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Article

Renewable Energy Initiatives at Canadian Sport Stadiums: A Content Analysis of Web-Site Communications

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Abstract: Researchers have positioned renewable energy as sustainable and able to mitigate environmental issues associated with fossil fuels. Further, sustainable initiatives have been offered as a point of differentiation for brands. In order to reap the benefits of such differentiation, managers must communicate the initiatives to relevant stakeholders. The research question guiding the current investigation thus was: What is the communication by Canadian sport stadium operators to calls for sustainable initiatives, specifically in the area of renewable energy? The examination included the 15 sport stadiums that hosted a professional team in Canada and their web-based *stadium communications on renewable energy* (SCORE). Understandings and competencies in renewable energy are proposed as a new function of sport stadium management; communication of these competencies is seen as a key point of differentiation and best practice.

Keywords: renewable energy; sustainability; communications; sport; Canada

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1. Introduction

The world economy is dependent upon energy from fossil fuel sources to meet its needs, and ensuring a stable source of energy is a growing concern. The consumption of fossil fuel energy from traditional sources such as oil, coal, and natural gas however generates pollution, such as greenhouse gases. This pollution issue "is by definition *global*" [1], involving every business sector, including sport. In this context, the environment should be considered a primary stakeholder of sport

and sport sustainability should be a managerial priority [2]. This sector, thus, provides the focus of the current investigation.

A transition to renewable energy has been noted as necessary to meet a "critical need…and overcomes various problems associated with the existing power system" [3]. Indeed, renewable energy can help to mitigate the greenhouse gas situation and can be used to offset the growing issues associated with declining oil production and increased difficulty with respect to extraction. Importantly, technology exists today to meet the call for renewable energy. Renewable energy is part of the solution to reduce dependence on fossil fuels by 70 percent by 2040 and offer savings of nearly $5.5 trillion per year [4]. Currently, the contribution of renewable energy to the world's energy needs has been positioned as high as 15%–20% [3]. This contribution however "is expected to increase to 60% by 2070" [5]. Understanding renewable energy in all sectors of society is, thus, important to reach the predicted need to reduce our demand for fossil fuels.

Environmental sustainability was defined by The United Nations' (UN) Brundtland Report as safeguarding the natural environment for current and future generations [6]. One conceptualization of environmental sustainability includes "the promise of … limitless pollution-free energy" [7]. Here, the Organization for Economic Co-operation and Development predicted the years 2010 to 2020 as being important in this promise and "could prove to be a watershed [time period] in the transition of energy systems" [8]. As organizations embrace this transition a myriad of positive results could occur; one such outcome includes enhanced organizational brand perception. Communication of renewable energy initiatives to the numerous stakeholder groups associated with an organization therefore should be a managerial priority. Indeed, the prioritizing of sustainability communications as a tool for shaping brand perceptions has been acknowledged before [9,10].

Historically sport organizations have relied on the media to disseminate organizational information. Given the advances in technology however there now exists "unique and distinct advantages for sport entities because they are able to communicate unfiltered messages directly to consumers" [11]. This direct access to consumers provides sport managers with a new and profound way to manage the brand. It appears that an understanding of brand management is worthy for any sport manager, including those responsible for sustainability initiatives; thus a brief look at brand theory will follow.

It has been noted that whenever a "brand interacts with, and makes an impression on, customers, employees, and other stakeholders" [12] brand perceptions are forged. Indeed, a brand's equity is derived from the totality of perceptions that individuals hold regarding the brand [13]. Over the past two decades, authors have focused attention on managing perceptions through building brand awareness, managing opinions on quality, and promoting loyalty [14,15]. Indeed, brand managers must take control over every organizational touch point to manage how the brand is perceived. Indeed, "utilizing all organization-to-stakeholder communication channels (*i.e.*, web communications) to promote brand-building initiatives could assist in enhancing brand loyalty" [9].

The purpose of the current study, thus, was to enhance understandings of the web-communications of renewable energy initiatives at professional sport facilities in Canada. The significance and managerial implications of such an investigation are threefold. Either, (1) facility managers are not currently engaged in renewable energy initiatives; (2) facility managers are engaged in renewable energy initiatives but are missing brand-building opportunities by failing to communicate their contribution to sport sustainability; or, (3) facility managers are engaged in both renewable

energy initiatives and brand-building endeavors. Here, sport facilities falling into one of the first two categories risk potential brand erosion. Thus, the research creates, in part, an audit of the communications concerning renewable energy initiatives currently being implemented at Canadian sport stadiums.

