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9B18M135

Cap and Trade in Ontario: General Motors Company

Adam Fremeth and Patrick Shulist wrote this case solely to provide material for class discussion. The authors do not intend to illustrate either effective or ineffective handling of a managerial situation. The authors may have disguised certain names and other identifying information to protect confidentiality.

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As the operations manager for the General Motors Company (GM) production facility in Oshawa—the only one in Ontario—your normally complex job has just become even more challenging. With the introduction of Ontario’s cap-and-trade system, you now must directly consider the cost of carbon in your decision making, which was the government’s intention from the start. This affects your decision making in three ways: (1) making production decisions, (2) trading permits, and (3) deciding on long-term investments in clean technology.

CARBON POSITION

Given your experience, and the expertise you can draw on from GM’s global operations, you have become an expert in production for GM’s plant in Ontario. You have a finely tuned sense of how to run the supply chain and schedule work in the plant. However, the introduction of a carbon cap-and-trade system complicates this decision-making process. Over the past few years, the plant’s production emitted around 150,000 tonnes of carbon dioxide equivalents (CO2e) per year. This far exceeds the 25,000-tonne threshold for mandatory inclusion into Ontario’s cap-and-trade system. As a result, you will have to obtain emissions permits for all of the Oshawa plant’s emissions. Fortunately, the Government of Ontario has stated that it will give GM 140,000 emissions permits during the first year of the cap-and-trade scheme. The government’s generosity is to ensure an easy and smooth transition into the program. However, the number of free permits will decrease every year, so GM will receive 135,000 permits in year 2 and 132,000 in year 3. The number of free permits across the entire market for all four firms will see a similar decrease from 1,922,000 permits in year 1 to 1,846,000 in year 2 and 1,772,000 in year 3.

Given the current condition of the plant, for every car that the Oshawa plant produces, 1.03 tonnes of CO2e will be released into the air. This ratio of is known as carbon intensity (CI). The production of cars, as you well know, is moderately carbon intensive due to the heat and electricity used in the production process. Cars themselves are *very* carbon intensive because the raw materials—especially steel—are very carbon intensive to produce. However, under Ontario’s cap-and-trade system, you are only responsible for your direct emissions—you are not responsible for upstream or downstream emissions.

Last year, the Oshawa plant’s output quantity was approximately 145,000 cars, the quantity at which revenue was maximized. GM has global operations and is heavily involved in the supply chain of the car. As such, even though the cars average a retail sales price of CA$30,000,[[1]](#footnote-1) much of this is credited to other divisions within GM. Your plant is credited with $2,700 in sales for each car rolling off the production line—*your effective average revenue.* The plant also has $105 million in fixed costs. You have calculated the average variable costs (AVC) as follows: , where *Q* is the production quantity. These numbers are not expected to change.

In previous years, your job focused on keeping the cost of production down and ensuring smooth logistics to end consumers. However, you realize that carbon pricing will have a large impact on overall profitability. As a result, your new goal is to maximize profit within the bounds of the new policy. To help make the market stable and more predictable, the Government of Ontario is instituting a price floor of $18 per tonne of CO2e emissions and a price ceiling of $54 per tonne. The price floor is the amount that the government will pay for excess permits held by the firm at year-end. The price ceiling will also act as a penalty per tonne of CO2e for firms that do not hold the requisite number of permits at year-end. Considering GM’s average annual emissions of 150,000 tonnes, and the fact that you have only been provided 140,000 permits for next year, you will have a shortfall of 10,000 permits that you need to procure. This shortfall can change if your production levels change. At the price floor, this would cost GM $180,000 in trades with other firms. At the price ceiling, it would cost $540,000, should you fail to acquire the needed permits. The amounts of money are significant, given the thin margins on cars and the large capital costs involved in setting up the operation.

EMISSIONS-REDUCTION STRATEGY

To avoid additional costs associated with procuring permits, GM can reduce production, although it would mean foregoing sales. Because GM’s permit allocation will be reduced every year, production levels would have to continually decrease. Therefore, production changes may be only part of the answer.

Instead, the bulk of GM’s strategy for meeting its permit needs should focus on two key activities: (1) investing in clean technology and (2) trading permits with other firms in the cap-and-trade scheme. In fact, if GM makes sufficient investments in clean technology, it could become a net seller of permits and open a new line of revenue. Unfortunately, this might be difficult, given the nature of operations. GM’s strategy should therefore focus on reducing emissions intensity where it can do so profitably, while simultaneously securing permits on the market from other firms. Pursuing this twin strategy will ensure that minimized costs are associated with the cap-and-trade scheme.

