

Cost-Benefit Analysis of Fossil Fuel Divestment

SUST 3502

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Executive Summary

Anthropogenic climate change is impacting the lives of people around the world; many institutions have, therefore, committed to reducing their greenhouse gas emissions (Cabusch et al). Fossil fuel investment, the act of selling off subsidiary investments, is one tool for targeted environmental impact reduction. Divest Dalhousie (n.d. a) is a student group campaigning for Dalhousie University to divest its endowment fund from the top 200 fossil fuel companies (Top 200); one concern with divestment is the potential negative impact on the fiduciary responsibility to Dalhousie's investors (Dalhousie Board of Governors, 2014). In this report, we examine the returns on investment for Dalhousie's endowment fund holdings in the Top 200; we then compare these returns to a hypothetical renewable energy portfolio. Our findings suggest that Dalhousie's Top 200 investments generated a negative return rate in the 2017/2018 fiscal year. Our hypothetical renewable energy portfolio generated a higher return. We also discuss the implications of diversification and risk, as well as longer timelines for investments.

Background

Climate change can have a serious impact on the livelihoods of many people around the world, especially those who live in coastal and/or farming communities. Probabilities of extreme weather events, such as droughts or floods, increase with a changing climate (Cubasch et al.). Changes in seasonal variation, such as precipitation patterns, are also attributed to climate change, and these changes can be detrimental for farmers who rely on a stable climate (Cooper et al., 2017). Climate change is also the likely culprit of the increased rate of global sea level rise, as land ice melts and the sea warms (Cubasch et al.). The quickly rising sea is already threatening many low-lying coastal communities, and this threat is only expected to increase (Nerem, Beckley, Fasullo, Hamlington & Mitchum, 2018). By investing in companies that emit high levels of greenhouse

gases (GHGs) that cause climate change (Cubasch et al.), Universities are perpetuating issues that affect people's basic needs, like food and shelter.

Dalhousie University (2010) is committed to decreasing its own GHG emissions, with a 2050 goal of net zero emissions. Dalhousie evidently wants to become a part of the climate change solution instead of part of the problem. Dalhousie's endowment fund is still invested in companies that are on the list of the top 200 GHG emitters (Top 200; Dalhousie Board of Governors, 2014), however, and a commitment to reducing global GHG emissions is not part of Dalhousie University's (2017 a) Statement of Investment Policies and Guidelines of the Endowment Funds. In its Climate Change Plan, Dalhousie University (2010) recognizes the issues caused by climate change and sets ambitious goals for itself. If Dalhousie reaches its goal of net zero emissions by 2050 but still holds investments in Top-200 companies, it is still part of the problem. The top 100 GHG emitting companies are responsible for 71% of total emissions, so investing in these companies has a substantial global impact (The Carbon Disclosure Project [CDP], 2017).

Ending fossil fuel investment and sponsorship is called "fossil fuel divestment" (Fossil Free: Divestment, N.D. a). The divestment movement has become increasingly global and the pressure for social responsibility has led to a number of universities committing to divest from fossil fuel holdings (Fossil Free: Divestment, N.D. b). In 2017, Université Laval was the first Canadian university to publicly commit to divestment from fossil fuel holdings and announce its ranking as second in the world for sustainable development (Cox, 2017). In 2008, Unity College made the commitment to gradually divest from fossil fuel holdings and in 2013 reported that their portfolio has met or exceeded all benchmarks over the course of 5 years (Unity College, 2013). The Vice President of Finance and Administration at Unity College states that divesting from the top 200 fossil fuel companies is predicted to have no negative impact on future returns (Unity

College, 2013). The Environmental and Energy Study Institute says that some reports indicate universities may actually be beginning to lose money on investments in fossil fuel holdings and that future returns for fossil fuel investments are predicted to continue to decline (Galbreath, 2016). Universities that have committed to divestment have demonstrated both social and economic benefits by reducing their environmental carbon footprint and making considerable returns on investments.

