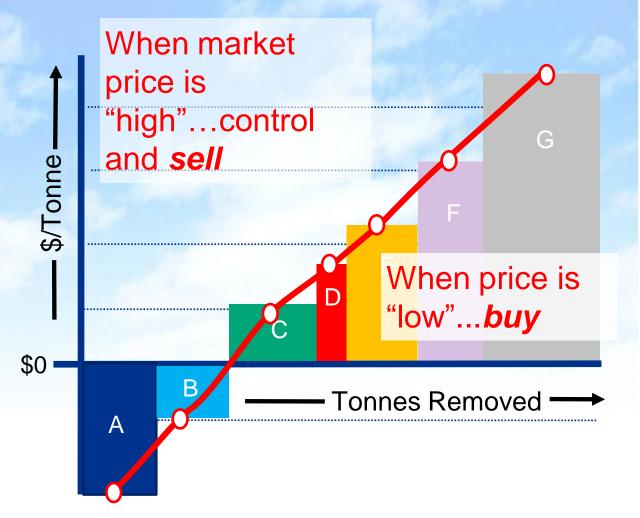
ETS Basics - Control, Buy, or Sell?

Marginal Abatement Control Cost Curve

- On-site controls
- No need to trade
- Build time

Control

• Irreversible





- Sealed bid
- Uniform price
- Price and quantity
- Multiple bids OK
- Winners pay same
- Clearing price = last
 fill
- Low bids don't trade

					Sold
		87.34	42.38		125,000
		125,00	@ \$45		
	Bids	Price (\$/ton)	Quantity (tons)	Aggregate Demand	
	E	60	15,000	15,000	15,00
	A	59	10,000	25,000	+ 10,000
	В	58	10,000	35,000	+ 10,000
	D	55	20,000	55,000	+ 20,000 + 20,000
	E	50	20,000	75,000	+ 20,000
	A	49	20,000	95,000	+ 5,000
	С	47	5,000	100,000	+ 25,000
	E	45	25,000	125,000	= 125,000
/	D	39	10,000	135,000	
	В	37	25,000	160,000	N
	A	35	40,000	200,000	
	С	30	20,000	220,000	$\sqrt{0}$



- Multiple buyers, sellers
- Inside bid & offer
- Market depth
- Recent trades
- Anytime*
- Market, limit, stop loss, partial fill orders

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Inside Market
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	-
Last 1	Irade
LUJU	Iuac

Exchange								
Current Market			Last 10 Trades					
	Tonnes	Price/ton	Time	Price/ton	Tors			
↑	30,000	48.90	14.42.10	45.12	10,000			
I	60,000	48.00	14.41.00	45.12	10,000			
И С	10,000	46.10	14.38.22	45.40	20,000			
	5,000	45.25	14.38.01	46.00	15,000			
	25,000	45.10	14.37.45	46.25	20,000			
U	15,000	45.00	14.36.22	47.00	5,000			
ΥN	35,009	43.90	14.35.33	47.25	25,000			
BU	15,000	42.10	14.32.52	48.00	10,000			
	5,000	42.00	14.10.05	48.10	25,000			
	42,000	41.75	14.01.34	48.00	40,000			



Market Order

Limit Order

Stop Loss Order

Partial Fill Order

Immediate or Cancel Purchase or sell specific quantity **at the then current market price**.

Set a **minimum sell price** or a **maximum buy price**. Order will only be cleared if the limit price is reached.

Order will be cleared once the market price reaches the specified level. Sellers (Buyers) can protect their position if the market falls (rises) beyond the order price.

Order can be filled if less than the entire volume can be sold/bought.

('Fill or Kill'): An order to buy or sell a specified number of units that is immediate filled. If the order cannot be immediately filled, it is automatically cancelled (killed).



Single buyer, seller
Product, price, volume
Anytime*

ETS parameters

Сар	355,850,000
Duration	3 years <i>(20 – 30 mins)</i>
Enterprises	242 (~21 humans and 221 AI bots)
Reduction target	9% (3%/year)
Share of free allowances	90%
Economic/emissions growth	2 – 6%/year
Banking limit	100% compliance obligation
Maximum offset use	10% compliance obligation
Auction - Schedule - Duration - Price floor / ceiling - Vintages	4 per year 45% of the year <mark>\$100 / \$300</mark> Current + future years
Penalty (per missing EA)	\$300 + 1 Allowance
Exchange volatility management	10%

To Win... Do Well

- Comply
- Manage (reduce) cost of control
- Abate early
- Participate in all markets throughout the sim
- Try posting two-way markets
- Manage 'long' / 'short' positions
- Orders good 'til cancelled
- Wandering fingers enter once be patient
- Choices (and inaction) have consequences

What if....?

- Policy scenarios
- Term
- Banking
- Auction price collars
- Penalties
- Limitations
- Linking

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