The researchers of the current study were guided by the research question: What is the communication by Canadian sport stadium/facility operators to the call for sustainability, specifically in the area of renewable energy? Here, Horne notes that sport facilities are "part of the legacy of sport…both positive and negative" [16].

The remainder of this paper will progress as follows: first, the role and primary sources of renewable energy will be introduced. This will be followed by a discussion on sport and environmental sustainability. Next, a review of the methods utilized in the investigation will be offered. Research data on Canadian sport stadiums and renewable energy will then be presented and discussed prior to the study's concluding section.

1.1. Renewable Energy

Traditional renewable energy sources include solar, wind, biomass, and geothermal energy. It is also important to note that there are additional, less conventional sources of renewable energy. For instance, a mechanism placed inside a soccer ball can produce energy from the vibrations generated as it is kicked. While innovative supplies of renewable energy certainly are noteworthy, the focus of the current investigation is on the contemporary, renewable energy sources including solar, wind, biomass, and geothermal. Purchasing of carbon offsets will also be considered in the context of renewable energy. While not a strategy for generating renewable energy directly, in this manuscript, an organization purchasing offsets is seen as being *involved* in renewable energy as they are providing foundational support for renewable energy projects.

1.2. Sport, the Environment and Energy Usage

"Major sports events consume considerable amounts of electricity, much of which is produced by burning fossil fuels, such as coal and oil" [17]. Indeed, the environmental impacts of large-scale sport events have come under scrutiny. For example, a major sport event, such as the FIFA World Cup of soccer, has the energy impact equivalent to 3 million kilowatt hours of energy (similar to the energy consumption needed to meet the demands of 700 household's annually in Europe) [18]. Further, sports such as skiing [19,20], ice hockey [21], and golf [22] have also been noted for their impact on the environment. Emery indicates that an "outward looking global focus of more sustainable management practice" [23] is a desirable goal. Here, programs have been developed to stimulate and guide the adoption of environmental activities within organizations, including renewable energy initiatives. For instance, the United States Green Building Council manages the Leadership in Energy and Environmental Design (LEED) program throughout North America. Additional examples include the European Eco-Management and Audit Scheme (EMAS) as well as the Ecology Energy Saving, Waste Reduction and Health (EEWH) in Taiwan. Thus, while attention to the environment has now proliferated into management discussions at major sport organizations and "teams are increasingly recognizing the value of sustainability initiatives" [24], there is much more to be done. For example,

an analysis of 21 sport-related journals published from 1987 to 2008 determined that there was a low level of research on sport and the natural environment [25]. The authors of this manuscript thus proposed a multiple case study to create, in part, a preliminary audit of Canadian sport stadiums' renewable energy initiatives based on their web-site communications. Here, Canadian sport facility managers have been challenged to make their stadiums world leaders "in the efficient and effective use of energy and resources" [2], including options of renewable energy. Further, communication of sport sustainability initiatives (*i.e.*, renewable energy) could be viewed as an instrument for enhancing a brand's equity. For these reasons the current investigation of value.

2. Method

This research involved a multi-case content analysis of major Canadian sport stadiums' web-based communications concerning renewable energy. Content analysis was described as "a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use" [26]. The methodological framework for this content analysis was based upon an adaptation of existing works [26,27]. Data collection included steps that outlined the sample, the unit of text, the coding themes and subthemes. Data analysis included steps that involved outlining the process, the analytical factors, and the coding mode. Each will be discussed in more detail next.

2.1. Data Collection

The multi-case strategy involved relevance sampling. To be considered a major sport facility in this manuscript, the facility must be home to a team in one of the following professional sport leagues: the National Hockey League (NHL), the Canadian Football League (CFL), the National Lacrosse League (NLL), the National Basketball Association (NBA), Major League Soccer (MLS) and Major League Baseball (MLB). The sample is outlined in Figure 1.