The carbon permits act like a traditional financial instrument. Whichever company is given a permit is the legal owner of the right to emit 1 tonne of CO2e. These permits are fully transferable, so GM can “buy” from other firms the right to further emissions. This is where the concept of marginal-abatement cost comes into play. Because of the nature of their operations, some firms can reduce carbon emissions less expensively than others through process modifications or investments in more efficient or cleaner technologies. For such firms, it is profitable to reduce emissions *beyond* the level required by the permits that they are allocated. These firms can then sell their excess permits to other firms—like GM, for example—for more money than the investment they made in the emissions-reduction technologies or process modifications.

For its part, GM has identified three main strategic investments that can be used to reduce the overall carbon intensity of its operations by reducing the carbon emissions per car produced. First, GM can upgrade the insulation linings used in its natural gas–powered furnaces. With improved insulation, furnaces consume less natural gas, which is a fossil fuel, resulting in fewer carbon emissions. GM estimates that upgrading insulation will reduce carbon intensity per car by 0.075 tonnes. For example, the level of carbon intensity will be 0.955 tonnes of CO2e per car after this modification, if done in isolation. Your accountant informs you that the *annualized*cost of the investment will be $225,000 each year for the next 15 years, which means that you will have a $225,000 expense *each year* on your income statement for the foreseeable future.

Second, you have been speaking with one of your engineers who notes that the fumes from painting the cars contain substantial quantities of greenhouse gases. She notes that for an *annualized*cost of $550,000 for each of the next 15 years, you can install a new ventilation-and-filtration system that would reduce your greenhouse gas emissions by the equivalent of 0.075 tonnes of carbon dioxide per car. Importantly, this investment in green technology—like all of GM’s options—operates independently of other investments and can be done in conjunction with other efforts to reduce carbon intensity.

Third, your engineer also points out that a lot of the heat from operations is simply lost. Your engineers suggest you could install heat exchangers to redirect this otherwise lost heat into the building’s heating system. This would reduce the plant’s heating load substantially in the winter, meaning that fewer fossil fuels would be consumed to heat the building. Your engineers estimate that an *annualized*cost of $6 million for each of the next 15 years could allow for the carbon intensity to be reduced by 0.17 tonnes per car.

When considering all these investment decisions, *it is important to consider the number of permits you will have, the total emissions you will make based on your production levels, and the total emissions reduction enabled by each clean-technology investment.* Also, any unused permits you own at the end of the year can be sold back to the government at the price floor of $18 per permit. On the other hand, for every permit shortfall at the end of the year, you will have to pay the price ceiling, which is a penalty of $54 per permit.

**ADDITIONAL MARKET INFORMATION**

The trading platform allows for an interactive marketplace where companies will have the opportunity to present offers to buy or sell permits at a stated price per permit, and other participating companies are able to accept those terms or offer counter bids. The government of Ontario has put in place rules to ensure the smooth functioning of the carbon market. Each transaction in the trading platform is capped at 10,000 permits per transaction to ensure the smooth functioning of the market. Finally, information on market transactions will be transparent to all companies, including the number of permits traded and the price per permit.

For assistance with your planning and decision-making, some relevant details are provided, including basic operating information, clean technology investment options, and carbon market details (see Exhibit 1).

Exhibit 1: BASIC Operating INFORMATION

|  |  |
| --- | --- |
| **Operating Item** | **Calculation** |
| Quantity produced (Q) | *Q*, expressed in terms of cars |
| Average variable production cost (AVC) |  |
| Total variable production cost (TVC) |  |
| Fixed costs (FC) | $105,000,000 |
| Credited revenue per car (P) |  |
| Total revenue (R) |  |
| Profit (π) |  |
| Baseline carbon intensity (CI) |  |
| Total baseline carbon emissions (TCE) |  |

Clean-Technology Investment Options

|  |  |  |
| --- | --- | --- |
| **Clean-Technology Investment Option** | **Annualized Cost** | **Reduction in Carbon Intensity** |
| Upgrade furnace | $225,000 | 0.075 |
| Filter paint fumes | $550,000 | 0.075 |
| Repurpose waste heat | $6,000,000 | 0.170 |

Note: It takes one year for all clean-technology investments to come online; therefore, an investment in year 1 changes the emissions intensity of year 2.

Carbon-Market Details

|  |  |
| --- | --- |
| **Carbon-Market Item** | **Calculation** |
| Meaning of one permit | Legally allowed to emit 1 tonne CO2e |
| Price floor for a permit | $18 |
| Price ceiling for a permit | $54 |
| GM’s year-1 permit allocation | 140,000 tonnes of CO2e |
| GM’s year-2 permit allocation | 135,000 tonnes of CO2e |
| GM’s year-3 permit allocation | 132,000 tonnes of CO2e |
| GM’s current annual emissions | 150,000 tonnes of CO2e |

Note: All currency amounts are in CA$; CO2e = carbon dioxide equivalent.

Source: Created by the case authors.

1. All currency amounts are in CA$ unless otherwise specified. [↑](#footnote-ref-1)