Dalhousie students care about the way their university chooses to invest its money. Divest Dalhousie (N.D. b) has a strong presence on campus, and the Dalhousie Student Union supports the divestment movement. Despite the pressure from students and Divest Dalhousie, in 2014 Dalhousie's Board of Governors ruled against divestment. One of the reasons Lawrence Stordy, The Chair of the Dalhousie Board of Governors (2014), gave for choosing not to divest from fossil fuels was that it would threaten the university's returns on its investments; "In order to reach a decision on divestment, the Board must consider its fiduciary duty to generate reasonable risk adjusted returns from a diverse portfolio of investments, taking into account the wishes of its benefactors" (Dalhousie Board of Governors, 2014, para. 6). This paper seeks to answer the following question: what were the financial implications of investment in the Top 200 fossil fuel companies as compared to divestment and hypothetical renewable portfolio investments for Dalhousie University in 2017/2018 fiscal year?

We will investigate returns on divestment for Dalhousie University using a Cost Benefit Analysis (CBA). The focus will be the expected change in Dalhousie's 2017/2018 return on investment, had the Board of Governors chosen to divest completely in 2017, investing in renewable energy instead. We will compare Dalhousie's returns on Top-200 fossil fuel investments to theoretical returns on renewable energy investments. The CBA will test our

hypothesis that Dalhousie University's returns would have increased from 2017/2018 had they divested from fossil fuels, in favour of renewable energy investments, in 2017.

Methods

In this Cost-Benefit Analysis of theoretical 2017 Divestment at Dalhousie, we considered Dalhousie University's 2017 investments in the top 200 fossil fuel companies and theoretical investments in renewable energy. Dalhousie University's (2017, b) investment portfolio was obtained, which is publicly available on their website, and access to the Fossil Free Indices' list of the top 200 fossil fuel companies was gained through the student group Divest Dalhousie. This list of the top-200 fossil fuel companies was determined by looking at the carbon assets of each company in 2017 (Fossil Fuel Indices, 2017). We then searched Dalhousie's 2017 endowment investments to find out if and how much they invested in each of the listed companies. Dalhousie investments in parent and subsidiary companies of top-200 fossil fuel giants were also included in this study. Upon obtaining the information which details exactly how much money Dalhousie invested in each company in 2017 and publicly available stock information from Bloomberg Marketwatch, we calculated Dalhousie's 2017-2018 return on its 2017 fossil fuel investments. For each company, we multiplied the one year return (from Bloomberg) by Dalhousie's 2017 investment amount, which is publicly available information. The fossil fuel companies were categorized based on Dalhousie's investment portfolio. Companies were categorized as United States (US) equity holdings, fixed income holdings, and International/Canadian equity holdings.

After this assessment of Dalhousie's returns on investment for the money held in fossil fuel equities, we analyzed alternative investment opportunities. We constructed sustainable energy portfolios, categorized in the same way as the fossil fuel companies, and determined each portfolio's return on investment for the 2017-2018 fiscal year. For each category, the total amount invested in fossil fuel companies was divided evenly between the corresponding renewable energy companies. We considered companies in various renewable energy sectors, such as solar power, wind power, hydropower, and geothermal power, as well as general renewable energy companies.

The construction of these hypothetical portfolios followed typical investment strategies, such as diversifying risk and maximizing profit. We decided which companies to consider in our final analysis by looking at how each company's stocks performed over the past 5 years, being careful to make decisions with information that would have been available in 2017. Upon obtaining and preparing the aforementioned data, a Cost-Benefit Analysis (CBA) compared theoretical renewable energy returns and true fossil fuel returns from 2017 to 2018.

This study makes the assumption that Dalhousie would have invested its 2017 fossil fuel holdings in renewable energy upon divestment. Comparing fossil fuel investments to renewable energy investments is the focus of this study; we do not suggest that this an advisable divestment strategy. Furthermore, for each category, we assumed equal investments in the renewable energy companies. We did not make individual assumptions about investments in each company because we could not do so systematically. This is a limitation, however, because it is unlikely that Dalhousie would invest in this way. The categorization of the data is also a limitation. The returns of each group would, likely, change drastically with re-categorization, although the total returns would remain the same. Another limitation of this study is that it has only been completed on a small temporal scale of one year. We chose not to predict the future of the stock market in this analysis, because stock market predictions are not always entirely correct. This is a substantial limitation, however, as the past year's stock price fluctuations may not accurately represent the future of the companies. Finally, we collected our data on yearly returns on investment for the Top 200 in late-February and early March. This method implies an assumption that yearly returns on investment will approximate one another day-to-day in the period; in other words, we assumed that the fossil fuel industry did not experience a market supply or demand shock in late February. Although the results of our CBA cannot be generalized to future implications of divestment, they are useful as a comprehensive comparison of Dalhousie's returns on 2017 investments in top-200 fossil fuel companies and theoretical 2017 investments in notable renewable energy companies.