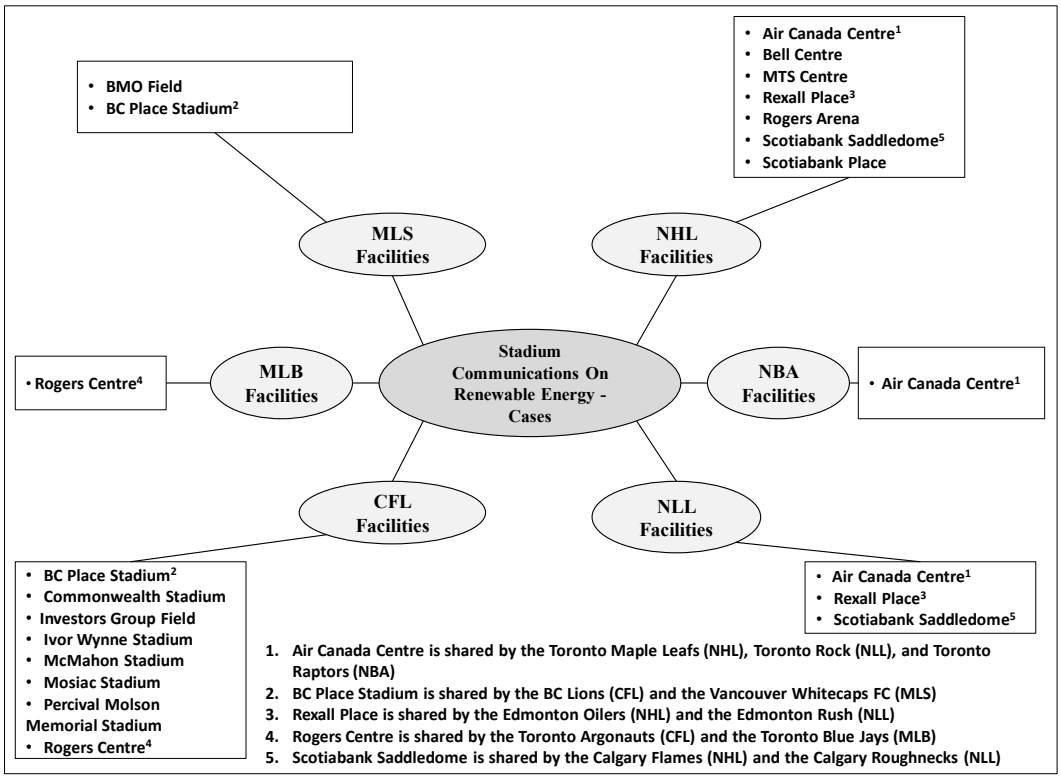
It is important to note that one sport facility, the Canad Inns Stadium in Winnipeg, Manitoba was eliminated from the study due to it being in a transitional situation. This facility was in the process of being sold and demolition plans were underway. Also, the Montreal Impact did not join MLS until the summer of 2012 and, therefore, their home facility was not included in this study. There were, thus, 15 sport stadiums under examination.

To begin, data on the architect, the year the facility opened, the owner and seating capacity was collected for each facility. Next, each unit of text consisted of the web-based communications concerning renewable energy at the sport stadiums listed above; communications had to be posted before 1 January 2012. The source of communications was the website for each sport facility. These communications are now referred to as *Stadium Communications on Renewable Energy (SCORE)*.

There were two coding themes derived from an adaptation of the environmental measurement tool called the Sport Event Environmental Performance Measurement (*SE-EPM*) [28]. The themes included the *environmental operational performance* and the supporting *environmental organizational system*. The sub-themes within the environmental operational performance theme included embracing renewable energy strategies, environmental disclosure, measuring, tracking, quantification and comparability of disclosed information, and the level of renewable energy utilization. The sub-themes within the environmental organizational system theme included environmental policies, programs,

targets, funding, auditing, education and the implications of renewable energy. Further, the study was open to emergent themes.

Figure 1. Major Canadian sport facilities included in SCORE analysis.



