

Emissions Trading Simulation

*Markets by Choice
....Results by Design*



Questions?

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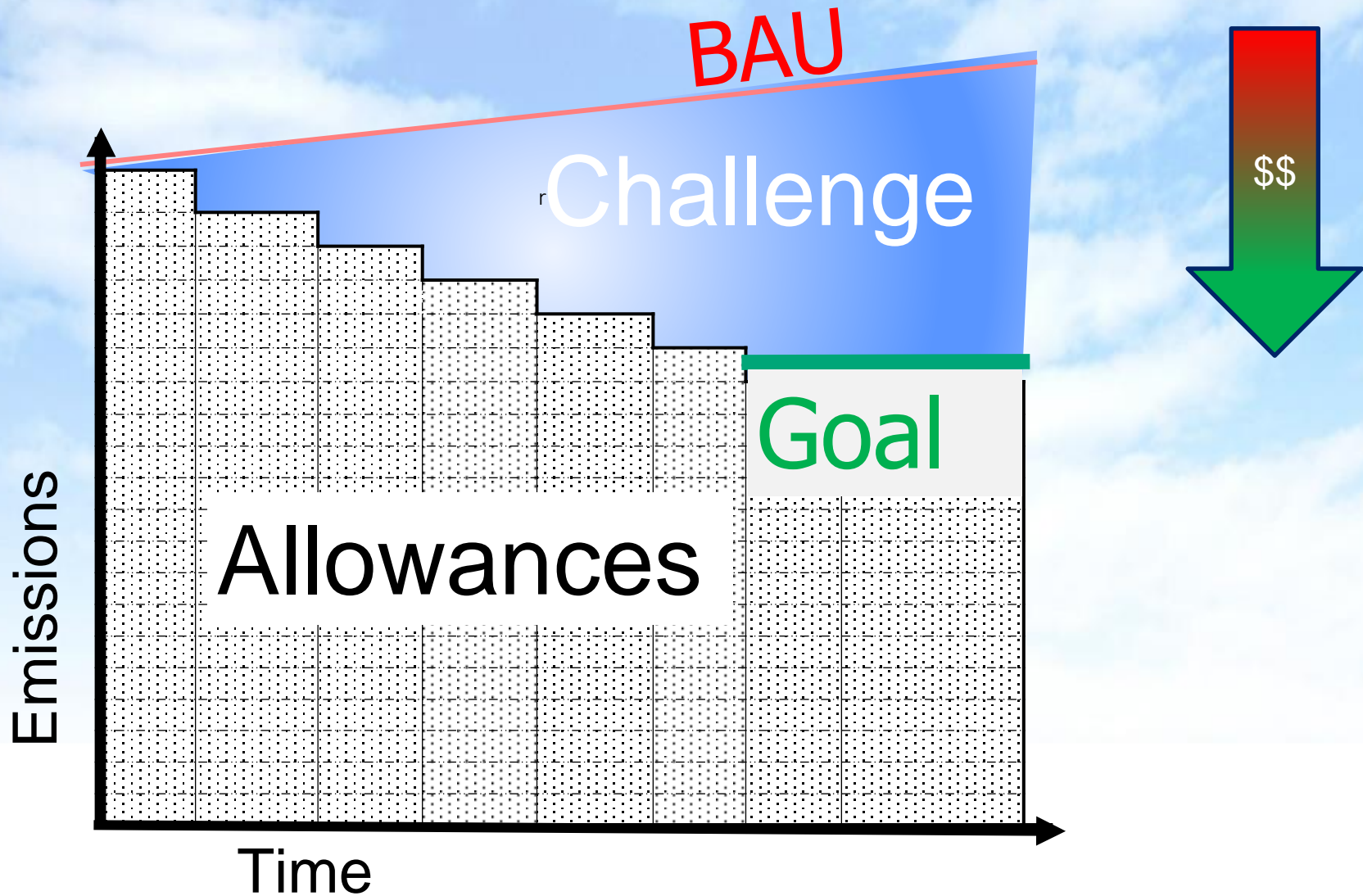
China, Korea, Vietnam, Thailand, Japan, India, US, Dominican Republic, Colombia, Brazil, Mexico, Chile, Europe, Wharton, Lewis & Clark, Duke, Yale, Columbia, UCSB Bren, UC Santa Cruz, Georgia Tech, Northeastern, Newcastle Law, Universidad Jesuita de Guadalajara, Universidad de los Andes, University of 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.**

Objective



Choices



Control



OTC



Exchange



Auction

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



[World Bank Simulation Report](#)

