Short Answer

1) A rollback method is a simple regulation, and therefore benefits from transparency and ease of enforcement. The major disadvantage is it doesn't consider relative cost of emission control, and is therefore economically inefficient. Tradeable permits are more likely to lead to Pareto optimal solutions.

2) The reduction in risk = 0.0009. This multiplied by 100 statistical deaths = 0.09 lives saved. This makes the valuation of a human life at: $11.1M.

3) Two reasons: First, the cost of retrofitting with fiber optics may not be as substantial. Second, the market for long distance telephony has likely grown and could support multiple firms.

4) Franchise bidding won't necessarily lead to a better outcome for the following reasons:
   i) Number of bidders may be limited
   ii) Renegotiation of contracts may raise prices
   iii) Competing on quality distorts selection process
   iv) Demand/costs may evolve within contract period, departing from efficient outcome
   v) Incumbent has paid fixed costs, therefore has advantage in bidding.

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5) The result of this practice was that airlines competed on quality (above efficient levels) since this was the only differentiation point legally permissible.

6) The story in question demonstrates that as long as property rights are clearly assigned, parties should be able to negotiate an efficient solution. Government intervention was likely unnecessary unless there were unnamed third parties affected by the pollution but without the ability to collectively bargain with the factory.

Part II) Numeric Problems

7) 1) $Q = 100 - P$

$Q^I + Q^R = 100 - P$

$\boxed{Q^R = 100 - P - Q^I}$ ✓

↳ residual demand

2) $Q^R = 100 - P - Q^I$

$P = 100 - Q^R - Q^I$

$Rev = PQ^R = 100Q^R - Q^{R^2} - Q^IQ^R$

$MR = 100 - 2Q^R - Q^I = MC = 2$

$100 - 2Q^R - Q^I = 2$

$98 = 2Q^R + Q^I$

$Q^R = \dfrac{98 - Q^I}{2} = \boxed{49 - \tfrac{1}{2}Q^I}$

↳ residual production

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3) $100Q^R - Q^{R^2} - Q^IQ^R = 50$

↳ at this level entrant is indifferent to entry b/c of fixed c = 50

$Q^I = 98 - 2Q^R$

$100Q^R - Q^{R^2} - (98 - 2Q^R)Q^R = 50$

$100Q^R - Q^{R^2} - 98Q^R + 2Q^{R^2} = 50$

$Q^{R^2} + 2Q^R - 50 = 0$

$Q^R = \dfrac{-2 \pm \sqrt{4 + 4(50)}}{2}$

$= -1 \pm \sqrt{51}$

$\doteq 6.14$

$Q^I = 98 - 2(6.14) = 85$

$\boxed{P \doteq 14.28}$ ✗ (forgot to include Q^I)

↳ this is the limit price in which the incumbent firm cannot raise w/o increasing entry (and further lowering price)

4) Since a Cournot game is only one stage, vast overproduction by one firm is not a ✓ credible threat so all firms output the Cournot ✓ amount regardless of past investment (This is only plausible if capacity is perfectly elastic and so the threat of overproduction isn't credible)

8)
1) The optimal number of research projects from society's view is when MC = MS (marginal surplus):

$E[S] = 25(P) = 25(1 - e^{-.5085n})$

$MS = \dfrac{dS}{dn} = +25(.5085)e^{-.5085n}$

$= 12.7125 e^{-.5085n} = MS = MC = 1$

$1 = 12.7125 e^{-.5085n}$

$\ln(1) = \ln(12.7125 e^{-.5085n})$

$0 = 2.54258 - .5085n$

$\boxed{n \doteq 5}$

Society is best off when 5 firms compete.

2) $P \doteq 1 - e^{-0.5085(25)} = 0.999996987$

Because, with 25 firms, discovery is $\doteq 1$, the decision to enter is based on whether your team discovers it first. Given entry cost = $1 and total benefit = $25

$$\frac{25}{n} = \$1 \quad \therefore \text{ zero-profit is reached at 25 firms.}$$

3) Social desirability would prefer to make a maximum of benefits - costs. However because a patent race is winner-takes-all, this encourages overinvestment.

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PART III)

Self-reporting and transparency in TRI has the potential regulatory impact of allowing other parties to negotiate emissions, similar to the story in question 6. With information on exact releases, affected parties could theoretically pay or negotiate to reduce those releases. In addition, a company not wishing bad press could voluntarily reduce emissions.

The political motivation of such regulation is that it promotes transparency which is popular in the voting public, and it avoids potential industry resistance from a command and control strategy.

This policy could be effective in allowing an affected individual the ability to collectively bargain with a firm releasing onto his/her property (including suing if damages are caused). This shifts from a centralized control to a decentralized system. Weaknesses of this regulation include dodging reporting by going below minimums, lying/erroneous self-report if the regulation is poorly enforced, third parties having significantly high organizing costs so as to be unable to collectively bargain with polluters. In addition, this regulation may be flawed if consumers fail to act on it, not being aware of the harm (as opposed to command and control which wouldn't require a response).

Points covered:
- Coase Theorem
- Info may not be capitalized
- More popular (cheaper) w/ industry

Points Missed:
- low implementation cost

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