It is important to note that many of the sport stadiums had environmental programs, such as the installation of building automation systems to ensure energy savings and the use of energy efficient light bulbs. In this manuscript, however, these types of programs were considered to be energy saving programs and not renewable energy strategies. Also, some facilities had major installations, such as the BC Place roof panels that were made of Ethylene Tetrafluoroethylene (ETFE) that consisted of a semi-transparent material to allow the transmission of natural light into the stadium from the roof; these panels were noted to save over 20 percent of the stadium's annual energy costs [29]. Again, these types of major installations were considered energy saving activities rather than renewable energy initiatives. This research focused only on the communication of renewable energy initiatives for the stadium specifically, and not the tenants of the sport stadiums—even if the tenant supported renewable energy or other sustainability endeavors, such as the Montreal Alouettes. Indeed, this team was noted to "have become the first Canadian professional team to go carbon-neutral" [30]; "the club will annually offset 400 tonnes of CO_2". Tenants or clubs in the four major North American team sport leagues, while outside the focus of this study, have been previously discussed [24].

2.2. Data Analysis

The data were analyzed separately by two of the researchers. The data analysis boundaries were set by the analytical factors stated in the *SE-EPM* [28]. The coding mode in this study involved human coding with a manual search of the web-based communications. The two researches each analyzed the

data separately and then held multiple discussions to ensure familiarity with the themes, subthemes, coding requirements and then to review and determine their agreement concerning the results.

3. Results and Discussion

In this investigation, 15 major sport stadiums that, in 2011, were home to Canadian professional sport teams from the NHL, CFL, NBA, NLL, MLS, and MLB were examined. The examination involved the stadium communications on renewable energy (SCORE) posted before 1 January 2012. Two themes, the *environmental organizational system* and the *environmental operational performance* and their sub-themes with respect to renewable energy, provided the focus for the investigation. The results are outlined below in Table 1.

Table 1. Canadian sport stadiums and renewable energy.

Air Canada Centre (Toronto, Ontario) [31] Year Facility Opened: February 1999 Architect: Brisbin Brook, Beynon Architects Owned by: Maple Leafs Sports & Entertainment (MLSE) Ltd. Seating Capacity: 18,800 (for ice hockey/basketball/lacrosse) Renewal Energy: - "Energy is the largest component of MLSE's footprint" [32]; - Stated an achievement of over 30% carbon footprint reduction [32]; - System of pipes laid into Lake Ontario for deep-lake cold water cooling eliminated the need for air conditioning compressors [32]; - Fryer oil collected and converted into biofuel [32]; - Recipient of the 2011 the Stadium Business Awards' Sustainability Award.
Bank of Montreal (BMO) Field (Toronto, Ontario) [33] Year Facility Opened: 2007 Architect: Brisbin Brooks Beynon Architects Owned by: City of Toronto Seating Capacity: 21,140 (for soccer) Renewal Energy: - Facility situated within a larger property called Exhibition Place that has wind turbines located on its grounds that began generating energy in 2003 [34]; - In 2009 and 2010 the wind turbine produced approximately 1 million kwh (kilowatt hours) per year that was fed into the local electricity grid [35]; - Aiming to be net zero with respect to their electricity usage; or no energy drawn from the external grid [34]; - In 2010, Exhibition Place implemented "a pilot project for a 100 kilowatt photovoltaic power-generation plant and a smaller combination solar photovoltaic/thermal plant" [36]; - Exhibition Place's environmental goals: (i) leading the use of energy-efficient technologies as well as technical and financial strategies to develop site sustainability; (ii) seeking opportunities for improving sustainability through initiatives in energy supply and use, solid waste management, building system improvement, transportation improvements and greening initiatives; (iii) achieving energy self-sufficiency and 80 per cent waste diversion by 2010, and (iv) integrating sustainability principles in the procurement and capital works policies and establishing an annual "environmental" capital budget [36].

