APPENDIX B:

COMPETITIVE VS. MONOPOLISTIC SUPPLY

To demonstrate in a most simple way possible the point that a company with market power (ability to influence prices) will produce less then socially optimal quantity, this example will compare a case of a perfect competition with perfect monopoly. In the spirit of making things simple, it is supposed that marginal cost (MC) is constant and equal to C, and that the demand is linear and defined as:

$$P = A - b \cdot Q$$

Where:

P = Price of the service provided

A = A price high enough to make quantity demanded equal to zero

b = slope of the demand curve, or the inverse of the rate of change in consumption due to change in price

Q = Quantity of the service provided

Both a monopoly and a price-taking business in a perfect competition will maximize their profit by setting marginal revenue (revenue for an additional unit sold) equal to marginal cost (cost of producing additional unit). If the cost of producing an additional unit is higher than the revenue obtained from that unit, the business is losing money. If the revenue is higher than the cost, the business is making money and therefore should keep on producing. In a perfect competition where a business is a price taker, the equation is simple:

$$R = P \cdot Q$$

$$MR = \frac{dR}{dQ} = P$$

Where:

R = Revenue

MR = Marginal Revenue

dR = Derivative of total revenue – change in revenue

dQ = Derivative of demand – change in storage offered (e.g. 1 MWh).

To obtain the quantity of service provided in perfect competition the marginal revenue is set to equal to marginal cost, which was defined as a constant "C":

$$MR = MC$$
$$P = C$$
$$A - b \cdot Q = C$$

$$Q = \frac{A - C}{b} \ or \ X, where \ X \ is \ a \ socially \ optimum \ quantity \ of \ good/service \ produced$$

Although a monopolist will also set marginal revenue equal to marginal price, it´s important to remember that his revenue function is different because he is not a price taker but rather a price maker. To make it less theoretical, think of how OPEC at its peak would define the price of oil by controlling the amount of oil produced. The size of monopoly's output determines the price it gets: the more is produced, the lower the price. In other words, the price is a function of "Q", and the Marginal Revenue is derived as follows:

$$R = P(Q) \cdot Q$$
$$R = (A - bQ) \cdot Q$$
$$R = A \cdot Q - b \cdot Q^2$$
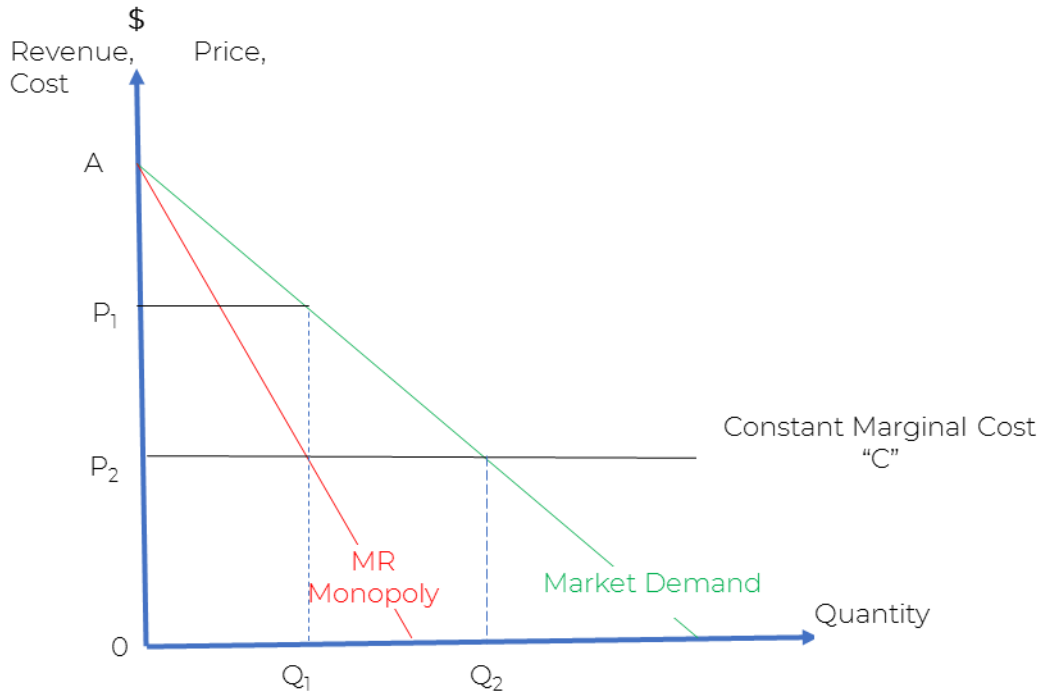$$MR = \frac{dR}{dQ} = A - 2b \cdot Q$$

Again, to obtain the quantity of service provided in a monopoly we set marginal revenue equal to marginal cost "C":

$$MR = MC$$
$$A - 2bQ = C$$

$$Q = \frac{1}{2} * \frac{A - C}{b} \ or \ \frac{1}{2} \ X, half \ of \ socially \ optimum \ quntity \ produced$$

The monopoly produces half of what the optimum social output would be. Graphically it would look like:

$
Revenue,   Price,
Cost

A

P₁

P₂   Constant Marginal Cost
                                            "C"

        MR
        Monopoly   Market Demand   Quantity

0
        Q₁   Q₂

Where:

Q_1 and P_1 are the monopoly quantity and price

Q_2 and P_2 are the competitive quantity and price

The monopoly profit is the area defined by $(0, P_1)$, $(0, P_2)$, (Q_1, P_2), (Q_1, P_1)

The efficiency loss (Dead Weight Loss) is the triangle defined by (Q_1, P_1), (Q_1, P_2), (Q_2, P_2). It's what consumers are willing to pay, but do not receive. There is no efficiency loss in perfect competition.