

## The emissions cap-and-trade game

### 1. Overall organization of the cap-and-trade game:

Up to six teams can play the game at one time, each team playing the role of a company participating in the emissions cap-and-trade market.

There are three game rounds, each round representing one emissions trading period that is more properly known as a compliance period. Compliance by a company means that at the end of a compliance period: 1) the company's emissions must not exceed the capped level; and 2) the number of emissions allowances held by the company must equal the level of its emissions in the period.

The cap-and-trade dynamic in the game is maintained by two types of companies: one type with emissions allowances to sell and the other type with a need to buy allowances. The dynamic is brought about by the two characteristic "operational" equations assigned to each company at game-start: 1) an emissions curve as a function of production level; and 2) a marginal abatement cost curve as a function of emissions abatement.

### 2. Information provided to each playing team at game-start as governing parameters for the game round:

- i. An equation of emissions vs production level (for a reference base year);
- ii. An equation of marginal abatement cost (MAC) vs abatement level;
- iii. Percent of base year emissions to be reduced as required by cap-and-trade policy, thus defining the cap in the game round;
- iv. Production level in game round, thus defining unabated emissions level;
- v. Emissions allowances allocated to company;
- vi. Percent of allocated allowances that are bankable; and
- vii. Prevailing carbon price in game round or compliance period.

### 3. Objective for a playing team:

The main objective for a playing team is to make "business" decisions that ensure that their company's emissions meet the cap and the company's cost of emissions abatement is minimized in a compliance period.

### 4. Focus, decisions, and actions in trading (buying or selling) emissions allowances:

A playing team pays attention to where the company's marginal abatement cost (MAC) corresponds to the abatement level required to meet the capped emissions level, and what that MAC is relative to the prevailing carbon price.

If that MAC is lower than the prevailing carbon price, the playing team may decide to abate its emissions more than is required to meet the cap, up to the level where its MAC

equals the carbon price. It then can sell off its freed up allowances at the carbon price. Since the allowance selling price is higher than the cost of abatement per ton of GHG, the company stands to gain monetarily from the sale of its freed up allowances even though it has paid its cost to abate its emissions to a level higher than is required by the cap. This incentive can lead to larger emissions reductions in a compliance period. The company may also decide on banking a certain number of emissions allowances for its use in a future compliance period as a hedge against an increasing carbon price, or in anticipation of its higher emissions from increased production levels in the future with no significant decrease in MAC in its operations.

On the other hand, if a company finds that its MAC at its required abatement level is higher than the prevailing carbon price, it may decide to buy a certain number of allowances to cover its emissions from a certain level up to its required level of abatement. Doing so means that the company can meet its capped emissions level at a cost lower than if it were to carry out direct emissions reduction to the capped level.

5. Results at the end of a compliance period:

At the end of a compliance period, the company should check the following:

- i. Its emissions in that period do not exceed the cap, and where applicable, whether it is able to carry out more emissions abatement than is required by the cap;
- ii. The number of emissions allowances it holds is equal to its total emissions;
- iii. Its total cost of emissions abatement required to meet the cap; and
- iv. Its savings on its abatement cost.