Results

Including parent companies and subsidiaries, Dalhousie University invested in 32 top-200 fossil fuel companies in 2017 (Top 200; Appendix, Table 1). These investments amounted to \$8,906,472.00 and lost the school \$745,747.94 in the 2017/2018 fiscal year (Table 1). Most of Dalhousie's fossil fuel investments were in oil and gas companies in 2017, and these investments accounted for \$721,336.16 of the total 2017/2018 loss, with an average loss of 10.38% in the 2017/2018 fiscal year (Table 1). Dalhousie's investments in parents and subsidiaries of top fossil fuel companies also, on average, experienced a 2018/2018 loss of 3.33% (Table 1). Inversely, coal investments had a positive average return of 0.88% over the same time period (Table 1). At \$5,533,611.00, Canadian and international equity holdings accounted for more than half of the \$8,906,472.00 invested in fossil fuel companies in 2017 (Table 2). Canadian and international companies had the lowest average 2017/2018 return (-11.02%) compared to United States (US) equity holdings and fixed income holdings, which had average 2017/2018 returns of -7.52% and 11.06% respectively (Table 2). Of the \$745,747.94 loss, \$609,650.86 was lost in Canadian and international investments in the 2017/2018 fiscal year (Table 2).

If Dalhousie moved its money from fossil fuel companies to renewable energy companies using the method considered here, all categories of investments would have experienced positive returns, totaling 1,003,909.53 (Table 3). If 2017 US fossil fuel equity holdings were instead invested in US renewable energy companies, the 2017/2018 return would have been \$752,002.04, an average return of 28.84%, which was the largest return of the three theoretical portfolios (Table 3). In fact, the theoretical US renewable energy equity holdings had the largest average return of any of the categories considered, fossil fuel or otherwise (Table 1, Table 2, Table 3). Subtracting the total 2017/2018 loss from 2017 fossil fuel investments from the theoretical total 2017/2018

gain from renewable energy investments, the difference between renewable energy and fossil fuel returns was found to be \$1,749,657.48.

Table 1: Dalhousie University's 2017 investments in top-200 fossil fuel companies and 2017/2018 returns on investment by company type (Dalhousie University, 2017b;).

Category	Amount Invested	Amount gained/lost	Average Return (%)
Oil and Gas	\$ 6,948,937.00	\$ (721,336.16)	-10.38
Coal	\$ 970,202.00	\$ 8,504.11	0.88
Parent & Subsidiary Companies	\$ 987,333.00	\$ (32,915.89)	-3.33
Total	\$ 8,906,472.00	\$ (745,747.94)	-8.37

Table 2: Dalhousie University's 2017 fossil fuel investments and 2017/2018 returns on investment by equity holding category (cite data).

Category	Amount Invested	Amount gained/lost	Average Return (%)
United States Equity	\$ 2,740,718.00	\$ (206,010.67)	-7.52
Fixed Income	\$ 632,143.00	\$ 69,913.59	11.06
Canadian & International Equity	\$ 5,533,611.00	\$ (609,650.86)	-11.02
Total	\$ 8,906,472.00	\$ (745,747.94)	-8.37

Table 3: Theoretical 2017 renewable energy investments and 2017/2018 returns on investment by portfolio category (cite data).

Category	Total invested	Amount gained/lost	Average return (%)
United States Equity	\$ 2,740,718.00	\$ 752,002.04	28.84
Canadian & international Equity	\$ 5,533,611.00	\$ 221,943.91	4.01
Fixed income	\$ 632,143.00	\$ 29,963.58	4.74
Total	\$ 8,906,472.00	\$ 1,003,909.53	11.27

Table 4: A cost-benefit analysis of 2017 Dalhousie University divestment, based on actual fossil fuel returns and theoretical renewable energy returns.