Table 1. *Cont.*

BC Place Stadium (Vancouver, British Columbia) [37] Year Facility Opened: 1983 Architect: Stantec Architecture Ltd. Owned by: BC Pavilion Corp. (PavCo)/Province of British Columbia Seating Capacity: 54,320 (for football); 21,500 (for soccer) Renewal Energy: - "The BC Pavilion Corporate purchased 6620 tonnes of carbon offset, worth 165,500.00 CAD to become carbon neutral for the 2011 calendar year" [38]; - "In some areas of the stadium, substitution of steam to gas heating has resulted in the ability to better target areas that require heat as required, upon demand" [38]; - "Monitoring utility consumption continues and baseline benchmarking will be established with respect to utility usage during event days (reflecting indoor/outdoor situations) as well as non-event days" [38]; - "BC Place continues to move forward towards meeting its carbon neutral and sustainability goals as set out in the Sustainability Master Plan…that was developed in 2009" [38]; - Has committee named GreenSmart Team; - Facility reopened in fall of 2011 (after 18 months of reconstruction) with a new clerestory/roof that included 1700 Ethylene Tetrafluoroethyene (ETFE) panels making the roof more energy efficient by saving 25 percent on energy costs (or about $350,000 per year). The change in the type of operating roof structure has already resulted in significant savings in energy costs…for the building" [38]; - "The target for the facility continues to be an annual 3% decrease in energy use, following the BC Provincial Government reduction target of 33% by 2020" [38].
Bell Centre—formerly the Molson Centre (Montreal, Quebec) [39] Year Facility Opened: 1996 Architect: Lemay &Associates and Lemoyne, LaPointe, Magne Owned by: the Molson family Seating Capacity: 21,273 (for hockey) Renewal Energy: - No renewable energy strategies were noted; however, in October 2009, the Bell Centre achieved LEED certification for existing buildings at the silver level and reported carbon emissions were reduced by 28% and energy efficiency improved by 35%; however, specifically how these reductions and efficiencies are unknowns and no renewable energy was found to be used to achieve this certification; in November 2009 Bell Centre achieved ISO 14001 [40] certification for environmental management; however, no renewable energy was found to be utilized to achieve this certification.
Commonwealth Stadium (Edmonton, Alberta) [41] Year Facility Opened: 1978 Architect: unknown Owned by: City of Edmonton Seating Capacity: 60,081 Renewal Energy: - No renewable energy strategies were noted; however, the City of Edmonton and the Edmonton Eskimos collaborated in 2010 to initiate a Green and Go program that focused on reductions concerning environmental impacts of transportation and the utilization of a synthetic artificial turf.

Table 1. *Cont.*

Ivor Wynne Stadium (Hamilton, Ontario) [42] Year Facility Opened: 1930 Architect: unknown Owned by: City of Hamilton Seating Capacity: 29,600 Renewal Energy: - No renewable energy strategies were noted; completed an energy audit in 2007 [43]; stated that an aggressive program is in place to reduce resource usage and that retrofit opportunities were pursued.
McMahon Stadium (Calgary, Alberta) [44] Year Facility Opened: 1960 Architect: Rule Wynn and Rule Owned by: University of Calgary Seating Capacity: 35,650 Renewal Energy: - No renewable energy strategies were noted.
Mosaic Stadium at Taylor Field (Regina, Saskatchewan) [45] Year Facility Opened: 1936 Architect: unknown Owned by: City of Regina Seating Capacity: 30,048 Renewal Energy: - No renewable energy strategies were noted; renewable energy noted as a feature in the future 2016 new build.
MTS Centre (Winnipeg, Manitoba) [46] Year Facility Opened: 2004 Architect: Sink Combs Dethlefs Owned by: True North Sports & Entertainment Seating Capacity: 15,015 (for hockey) Renewal Energy: - No renewable energy strategies were noted.
Percival Molson Memorial Stadium (Montreal, Quebec) [47] Year Facility Opened: 1914 Architect: Percy Erskine Nobbs Owned by: McGill University Seating Capacity: 25,000 Renewal Energy: - No renewable energy strategies were noted.
Rexall Place (Edmonton, Alberta) [48] Year Facility Opened: 1974 Architect: Manasc Isaac Architects, LTD Owned by: Northlands Entertainment Seating Capacity: 16,839 Renewal Energy: - Heat released from the ammonia in the cooling compressors is automatically recovered and used to heat water that is then used to melt snow by the Zamboni ice making machines [49].

