

## Homework for Session 4

The InterGen Corporation is considering an investment in the Philippines. Under the current proposal, InterGen would spend \$200 million to build a gas-turbine power plant. InterGen would sell the power to the local electricity distribution company, the Luzon Electric Company (LEC), which has a monopoly on local transmission.

Once the plant is built, LEC's sales of the electricity will produce \$300 million in operating profits. The total value of the project is therefore  $\$300 - \$200 = \$100$  million.

Before the plant is built, InterGen and LEC sit down to negotiate a contract. They must bargain over who gets what share of the \$100M. Let's assume that InterGen and LEC have equal bargaining power and decide to split the profit down the middle. In particular, they agree that InterGen will pay for the plant, and then LEC will pay InterGen \$250 million over the course of the project. This will leave each company with a \$50 million profit.

At the same time, InterGen realizes that LEC would be the only possible buyer of the electricity once the plant is built. In particular, InterGen's best alternative option if LEC won't buy the electricity would be to shut the plant down.

1. What are the rents InterGen earns from the project should the contract be honored? (Hint: Pick the right number above)
2. What are the rents InterGen earns from the project if LEC refused to buy the electricity and InterGen is forced to shut the plant down?

Imagine that LEC decides to renegotiate the contract from scratch once InterGen has made its investment. In particular, LEC says, "That stuff about us paying you \$250 million? That was way too much. We have to work out a new deal." InterGen's managers are angry, but they realize that their next best option, shutting the plant down, would mean a huge loss on the project – they've already sunk \$200 million. On the other hand, once LEC tries to renegotiate, all options are back on the table, and LEC certainly won't get any benefit out of the project if InterGen decides to shut the plant down.

3. What is the total future income from the project that remains to be bargained over?

As before, assume that the two parties have equal bargaining power, so that they end up splitting the future income right down the middle.

4. In that case, how much does LEC pay InterGen for the plant?
5. Therefore, what would InterGen earn on the project should the contract *not* be honored?
6. What will LEC's profit be if it breaks the contract and pays your answer to (4)?

Consider the “game tree” on the following page, which allows us to think about the strategic issues in a clear manner. The first node of the game tree, labeled “InterGen”, represents InterGen’s decision about whether to invest. If it does not invest, then we travel down the branch to the left: InterGen earns \$0, as does LEC. If InterGen does invest, then we travel down the branch to the right. In this case, the payoffs to both parties will depend on the action taken by LEC, who can either honor the contract or renegotiate. (Stare at the payoffs to the parties. Do you recognize them from your answers above?)

Working backwards through the tree, a procedure called “backwards induction”, we can analyze the strategic outcome of this game.

7. What is LEC’s optimal decision? That is, if given the choice, will LEC honor or renegotiate the contract?
8. Given your answer to (7), will InterGen invest in the first place?

This is an example of a *hold-up problem*, which often occurs when there are *relationship specific investments*.

This example is very simple and ignores many features that may be relevant to the decisions of the parties. Thinking generally about these kinds of situations, why might LEC not be so quick to renegotiate? What kinds of strategies do you think counterparties can undertake to avoid these kinds of problems?