Fossil Fuel Return on Investment (costs)	Renewable Energy Return on Investment (benefits)	CBA (benefits - costs)
\$ (745,747.94)	\$ 1,003,909.53	\$ 1,749,657.48

Discussion

The objective of this project was to analyze the financial feasibility of divestment from fossil fuel holdings. This project aimed to determine the returns on investments if Dalhousie University divested from the top 200 fossil fuel companies in 2017. As well, a theoretical portfolio determined the returns on investments if Dalhousie were to instead invest in renewables. Through conducting a cost-benefit analysis it was found that divestment from fossil fuel holdings in 2017 would have increased overall returns. In the 2017/2018 fiscal year, Dalhousie had a negative return \$745,747 from holdings that were listed in the top 200 fossil fuel companies. A theoretical portfolio shows that if Dalhousie had invested the money into renewable companies, they would have seen a return of \$752,002.04 from US renewable energy companies alone (Table 2). Compared to the 7.52% loss United States equity holdings in fossil fuel companies experienced, this is a substantial improvement. As a whole, the returns on investments in renewable energy companies had a total gain of \$1,003,909.5, while the returns on investments in fossil fuel companies had a total loss of \$745,747.94 (Table 4). Thus, the benefits of divestment outweighed the costs in the 2017/2018 fiscal year.

The results of this project address the concerns of the board of governors regarding the financial impacts of divestment and the risk of insufficient returns. The results from the cost-benefit analysis provide evidence that divestment would have maximized 2017/2018 returns. Notably, Dalhousie receives endowment gifts that could potentially influence financial incentives to maintain investments and foster relationships with certain companies. However, in the Statement of Investment Policies and Guidelines of the Endowment Funds, accepting fees, brokerage, commission, or gifts creates a conflict of interest and shall not influence investment holdings (Dalhousie University, 2017a). As these external gifts should not influence the investment decisions, they were not included in the cost-benefit analysis. In article 5.7 of the

Statement of Investment Policies and Guidelines of the Endowment Funds also states that “Dalhousie University believes that over the long term, companies that exhibit responsible corporate behavior with respect to environmental, social and governance (ESG) factors, will have a positive impact on long-term financial performance” (Dalhousie University, 2017a). If cost benefit analyses continue to follow this trend of negative returns on fossil fuel investments, Dalhousie will have to divest from top 200 fossil fuel companies to avoid contradicting its own policies and guidelines.

Government restrictions on carbon emissions may pose future risks for investment holdings in fossil fuel companies. To meet emission reduction pledges, governments may introduce and enforce carbon pricing policies (Kang et al., 2017). This would have significant negative impacts on investment returns if Dalhousie doesn’t shift away from a portfolio based in fossil fuel companies. Oil prices have a history of being particularly volatile, and the volatility of oil prices are predicted to continue in future years (Diaz et al., 2016). Oil price volatility can have negative impacts on stock returns (Diaz et al., 2016). Advances in renewable energies also shows promise for future investments. Shifts in demand towards renewable energy will further devalue fossil fuels. Divestment strategies to begin to shift away from fossil fuels towards renewable energy will allow for a more diversified portfolio in the future. Due to the declining cost of solar energy, in 2032 it is predicted that solar capacity will surpass coal-fired electricity capacity and in 2039 surpass all fossil fuel capacity (Bullard, 2017).

This cost-benefit analysis also doesn’t take into account the social costs and benefits of divestment. Various social factors could be valued and included to create a more comprehensive cost-benefit analysis. Renewable energy technologies emit little to no greenhouse gas emissions during operations. This is in contrast to the 29% of greenhouse gas emissions that come

predominantly from fossil fuels and natural gas (Union of Concerned Scientists [UCSUSA], N.D.). There are also many risks associated with the emissions from coal and natural gas. Links between the pollution from greenhouse gas emissions can cause breathing problems, neurological damage, heart attacks etc. (UCSUSA, N.D.). Harvard University estimated that the public health issues as a result of coal pollution is \$74.6 billion USD every year (UCSUSA, N.D.). Renewable energy sources do not emit air or water pollutants. As well, fossil fuels such as coal and gas are exhaustible. Sources of fossil fuels will continue to deplete and this could exacerbate an already volatile market. The creation of jobs from an expanding renewable energy sector is a social benefit that could be quantified for a social cost-benefit analysis. The jobs in the fossil fuel industries are largely mechanized and not as labor intensive as the renewable sector. More jobs are created on average for each unit of electricity generated from renewable sources than fossil fuels (UCSUSA, N.D.).

