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9B18M133

Cap and Trade in Ontario: TransAlta corporation

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 TransAlta Corporation (TransAlta) power generation 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

At TransAlta, your job is to oversee electricity-generation operations of the 1,192 megawatts of installed capacity. This includes four natural gas–power plants, five hydro plants, and three wind farms.[[1]](#footnote-1) A key part of your job involves setting output targets for each of these 12 facilities. Drawing on your own experience and TransAlta’s global knowledge base, you are now an expert in this field. However, the introduction of a carbon cap-and-trade system complicates your decision-making process. Over the past few years, TransAlta’s Ontario operations emitted an average of around 1,188,000 tonnes of carbon dioxide equivalents (CO2e) per year, which 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 the plants’ emissions. Fortunately, the government of Ontario has stated that it will give TransAlta 1,158,000 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 TransAlta will receive 1,108,000 permits in year 2 and 1,058,000 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 mix of electric-generating plants that you oversee, for every gigawatt hour (GWh) of power produced, there are 270 tonnes of CO2e emitted into the air. This ratio of is known as carbon intensity (CI). Looking back over the last few years of information, you note that TransAlta produces an average of approximately 4,400 GWh of electricity per year. TransAlta is a price taker in the wholesale electricity market. Despite some fluctuations, your company receives about CA$150,000[[2]](#footnote-2) for every GWh of power you supply to the grid. Production costs for electricity are complex, but looking back on your records, you have calculated the average variable cost (AVC) of production as follows: where *Q* is the annual quantity of electricity produced in GWh. Fixed costs are large, at $280 million per year. In addition, the firm’s long-term contracts limit the opportunity to modify production substantially beyond a narrow band, with minimum production being 4,100 GWh. These numbers are not expected to change.

In previous years, your job focused on trying to keep the cost of production down and ensuring proper timing of generation. 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 also 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 TransAlta’s average annual emissions of 1,188,000 tonnes, and the fact that you have only been provided 1,158,000 permits for next year, you will have a shortfall of 30,000 permits that you need to procure. This shortfall can change if your production levels change. Should the market for permits fall to the price floor, this would cost TransAlta $540,000 in trades with other firms; at the price ceiling it would cost $1,620,000, should you fail to acquire the needed permits. Given the thin margins on electricity and the large capital costs involved in setting up the operation, these amounts are significant.

EMISSIONS-REDUCTION STRATEGY

To avoid additional costs associated with procuring permits, TransAlta can reduce production, although it would mean foregoing sales. In addition, you are severely restricted from decreasing production because of long-term contracts that require at least 4,050 GWh to be delivered annually. Because TransAlta’s permit allocation will reduce every year, production levels would have to continually decrease, which would run counter to the goal of selling electricity. Therefore, production changes may only be a small part of the answer.

Instead, the bulk of TransAlta’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 TransAlta makes sufficient investments in clean technology, it could become a net seller of permits, opening a new line of revenue. TransAlta’s strategy should therefore focus on reducing emissions intensity as much as possible where it can do so profitably, and then on trading permits in the market. 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 one tonne of CO2e. These permits are fully transferable, so TransAlta 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 sell their excess permits to other firms—like TransAlta, for example—for more money than the investment they made in the emissions-reduction technologies or process modifications.

For its part, TransAlta 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 GWh produced. First, TransAlta can upgrade the turbines in some of its gas-fired power plants. The upgrade will improve overall efficiency and allow more electricity to be produced from a set amount of fossil fuels. TransAlta estimates that the upgrade will reduce carbon intensity by 10 tonnes per GWh. Specifically, the level of carbon intensity is reduced from 270 tonnes of CO2e per GWh to 260. Your accountant informs you that the *annualized*cost for each of the next 15 years from this investment is $500,000, which means that you will have a $500,000 expense *each year* on your income statement for the foreseeable future.

Second, you have recently been speaking with some of the site engineers who have noted that you can efficiently add a few new wind turbines to existing wind farms. At an *annualized* cost of $1.2 million for each of the next 15 years, you can increase the amount of electricity generated by wind turbines—something that produces no carbon emissions. This would reduce carbon intensity by 10 tonnes per GWh of production. Importantly, this investment in green technology—like all of TransAlta’s options—operates independently of other investments and can be done in conjunction with other efforts to reduce carbon intensity.

Third, your engineer also notes that you can build a new water reservoir, dam, and generating station at an *annualized* cost of $2.5 million for each of the next 15 years. Much like expanding wind generation, this would increase the amount of “clean” electricity that TransAlta produces and lower your carbon intensity by 8 tonnes per GWh of production.

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*, represented in gigawatt hours |
| Average variable production cost (AVC) |  |
| Total variable production cost (TVC) |  |
| Fixed costs (FC) | $280,000,000 |
| Sales price per gigawatt hour (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 Emissions Intensity** |
| Upgrade turbines | $500,000 | 10 |
| Install additional wind turbines | $1,200,000 | 10 |
| Build hydro station | $2,500,000 | 8 |

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 of CO2e |
| Price floor for a permit | $18 |
| Price ceiling for a permit | $54 |
| TransAlta’s year-1 permit allocation | 1,158,000 tonnes of CO2e |
| TransAlta’s year-2 permit allocation | 1,108,000 tonnes of CO2e |
| TransAlta’s year-3 permit allocation | 1,058,000 tonnes of CO2e |
| TransAlta’s current annual emissions | 1,188,000 tonnes of CO2e |

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

Source: Created by the case authors.

1. “Plants in Operation,” TransAlta, accessed June 26, 2018, www.transalta.com/facilities/plants-operation. [↑](#footnote-ref-1)
2. All currency amounts are in CA$ unless otherwise specified. [↑](#footnote-ref-2)