Table 1. *Cont.*

Rogers Arena (Vancouver, British Columbia) [50] Year Facility Opened: 1995 Architect: Brisbin, Brook and Beynon Owned by: Canucks Sports and Entertainment (CS&E) Seating Capacity: 18,890 Renewal Energy: - No renewable energy strategies were noted; has partnered with BC Hydro to find energy efficiencies; founding member of the Green Sports Alliance (GSA).
Rogers Centre—formerly SkyDome (Toronto, Ontario) [51] Year Facility Opened: 1989 Architect: Roderick Robbie Owned by: Rogers Communications Seating Capacity: 46,105 (for baseball) Renewal Energy: - No renewable energy strategies were noted.
Scotiabank Saddledome (Calgary, Alberta) [52] Year Facility Opened: 1983(Scotiabank Saddledome) Architect: Graham McCourt Architects (Munsey & Suppes, 2012) Owned by: Calgary Flames (Munsey & Suppes, 2012) Seating Capacity: 17,000 (Scotiabank Saddledome) Renewal Energy: - No renewable energy strategies were noted.
Scotiabank Place * (Ottawa, Ontario) [53] Year Facility Opened: 1996 Architect: Rossetti architects, Murray & Murray Architects (associate) Owned by: Capital Sports Properties Seating Capacity: 19,153 (for hockey) Renewal Energy: - No renewable energy strategies were noted; completed an "audit of our buildings and space with the immediate goal of reducing carbon emissions and to have carbon-neutral facilities in the long-term" [54]; partnered with Direct Energy; has a "Think Green Go Red" initiative.

* Renamed Canadian Tire Centre.

To begin, the median age of the stadiums was 28 years; the average age was 34.73 years; and the stadiums' age range extended from 4 years (BMO Field) to 97 years of age (Percival Molson Memorial Stadium). Stadiums under the age of 20 included the MTS Centre (7 years of age), Air Canada Centre (12 years of age), Scotiabank Place and Bell Centre (both 15 years of age), and Rogers Arena (16 years of age). The older stadiums in the examination included Ivor Wynne Stadium (81 years of age) and Mosaic stadium (75 years of age).

The stadium ownership was spread across six ownership types. A total of 33.33% of the stadiums were owned by an entertainment company, 26.66% were owned by a city, 13.33% were owned by a university, 13.33% were owned by a property management company; 6.66% were owned by a communications company and 6.66% were privately owned. Seating capacity ranged from 15,015 to 60,000 with the average being 28,593 seats.

In the environmental operational performance theme, the baseline results indicated that 4 (26.66%) of the stadiums communications did reveal involvement in renewable energy strategies, including: Air Canada Centre, BMO Field, BC Place Stadium, and Rexall Place. In the first sub-theme on embracing renewable energy strategies, the communications revealed that the conventional renewable energy strategies being utilized included: a wind energy project along with a pilot study in solar energy at BMO Field, a biomass/biofuel energy project at the Air Canada Centre, and the purchase of offsets at BC Place. Further, an emergent theme in non-conventional renewable energy strategies involved a heat exchange strategy at Rexall Place and a "Deep Lake Water Cooling System" [32] at the Air Canada Centre. It is apparent that the stadiums involved in renewable energy were utilizing both conventional and non-conventional strategies.

At BMO Field, wind turbines had been positioned on the surrounding grounds called Exhibition Place. These turbines produced approximately 1 million kilowatt hours per year in 2009 and 2010 that was fed into the local grid. Additionally, recently, these same grounds instituted "a pilot project for a 100 kilowatt photovoltaic power-generation plant and a smaller combination solar photovoltaic/thermal plant" [36]. Difficulties arise concerning the specific sport stadium renewable energy activities concerning wind energy and the pilot project in solar energy as the sport facility is encompassed within a larger complex or grounds. In 2010, however, Exhibition Place communicated an aim to utilize 100% renewable energy at its related facilities; this includes BMO Field. This aim was interpreted to mean that BMO Field was involved in a transition to renewable energy with wind energy usage and the pilot study on solar energy. Communications, however, have not been posted that confirm the aim for 100% renewable energy had been met at BMO Field or the adjacent facilities; this is interpreted in this manuscript therefore as not having been met at this time.

A biomass energy project at the Air Canada Centre was communicated as involving fryer oil that was converted into biofuel. Additional information, however, was not revealed concerning the process for converting the oil, the amount of biofuel generated and its use. Interestingly, in June 2012, Air Canada, the national airline with the naming rights to the sport facility, utilized recycled cooking oil in an airline test flight from Toronto to Mexico City. This flight was noted as "using 50 percent biofuel… [and] was expected to generate 40 per cent fewer emissions" [55].

