Carbon Footprint and Clean Energy at Simon Pearce[1]

On a crisp Fall day in October 2009, Rob Adams, president of glassware/pottery maker and restaurateur Simon Pearce, looked down at the Ottauquechee River rushing over the dam at the company's flagship store in Quechee, Vermont. The dam, and the electricity it generated for Simon Pearce, embodied a decades-old commitment to renewable energy and sustainability by the company's eponymous founder, a commitment that many of its customers and employees implicitly accept.

Yet, the company had not thought much about these issues in any systematic fashion. Mr. Adams wondered: What did 'sustainability' mean for Simon Pearce? How, if at all, would it matter to the company's stakeholders? For starters, what is the company's carbon footprint? What initiatives could he adopt to mitigate the impact of that footprint, or even better, reduce it? What would such initiatives cost?

Mr. Adams was also weighing how he could justify such spending in an economy that was re-emerging from one of the worst downturns in US history. It was a downturn that had been difficult on firms like his, which relied on discretionary consumer spending.

The Company

Simon Pearce produces and sells premium quality hand-blown glassware and pottery. With approximately $26M in annual revenue, the company's operations span product design, production, distribution (wholesaling and retailing), and restaurant operations.

The founder opened his first glass blowing workshop in Kilkenny, Ireland in 1971. In 1981, Mr. Pearce relocated to America to avoid European business constraints and high energy costs. He picked a setting where he and his family could live and he could work, as well as produce his own energy on-site. (Energy is a significant input to run the furnaces to produce glass and pottery.) An old woolen mill building in bucolic Quechee, located in the northern New England state of Vermont, seemed like the perfect setting to house his American enterprise. The facility produced its own hydro-power electricity from the Ottauquechee River, with restorations last completed in 1981.

Today, Simon Pearce has its headquarters in Windsor, VT about 10 miles south of Quechee. Production occurs in three locations: Quechee and Windsor, VT and at a facility further south, in Mountain Lake Park, Maryland (MD). The company's products are sold via ten company-operated retail stores, to 400 wholesale accounts, to corporations as engraved gifts, as well as directly to customers from the company's website and catalog operations.

Simon Pearce creates premium-priced glass and pottery products that are commonly acknowledged to be elegantly designed, produced with high-quality materials and craftsman-

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[1] This case was developed by Tuck research fellow Matthew Bolduc under the supervision of Tuck professor Anant Sundaram, as a basis for class discussion. The casewriters are deeply grateful for the insights, data, and assistance provided by Rob Adams and Steve Holt of Simon Pearce. Some facts have been simplified for pedagogic purposes.

ship, and intended for a lifetime of everyday use. Its focus on 'timeless design and durability' with a minimal simplicity in design has led to a fiercely loyal customer base.

In 2009, Mr. Pearce had decided that his interests were less in running the business, and more focused around his family and his passion for product design and glass-blowing. He hired Rob Adams as president to oversee the day-to-day operations of the company. Mr. Adams, an undergraduate from Dartmouth College in nearby Hanover, New Hampshire, has an MBA from the Kellogg School of Management at Northwestern University.

Simon Pearce's Operations

Simon Pearce receives silica and clay from Sweden and Massachusetts, respectively, converts these in one of their facilities in Maryland or Vermont into the finished product, and sends the finished product to its Maryland warehouse. From the warehouse, products are shipped via Fedex to 400 wholesale accounts, online customers, and half of its retail stores along the East coast. The remaining stores get their products delivered by company-owned trucks.

Simon Pearce is selective about raw materials. The silica is sourced from a specific site in Belgium where the grains of sand are uniform in size. It is then sent to a processing plant in Sweden that adds certain chemicals to optimize it for glass blowing. Annual shipments, by sea, weigh in at approximately 925,000 metric ton-kms (a measure that takes into account both the total weight and distance traveled).

Once shipments land at North American ports, they are sent via truck to the company's locations in Vermont and Maryland. (Production is distributed between Windsor, Quechee and Maryland in rough proportions of 30%, 20%, and 50% respectively). It is estimated that trucking raw materials to the site comes in at 67,500 ton-kms.