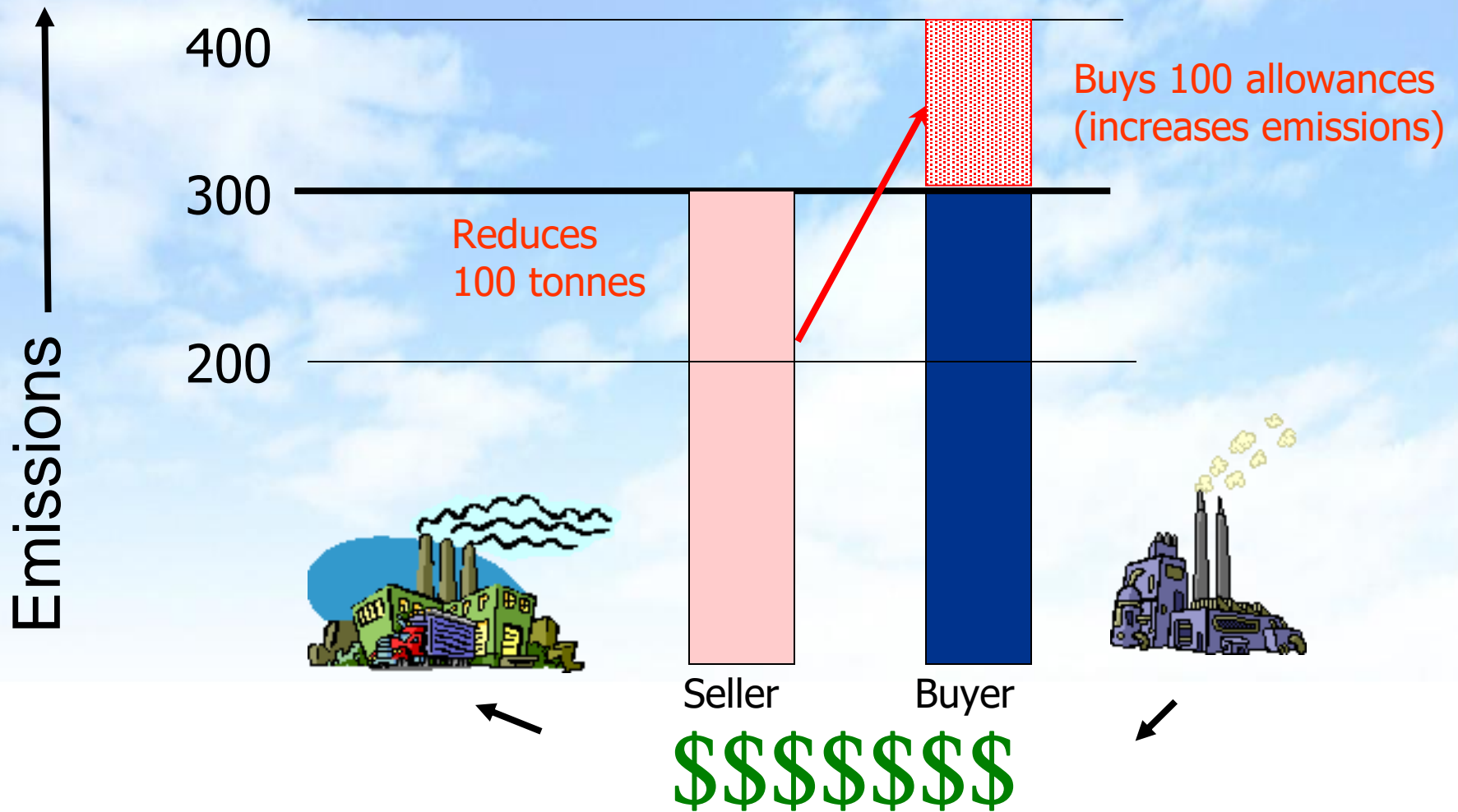
Key terms

- 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**



- Goals:**
- GHGs
 - Energy
 - Env Justice
 - Jobs
 - Equity
 - Near/long term

Better to be in the Kitchen than on the Menu



CarbonSim Schedule

YEAR 1, 2, 3 = 20 MINUTES/YR

ABATEMENT

Auction 1
2:15

2:45

Auction 2
2:15

2:45

Auction 3
2:15

2:45

Auction 4
2:15

2:45

EXCHANGE TRADES

OVER THE COUNTER TRADES

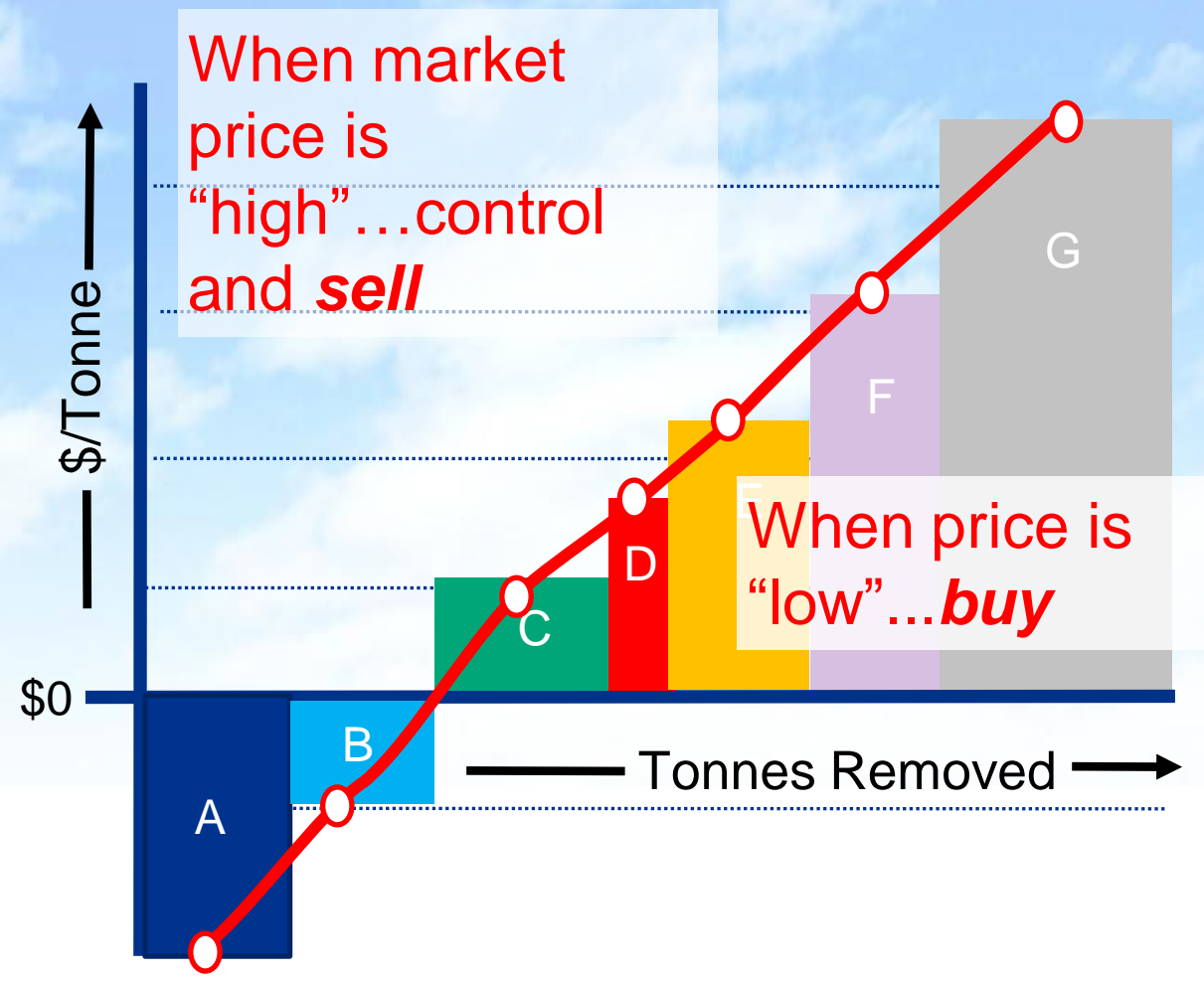
DISCUSSION – QUESTIONS – LESSONS LEARNED



ETS Basics - Control, Buy, or Sell?

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

Marginal Abatement Control Cost Curve



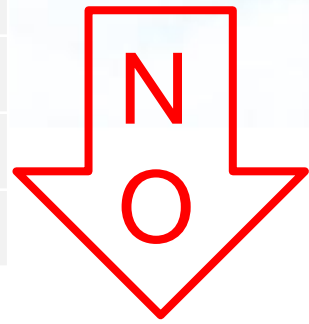


Sold
125,000
@ \$45

125,000 for Auction

Bids	Price (\$/ton)	Quantity (tons)	Aggregate Demand
E	60	15,000	15,000
A	59	10,000	25,000
B	58	10,000	35,000
D	55	20,000	55,000
E	50	20,000	75,000
A	49	20,000	95,000
C	47	5,000	100,000
E	45	25,000	125,000
D	39	10,000	135,000
B	37	25,000	160,000
A	35	40,000	200,000
C	30	20,000	220,000

15,00
+ 10,000
+ 10,000
+ 20,000
+ 20,000
+ 20,000
+ 5,000
+ 25,000
= **125,000**



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



Last Trade

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

Exchange					
Current Market			Last 10 Trades		
	Tonnes	Price/ton	Time	Price/ton	Tonnes
↑	30,000	48.90	14.42.10	45.12	10,000
	60,000	48.00	14.41.00	45.12	10,000
SELLING	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
BUYING	15,000	45.00	14.36.22	47.00	5,000
	35,000	43.90	14.35.33	47.25	25,000
	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

Inside Market



Market Order

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

Limit Order

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

Stop Loss Order

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.

Partial Fill Order

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

Immediate or Cancel

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



- Single buyer, seller
- Product, price, volume
- Anytime*

ETS parameters

Cap	355,850,000
Duration	3 years (<i>20 – 30 mins</i>)
Enterprises	242 (<i>~21 humans and 221 AI bots</i>)
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 <ul style="list-style-type: none">- Schedule- Duration- Price floor / ceiling- Vintages	4 per year 45% of the year \$100 / \$300 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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