The BC Pavilion Corporation that manages BC Place "purchased 6620 tonnes of carbon offset, worth 165,500.00 CAD to become carbon neutral for the 2011 calendar year" [38]. This purchase activity represented participation in a transition to renewable energy with the support of renewable energy strategies.

Rexall Place was noted as having a heat release strategy whereby "heat from hot ammonia in cooling compressors…is recovered by generating hot water in the condenser. This hot water is transported and used to melt snow, which is required to load the Zamboni ice conditioning machine" [49]. This heat exchange strategy, albeit interpreted by the authors of this manuscript to be at a low level, did however represent a transition to renewable energy. The Air Canada Centre established a "Deep Lake Water Cooling System" [32] that has been in operation since 2004 and involved a series of three pipes extending five kilometers into Lake Ontario. This 170 million-dollar (U.S.) cold water project "draws water from three miles (five kilometers) offshore and 270 feet (83 meters) down, where the temperature of Lake Ontario stays near 39.2 degrees Fahrenheit (4 degrees Celsius) throughout the year" [56]. This water is too cold to drink, however, as it is transferred "heat exchangers allow the lake

water to cool a…self-contained water circulation system" [56] generating an air conditioning system. This transition to a cold-water cooling system as a renewable energy strategy was interpreted as a unique emergent strategy in renewable energy for summertime air conditioning for stadium situated near cold water sources. None of the other stadiums communicated that they had utilized this strategy; thus, this is interpreted as advancement in renewable energy at Canadian sport stadiums.

Each SCORE was then examined for sub-themes, including environmental disclosure, measuring and tracking, and quantification. None of the communications for sport stadiums utilizing renewable energy specifically indicated that their energy program was being tracked, measured and/or quantified. The low level of environmental disclosure meant that comparability was limited. The cost to implement each renewable energy strategy, the cost and energy savings expected over time, and, importantly, how these strategies aided to safeguard the natural environment was not available for this study due to a lack of data in the web-based communications.

Comparisons, however, were possible based on the types of renewable energy strategies being utilized, the age, size and the site of the stadium utilizing renewable energy, along with the architects. It was noted that the age of stadiums utilizing renewable energy included: Air Canada Centre (12 years); BMO Field (4 years); BC Place (28 years) and Rexall Place (37 years). Clearly, age is not a determining factor for renewable energy use as young stadiums, as well as older stadiums, were involved in renewable energy. Interestingly, the Air Canada Centre won the 2011 Sustainability Award given out at The Stadium Business Summit "for meeting the sustainability challenge with practical, cost-effective and community-focused solutions… not easy in a busy building that is more than a decade old" [57]. Renewable energy, thus, was not relegated only to new stadium builds in Canada.

The four stadiums with renewable energy utilized 3 different architectural firms indicating that, in this sample, the firm is not a deciding factor concerning the institution of renewable energy initiatives. The Air Canada Centre and BMO field utilized Brisbin Brook, Beynon Architects; BC Place used Stantec Architecture Ltd.; and Rexall Place used Manasc Isacc Architects.

Overall, the results within the first theme on environmental operational performance illustrated that the stadiums set their own direction concerning renewable energy strategies. No map emerged involving the development of a collective as the stadiums were not seen as working as a cohesive group to learn from each other and follow the same pathway to renewable energy. Also, interestingly, no cases of geothermal renewable energy were found. Further, it was noted that communications for comparability could be complicated as stadiums, such as BMO Field and BC Place, were situated within surrounding grounds and groups/organizations with respect to their renewable energy strategy. This meant that the specific sport stadium data on measured, tracked and the quantification of the renewable energy strategies for each stadium could be intertwined within broader data making quantification for future comparability difficult.

Next, the focus of the investigation moved to the second theme of analysis: the *environmental organizational system* including the environmental policies, programs, targets, funding, auditing, education and implications of renewable energy. Findings revealed that stadium renewable energy policies were non-existent within the communications. Further, communications on renewable energy strategies centered on announcing particular projects and did not outline full strategy or program details. Also, only one stadium was involved in communicating renewable energy targets. Exhibition

Place, the grounds that house BMO Field, announced a target of 100% renewable energy; to be "leading the use of energy-efficient technologies" and "achieving energy self-sufficiency" [36].

