# Lecture # 8 -- Transferable Discharge Permits

## I. Transferable Discharge Permits

- Tradable permits work by addressing the *property rights* problem. Permits give a firm a property right to emit a certain level of a pollutant, but no more. The firm needs to obtain the right to exceed the limit by purchasing more permits.
    - In addition, if the firm does not want to use all of its permits, it can sell them to someone else.
- Two types of trading programs:
    - Credit trading programs
        - Firms can sell credits generated by reducing emissions more than required
        - Offset programs are an example
    - Cap-and-trade programs
        - Government makes a centralized decision as to how much pollution is allowed, then distributes permits to all participants
- How permits work:
    - Government begins by setting the desired level of emissions (potentially considering MAC and MD).
        - Thus, like command and control policies, the government has control over the final amount of pollution.
    - Firms are issued permits to emit pollutants. Only the desired number of permits is issued. Thus, the quantity is assured. (E.g. if goal is 1000 tons of emissions, may give 100 firms permits for 10 tons each).
    - Firms can buy and sell permits.
        - Firms with higher MAC will be willing to buy permits from firms with lower MAC.
            - If the price paid is less than the MAC of the high-cost firm, it is better off.
            - Similarly, if the price is greater than the MAC of the low-cost firm, it is better off. It can take the money it gets from selling the permit, use it to reduce pollution, and still have some left over.
            - ***Such trades are possible until MAC is equal across firms.***
                - Thus, permit trading allows a given level of pollution control to be achieved for the least possible cost. Economists consider this least-cost solution to be efficient.

- Today's class was an exercise in permit trading.
    - The class was divided into six firms, and each firm was given an initial allocation of permits. Based on the marginal abatement costs of each group, firms could offer to buy or sell permits.
    - As expected, the final allocation lowered the variance of marginal abatement costs across firms.
        - Firms with high marginal abatement costs bought permits, so that they could pollute more, and firms with low marginal abatement costs sold permits, and polluted less.
        - Thus, the abatement was done by the firms who could achieve abatement at the lowest cost.
    - Note that the permit market enabled us to learn the marginal cost of abatement. Firms did not know the costs of other firms, but we still reached an equilibrium in which costs were lower.
    - I have placed the results of the market exercise on a spreadsheet, along with some discussion. In both rounds, marginal abatement costs moved closer together. While we did not achieve the lowest possible cost reduction, total abatement costs fell in both rounds. The optimal solution can be seen by looking at the combined marginal abatement cost curve for all six firms on the tab “Abatement Schedules” on the spreadsheet with results. This is the marginal abatement cost curve that results from following the equimarginal principle
        - In round 1, total abatement costs fell from $114 before trading to $108 after trading. The best we could have done was $104.
        - In round 2, total abatement costs fell from $304 before trading to $265 after trading. The best we could have done was $261.
        - That total costs still fell even though one firm made an ill-advised trade in each round is an important lesson. Most trades were beneficial for both sides, so the opportunity to trade still makes things better overall.
    - If you would like to see results from a year where the class achieved the efficient solution, I’ve also posted a spreadsheet with the results from 2020.