The company also uses a mix of fuels to fire glass melters, pipewarmers, and reheating and finishing lehr furnaces, run the pottery kilns, and operate the restaurant, retail and office business units. Records show that 283,800 gallons of propane and 18,461,000 cubic ft. of natural gas were used in the prior year.

Being located in different parts of the US, Simon Pearce uses electricity from several 'eGRID' subregions.[2] In the Northeast region (the 'NPCC eGRID subregion') it used about 3,000,000 kWh,[3] in RFCW ('Reliability First Corporation West') subregion approximately 2,200,000 kWh, and in RFCE ('Reliability First Corporate East') subregion, 821,000 kWh.

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[2] eGRID = Emissions and Generation Resource Integrated Database, is an inventory of environmental attributes of regional electric power systems in the US, maintained by the US Environmental Protection Agency (www.epa.gov/egrid/). Different regions have different emissions profiles based on the electricity-generating input used, e.g., coal vs. natural gas vs. nuclear.

[3] kWh = kiloWatt-hour. It is a measure of the amount of energy consumed over time, and is the most commonly used billing unit for electricity purchased from electric utilities. It is calculated by multiplying the instantaneous rate of energy use (watts, W) by the amount of time that the energy is used (hours, h). Thus, for example, a 75W bulb that is left on for one hour uses 75 watt-hours (Wh). If left on for a thousand hours, it uses 75kWh. According to the US Department of Energy, in November 2009, the

The hydroelectric facility in Quechee, VT produced about 1,500,000 kWh.

Once the products are finished, they are either transported to the Maryland facility for warehousing, or displayed in company-owned retail space. Company-owned trucks are used to transport half of the retail inventory, and they use 4,700 gallons of diesel fuel per year. Wholesale accounts and online orders are processed from Maryland, with Fedex handling transportation from the warehouse to the final destination. Simon Pearce ships anywhere between 120,000 and 200,000 lbs. via Fedex to service wholesale and to fulfill online orders.

The company employs 300 people across its retail, production, restaurant and office operations. A commuting survey revealed that each employee commutes an average distance of 29 miles per weekday. (According to the US Bureau of Transportation Statistics, average fuel efficiency of passenger vehicles in the United States is 22.5 miles per gallon of gasoline.)

Finally, Simon Pearce operates two high-end restaurants, one in Quechee, VT and the other in Westchester, PA. Together, they serve 143,000 'covers' annually. ('Cover' is a term in the restaurant industry that is a proxy for the number of meals served.)

GHG Emissions and a 'Price on Carbon'

About the time that Rob Adams was taking the reins at Simon Pearce, there was increasing debate in Washington, DC and in the international community about the need to put a price on carbon dioxide (CO_2), or more generally, greenhouse gas (GHG), emissions that were the cause of global climate change.

The aim of such a price would be to get those who emit GHGs to 'internalize', or fully bear, the true cost of the 'externalities'[4] associated with such climate change-causing emissions. The added burden of such a price of emissions would give emitters the incentive to become more carbon-productive in their operations and to switch to less emissions-intensive, primarily non-fossil fuel-based, sources of energy.

There is an already well-functioning CO_2 emissions trading system in the European Union called the 'EU-ETS', in which prices have generally fluctuated between $15 and $25 per metric ton. Initial estimates of an equilibrium price in an equivalent US system put it in a similar range.

Reflecting on the founder's initial interest in self-generated renewable electricity, Mr. Adams decided to use this opportunity to make a preliminary assessment and measurement of

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average US household consumed 920 kWh per month, at a delivered retail cost of ¢11.3/kWh. Industrial and commercial users often pay a lower rate, about 60% - 80% of the residential retail cost.

[4] Economists use the term 'externality' to refer to the outcomes or side effects of economic actions that impact those who are not party to the contract that led to the outcome. Externalities can impose positive or negative side effects. Examples of negative externalities include pollution and CO_2 emissions that impose damage and clean-up costs on society-at-large, while examples of positive externalities would include education systems or physical infrastructure that, say, improve economic productivity.