Conclusion

In the 2017/2018 fiscal year, Dalhousie's fossil fuel investments had a negative return. Renewable energy investments would have been more financially viable over this one-year period. Reasonable policy recommendations cannot be made with investment information from just one year, however. Therefore, future studies should look at returns on fossil fuel investments and alternatives on a larger temporal scale. In order for this to be possible, Dalhousie needs to release more of its investment information. In 2018, Dalhousie's 2017 report on its investment holdings was readily available on its website; however, there was no easily accessible archive of past reports (Dalhousie University, 2017b). We recommended that Dalhousie make its past investment reports available alongside more recent reports, so studies regarding the financial implications of divestment can be more comprehensive. As discussed above, future cost-benefit analyses should

also attempt to quantify the costs and benefits of divestment that go beyond returns on investment.

This study reveals a snapshot of returns on Dalhousie's fossil fuel investments and potential renewable energy returns; the results suggest that these investments may not be fiscally responsible. Therefore, more research should be carried out to address the question of whether or not fossil fuel investments are more profitable for Dalhousie than alternative investments.

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Appendix

Table 1

Company Type, Equity Holding, & Name	Amount Invested (CAD)	Yearly Returns	Gain/Loss (CAD)
Oil and Gas Companies			
<i>US equity</i>			
Exxon Mobil Corporation	\$ 240,618.00	-2.72	\$ (6,544.81)
Chevron Corporation	\$ 229,109.00	5.75	\$ 13,173.77
Conocophillips	\$ 246,082.00	17.65	\$ 43,433.47
Hess Corp	\$ 212,173.00	-9.79	\$ (20,771.74)
Southwestern Energy Co	\$ 228,813.00	-58.76	\$ (134,450.52)
QEP Resources Inc	\$ 60,681.00	-48.55	\$ (29,460.63)
Murphy Oil Corp	\$ 247,837.00	-1.79	\$ (4,436.28)
SM Energy Company	\$ 47,147.00	-18.64	\$ (8,788.20)
WPX Energy Inc	\$ 105,263.00	3.18	\$ 3,347.36
Gulfport Energy Corp	\$ 54,577.00	-55.08	\$ (30,061.01)
Energen Corp	\$ 104,223.00	-5.88	\$ (6,128.31)
National Fuel Gas Company	\$ 100,912.00	-13.84	\$ (13,966.22)
<i>Fixed Income</i>			
Canadian Natural Resources	\$ 208,920.00	-6.27	\$ (13,099.28)
Suncor Energy	\$ 107,710.00	9.68	\$ 10,426.33
Husky Energy	\$ 124,480.00	9.51	\$ 11,838.05
<i>International/Canadian Equity</i>			

