

ECON 255, HOMEWORK 1.
MARKET EFFICIENCY

- (1) The demand for electricity in Coalville is given by $Q_D(P) = 1000 - 1000P$. Meanwhile the supply of electricity is given by $Q_S(P) = -800 + 8000P^1$, where in both cases quantity is measured in megawatt-hours per day the price P is in \$ per kilowatt-hour.
- (a) Assume the market is competitive. What is the market clearing price? How much electricity is traded in this market? Make a diagram illustrating this.
 - (b) What is the sum of producer and consumer surplus in the market equilibrium?
 - (c) Suppose that the production of electricity has costs which are borne neither by producers nor by consumers in this market. These costs are describe by the following *Marginal External Cost* function.

$$MEC(Q) = .05 + .0001Q$$

Construct a *Marginal Social Cost* function and add it to your diagram.

- (d) Accounting now for the external cost, what is the total social surplus generated by the electricity market? (Hint: You may have to convert the supply curve to a marginal cost curve.)
- (e) Describe the *efficient* outcome. How much electricity would be produced? What would be the cost of that output level to producer? to external cost bearers? What would be the total benefit of that output to consumers? How much more efficient is the efficient outcome than the market solution measured in dollars per day?
- (f) What price would give consumers the incentive to demand the efficient level of output? What price would give producers the incentive to produce the efficient level of output?

¹Or more precisely, $Q_S(P) = \max\{0, -800 + 8000P\}$

- (2) Suppose there are four roommates who all like to smoke but who all hate the indoor air pollution cause by the smoking (including their own). Each of them derives individual enjoyment from smoking inside worth \$8 per cigarette for up to 25 cigarettes per week (after which their MWTP drops to 0). However each of them also suffers from the indoor air pollution according to the following marginal cost schedule

$$MC = \frac{Q}{20}$$

where Q is the total number of cigarettes smoked by all four roommates per week.

- (a) To be clear the cigarettes are private goods and the enjoyment of smoking one is only experienced by the smoker. However the pollution here is non-rival, so that the cost of a cigarette smoke is “shared” by all four roommates. For example take, as a starting point, that all four smoke 25 cigarettes per week each for a total of 100 smoked in the apartment per week. If one roommate cuts back by 1, the benefit (in terms of reduced cost) to each roommate is \$5 for a total benefit of \$20. Would any of the roommates have an incentive to cut back without any kind of compensation (either in cash or in promised reciprocity)?
- (b) What is the efficient number of cigarettes smoked in the apartment per week?
- (c) Can the efficient outcome to be achieved? If so, how? Do you need to assume that the roommates preferences are common knowledge? Do you need an outside courts to enforce agreements? Would government intervention help?