Simon Pearce's emissions, and to begin to formulate a strategy around reducing the company's overall carbon footprint.

Measurement of Carbon Footprint

Before something can be priced, its quantity must be measured. There are currently reasonably well-developed and increasingly widely-used standards to measure household, commercial, and industrial 'carbon' emissions, or more precisely CO_2e ('carbon dioxide-equivalent') emissions.[5] While some of the standards are still evolving, the measurement protocol that is most commonly used by companies worldwide is the one developed and implemented by the nonprofit organization, GHG Protocol (see ghgprotocol.org).

The 'GHG Protocol Corporate Standard' provides standards and guidelines for firms to measure their GHG emissions. It covers the accounting and reporting of the six greenhouse gases covered by the United Nations' Kyoto Protocol — carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

Emissions fall into three categories, referred to as 'Scope 1,' 'Scope 2,' and 'Scope 3'. These range from directly produced emissions, to indirect emissions associated with purchased energy, to even more indirect emissions attributable to the firm's activities but which occur from sources owned or controlled by another entity. Specifically:

> Scope 1: All 'direct' GHG emissions, where direct emissions are emissions from sources that are owned or controlled by the reporting entity.
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> Scope 2: Indirect GHG emissions from purchased electricity, heat or steam.
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> Scope 3: Other indirect emissions, such as the extraction/production of purchased material, transport-related activities in vehicles not owned by the reporting entity (e.g., employee commuting/business travel), emissions in the supply- or customer-chain (e.g., from the use and disposal of a product), electricity-related activities not covered in Scope 2 (e.g., transmission and distribution losses), outsourced activities, waste disposal, etc.

Measurement of each Scope involves the use of emission 'conversion factors' which relate the amounts emitted to a particular amount of activity performed by the business, the composition of fuels used, and the composition of fuels used in the utilities that supply energy to the business. The composition of fuels will differ with time, and by region. Default values are sometimes used where custom values are difficult to come by.[6]

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[5] Colloquially, the terms 'carbon' and 'CO_2' are often used interchangeably. But some caution is in order. The actual product that is priced and traded in carbon markets is 'CO_2e' or the carbon dioxide-equivalent units of each of six major GHGs (see next paragraph in case text). If a conversion from CO_2 (or CO_2e) to carbon is required, the former has to be divided by 3.67. In other words, one ton of carbon equals 3.67 tons of CO_2 (or CO_2e).

[6] The most comprehensive – although still incomplete, and self-reported – source of global corporate emissions data is the Carbon Disclosure Project (CDP), a UK-based nonprofit organization (see

CO_2e conversion factors that are relevant to the calculation of Simon Pearce's carbon footprint are shown in Exhibit 1.

Potential Projects to Reduce Carbon Footprint

There are only a handful of ways for a company to lower its carbon footprint: become more carbon efficient in its current and future operations, or switch to non-fossil fuel based sources of energy, or buy carbon 'offsets' in open markets,[7] or capture and put away for good the CO_2 that is produced ('carbon capture and sequestration,' or CCS). Of these, only the first three options are realistic for most non-energy producing firms to consider.

Mr. Adams was keen to look at every aspect of his operations to see where he could make Simon Pearce more carbon efficient, but that required a still deeper level of analysis. He directed Steve Holt, Director of Buildings & Operations to assess opportunities in that area.

A more immediate and visible solution would be to power some or all of the company's energy needs with non-fossil fuel-based sources of energy, notably, wind, solar, or small hydro-power generation. Across Simon Pearce's facilities, there are three specific capital projects that he was considering: a wind turbine project in MD, a solar installation in Windsor, VT, or refurbishing and upgrading the small hydro-generation equipment in Quechee, VT, which had not been attended to in nearly three decades.

Professors at Frostburg State University in MD had conducted a year-long wind survey of Simon Pearce's property in Mountain Lake Park, MD. Their findings indicated that a 1.5 mega-Watt (i.e., 1,500 kilo-Watt) turbine would produce enough energy to handle that facility's electricity needs. The assumptions driving the installation and operations of the wind turbine are shown in Exhibit 2a.