Canadian Natural Resources	\$ 60,089.00	-5.59	\$ (3,358.98)
Suncor Energy	\$ 1,406,716.00	8.34	\$ 117,320.11
Seven Generations Energy	\$ 726,743.00	-37.31	\$ (271,147.81)
Encana	\$ 35,713.00	3.6	\$ 1,285.67
BP	\$ 255,507.00	8.29	\$ 21,181.53
Gazprom	\$ 51,666.00	19.46	\$ 10,054.20
Imperial Oil	\$ 102,916.00	-14.29	\$ (14,706.70)
Royal Dutch Shell	\$ 235,582.00	12.62	\$ 29,730.45
Total SA	\$ 412,744.00	7.15	\$ 29,511.20
Cenovus Energy	\$ 1,342,716.00	-33.94	\$ (455,717.81)
TOTAL OIL & GAS	\$ 6,948,937.00		\$ (721,336.16)
Coal Companies			
<i>US equity</i>			
CONSOL Energy Inc	\$ 59,249.00	4.46	\$ 2,642.51
Black Hills Corp	\$ 70,496.00	-13.82	\$ (9,742.55)
FirstEnergy Corporation	\$ 212,182.00	11.53	\$ 24,464.58
<i>Fixed Income</i>			
Teck Resources	\$ 191,033.00	31.8	\$ 60,748.49
TOTAL COAL	\$ 532,960.00	N/A	\$ 8,504.11
Parent & Subsidiary Companies			
<i>US equity</i>			
CNO Financial Group Inc	\$ 70,917.00	12.45	\$ 8,829.17
United Continental Holdings Inc	\$ 376,833.00	-12.43	\$ (46,840.34)
Cabot Corp	\$ 73,606.00	12.62	\$ 9,289.08
Canadian/International			
Mitsui Fudosan Co	\$ 465,977.00	-0.9	\$ (4,193.79)
Mitsubishi Estate Company, Limited	\$ 437,242.00	-15.92	\$ (69,608.93)
TOTAL PARENT & SUBSIDIARY	\$ 1,424,575.00	N/A	\$ (32,915.89)
GRAND TOTAL	\$ 8,906,472.00	N/A	\$ (745,747.94)

Table 2

Company <i>Equity Holding</i> & Name	Amount Invested (CAD)	Yearly Returns	Gain/Loss (CAD)
<i>US equity</i>			
Renewable energy group	\$ 274,071.80	14.14%	\$ 387.54
Canadian Solar Inc.	\$ 274,071.80	14.70%	\$ 40,288.55
Sunrun Inc.	\$ 274,071.80	53.00%	\$ 145,258.05
First Solar Inc.	\$ 274,071.80	110.67%	\$ 303,315.26
Iberdrola SA	\$ 274,071.80	15.60%	\$ 42,755.20
Calpine co.	\$ 274,071.80	0.79%	\$ 2,165.17
NRG Yield Inc.	\$ 274,071.80	7.56%	\$ 20,719.83
US Geothermal Inc	\$ 274,071.80	24.02%	\$ 65,832.05
CPN	\$ 274,071.80	32.17%	\$ 88,168.90
Ormat Technologies	\$ 274,071.80	15.73%	\$ 43,111.49
TOTAL	\$ 2,740,718.00	N/A	\$ 752,002.04
<i>Fixed Income</i>			
Insight Renewable Energy Fund	\$ 158,035.75	13.26%	\$ 20,955.54
TIAA-CREF Social Choice Bond Fund	\$ 158,035.75	2.55%	\$ 4,029.91
Calvert Green Bond Fund	\$ 158,035.75	1.52%	\$ 2,402.14
Praxis Impact Bond Fund	\$ 158,035.75	1.63%	\$ 2,575.98
TOTAL	\$ 632,143.00	N/A	\$ 29,963.58
<i>International/Canadian Equity</i>			
China Yangtze Power Co., Ltd.	\$ 461,134.25	32.66%	\$ 150,606.45
Brookfield Renewable Partners LP	\$ 461,134.25	10.32%	\$ 47,589.05
IDACORP Inc	\$ 461,134.25	-8.99%	\$ (41,455.97)
Portland General Electric Company	\$ 461,134.25	-7.57%	\$ (34,907.86)
Innergex Renewable Energy Inc	\$ 461,134.25	0.06%	\$ 276.68
Siemens Gamesa Renewable Energy SA	\$ 461,134.25	-28.41%	\$ (131,008.24)
TransAlta Renewables Inc.	\$ 461,134.25	-17.89%	\$ (82,496.92)
Falk Renewables SpA	\$ 461,134.25	127.76%	\$ 589,145.12
Synex International Inc	\$ 461,134.25	11.36%	\$ 52,384.85
Good Energy Group	\$ 461,134.25	-51.81%	\$ (238,913.65)
Pattern Energy Group	\$ 461,134.25	-3.23%	\$ (14,894.64)

Vestas Wind Systems A/S	\$ 461,134.25	-16.13%	\$ (74,380.95)
TOTAL	\$ 5,533,611.00	N/A	\$ 221,943.91
GRAND TOTAL	\$ 8,906,472.00	N/A	\$ 1,003,909.53