Similarly, there was a proposal from a local supplier in Vermont for a solar installation in Windsor, the assumptions for which are shown in Exhibit 2b. Finally, the 50-year old hydro facility in Quechee could be refurbished and increase its capacity from approximately 250kW maximum output to about 400 kW maximum output, and Steve Holt thought that he might be able to apply for Federal grant money. Its assumptions are shown in Exhibit 2c.

The American Recovery and Reinvestment Act of 2009 provides two other incentives to encourage business to develop renewable energy assets. A production tax credit, or PTC, offers

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cdproject.net). Scope 1, 2, and 3 emissions data for hundreds of publicly traded companies worldwide can be found on its website. Currently, approximately two-thirds of the companies in the S&P500 voluntarily report their CO_2e emissions to CDP, although the depth and quality of reporting varies a great deal.

[7] These are financial instruments aimed at reducing GHG emissions. In this market, buyers can purchase offsets to 'pay for' their emissions. For example, a company might purchase carbon offsets to compensate for the emissions caused by employee business travel or coal-based electricity consumed. There are both regulated and 'voluntary' markets. In the US, the market for offsets is unregulated. Offsets are usually made through financial support of projects that reduce GHG emissions, such as renewable energy (wind, solar, hydro), destruction or conversion of methane, and forestry investments.

a tax credit of ¢2.1 per kiloWatt-hour (kWh) for wind- and solar-based energy, and ¢1 per kiloWatt hour (kWh) for incremental hydropower. An investment tax credit, or ITC, allows the owner of the facility to receive a tax credit of 30% of the investment in the year it starts producing power. These incentives are mutually exclusive and businesses must choose either the PTC or ITC.

Mr. Adams was also intrigued by the prospect of being able to access the market for carbon offsets associated with renewable energy projects. However, he was somewhat troubled by the 'sight-unseen' nature of the offsets that he was purchasing, and more than a bit puzzled by the seemingly huge disparity in costs associated with emissions reductions achieved internally versus reductions purchased in the market for offsets. Many firms selling 'verified' emissions reduction certificates were offering to do so – and, in the process, also helping purchasers to develop and design communication tools and media so as to claim 'green'ness – at a cost of $3 to $4 per ton CO_2e in the US, in late 2009.

Going Forward

Given the increasing environmental consciousness of many of its customers and its employees, Rob Adams was also pondering whether and how the focus on carbon footprint reduction could provide opportunities to strengthen Simon Pearce's market positioning or brand identity. Moving ahead on one or more of the projects under consideration could provide the company the opportunity to visibly emphasize their commitment to sustainability. On the other hand, he might also open up Simon Pearce to unnecessary criticism of 'greenwashing,' a potential source of unwanted debate and distraction that he would rather avoid.

At some point in the near future, Rob Adams knew that he would have to make decisions on these projects and the direction of the company, decisions that would impact Simon Pearce in many aspects of their cash flows including potential investments, emissions exposure, and revenue generating brand positioning.

Exhibit 1: CO_2e Emissions Conversion Factors

Source	*Units*	*'000 kg CO_2e/Unit*
Propane	Gallons	0.00193056
Natural Gas	Cubic feet	0.00005440
Diesel Fuel	Gallons	0.01015787
NPCC	kWh	0.00042401
RFCE	kWh	0.00051960
RFCW	kWh	0.00070000
Upstream Shipping	Ton-kms	0.00017220
Upstream Trucking	Ton-kms	0.00027237
Downstream Transport	Pounds (lbs.)	0.00326000
Food	Meals	0.01000000
Gasoline	Gallons	0.00887400

Sources: Conversion factors are calculated from data provided by the GHG Protocol and EPA.

Exhibit 2: Possible Renewable Energy Projects

2a. Wind Turbine Project in Mountain Lake Park, MD

Professors at Frostburg State University, MD, conducted a year-long wind survey of Simon Pearce's property in Maryland. Their findings indicate that a 1.5 Mega-watt turbine would produce enough energy to handle that facility's electric needs. Casewriters estimate the following regarding the project:

- The turbine would cost $2 Million, and an additional $1M for installation, integration and delivery. Thus, initial expense will total $3 million.

- Simon Pearce could finance 40% of this expense with debt, the rest with equity. The debt would attract a government-subsidized 1.5% interest rate, and would be repaid as an annuity over the estimated life of the project, 20 years.

- Turbine cost will be depreciated on a 10-year straight-line basis. (For the purposes of analysis, assume that Simon Pearce is sufficiently profitable).

- The wind resource in Maryland suggests 8.4 mph average wind speed. A 1.5 Megawatt turbine from GE (the 1.5XLE model) would operate at a 12.9% 'capacity factor' given this wind resource. The capacity factor is the actual amount of electricity generated as a percent of the total potential electricity if the turbine produced its name plate capacity all the time. For example, during the year, 1500 kW x 24 hr/day x 365 days = 13,140,000 kWh is total theoretical capacity, but a 12.9% capacity factor would mean the turbine would produce 1,699,000 kWh of electricity annually.

- The current MD electricity tariff (i.e., power that would have to be purchased if not internally produced) is $0.11 per kWh, expected to increase at 2% per year. Operating costs (such as equipment maintenance, insurance, legal, warranty, etc.) would equal $100,000 in the first year, increasing at $3,000 per year.

- Simon Pearce's cost of equity capital for a project such as this is 12%, and there are no expected cash flows after year 20.

2b. Solar Installation in Windsor, VT

A local, VT-based supplier and installer of solar equipment assessed that Simon Pearce would need an installation of 750 kW capacity to meet a significant portion of its Windsor facility power needs. Casewriters estimate the following regarding the project:

- Because of latitude, weather, solar intensity, day/night differences, etc., each solar project gets a "production factor" that accounts for all these variables. The total annual output of a solar array is obtained by multiplying the production factor by the installed capacity. The production factor for Windsor, VT is 1,547.

- Due to degradation of the solar cells, electricity production is expected to decline by 15% over the 20 year life of this project.

- The investment required for this project would be $4.25 per watt. Annual operating and maintenance expenses (including routine repair, site upkeep, insurance, etc.) are expected to be $25,000 per year, increasing at 3% per year.

- Investment cost will be depreciated on a 10-year straight-line basis. (For the purposes of analysis, assume that Simon Pearce is sufficiently profitable).

- The current VT electricity tariff (i.e., power that would have to be purchased if not internally produced) is $0.10 per kWh, expected to increase at 2% per year.

- Simon Pearce could finance 40% of this project with debt, the rest with equity. The debt would attract a government-subsidized 1.5% interest rate, and would be repaid as an annuity over the life of the project, 20 years.

- Simon Pearce's cost of equity capital for a project such as this is 12%, and there are no expected cash flows after year 20.

<u>2c. Hydroelectric Facility in Quechee, VT</u>

The hydro-electric turbine generator at Quechee is 50-year old technology. Steve Holt has applied for Federal grant money to help offset some of the costs associated with refurbishing the generator. This work involves a range of tasks including optimizing the turbine blade design, clearing the path of the water flow and increasing the speed capacity of the generator.

- Simon Pearce's realized maximum power production from the Quechee facility could increase from ~250 kW to ~420 kW. In other words, each hour that it ran at full power, it would produce 420kWh of electricity. The plant currently operates at 70% capacity, and is expected to operate at 70% capacity after the project.

- The refurbishment would cost $300,000, of which $200,000 could conceivably be funded by the Federal government in a grant for 'green' energy. Failing that, Simon Pearce could apply for a loan with financial terms similar to that for the wind installation.

- The project would require shutting down the hydro-electric generator for 3 months while the work is completed.

- The current VT electricity tariff (i.e., power that would have to be purchased if not internally produced) is $0.10 per kWh, expected to increase at 2% per year. Operating costs would equal $15,000 in the first year, increasing at 3% per year.

- The improvements are expected to be effective for 15 years, after which wear will eliminate the benefits and another renovation may be completed. Essentially, this can be viewed as a 15-year project with no cash flows after that time.

- Simon Pearce's cost of equity capital for a project such as this is 12%, and there are no expected cash flows after year 15.

Source: Casewriter estimates.