The funding of renewable energy strategies was found to be a limited topic within the communications. Only BMO Field, situated within the grounds of Exhibition Place noted "establishing an annual 'environmental' capital budget" [36]; information specific to renewable energy plans however were not present. Additionally, discourse on auditing the renewable energy strategies was absent from the communications. Similarly, education was also not a topic within the communications.

The implication based on the data analysis for the two themes and their subsequent sub-themes is that a transition to renewable energy is underway at Canadian sport stadiums, albeit generally at a low level of commitment and at the early stages of transition, with the exception of BMO Field. This level of transition implied that renewable energy was recognized as an option, even if it is being instituted at a slow pace. This transition, however, is important as the Air Canada Centre, owned by MLSE, indicated that "energy is the largest component of MLSE's footprint" [32].

Within the sport facilities that did not report a transition to renewable energy, there were communications that indicated a consideration concerning the concept of environmental sustainability. One example was the Bell Centre in Montreal, Quebec; this facility achieved LEED certification for existing buildings at the silver level and an ISO 14001 certification for environmental management systems [40]. Another example was Commonwealth Stadium in Edmonton Alberta; stadium officials collaborated with the City of Edmonton and the Edmonton Eskimos in 2010 to initiate a "Green and Go" program that focused on reductions concerning environmental impacts of transportation and the utilization of a synthetic artificial turf. A final example is Ivor Wynne Stadium in Hamilton, Ontario that completed an energy audit in 2007. These facilities were not directly involved in renewable energy; however, they illustrated a movement in sustainability. The authors of this manuscript purport that it is logical for a movement in sustainability to be a precursor to the potential future involvement in a commitment to renewable energy.

4. Conclusions

This research sought understandings on the research question: What is the communication by Canadian sport stadium/facility operators to the call for sustainability, specifically in the area of renewable energy? The current research thus created, in part, an audit of the communications concerning renewable energy initiatives currently being implemented at Canadian sport stadiums. Here, the authors' contention is that sport facilities failing to engage in or communicate renewable energy practices risk brand erosion. The examination involved 15 major sport facilities that were home to Canadian professional sport teams during 2011 from the NHL, CFL, NLL, MLS, NBA, and MLB and their stadium communication, posted on-line before 1 January 2012. This research acts, in part, as a preliminary audit on the communications by major Canadian sport stadiums concerning a transition to renewable energy.

Results indicated that renewable energy had emerged within the Canadian sport stadium landscape. A total of four (26.66%) stadiums, home to Canadian professional teams, were involved in renewable energy. The range of renewable energy projects included the following: one large wind energy project with an associated small pilot project in solar energy at BMO Field, a small biomass/biofuel strategy

at the Air Canada Centre, and the purchase of renewable energy offsets at BC Place. Additionally, a small heat exchange strategy was utilized at Percival Molson Memorial Stadium. Importantly, the Air Canada Centre utilized a Deep Lake Water Cooling System for their air conditioning system that was interpreted as a cutting edge strategy that could lead the way for renewable energy for air conditioning for stadiums situated near cold water sources. Overall, the results revealed that the stadiums were heading in multiple directions with respect to renewable energy.

The level of renewable energy and its impact at the Canadian sport stadiums was interpreted to be in the primary stage. This interpretation was based on the fact that the communications of renewable energy strategies highlighted relatively small initiatives in terms of their potential production of renewable energy, with the exceptions of the wind project at BMO Field. Additional mitigation information was not discernible based on the lack of data within the communications. This included a lack of environmental disclosure, measuring and tracking, and the quantification that allowed for the comparability of disclosed information and, thus, the level of renewable energy utilization was not possible to establish at this time.

Future research is needed to advance understandings on stadium operators' renewable energy initiatives. Communication of initiatives must be monitored to understand changes in stakeholders' brand perceptions. Best practices for efficiency and effectiveness, trends, and leadership in sport facility renewable energy can then be established. Finally, long term studies are needed to answer the question: Will sport stadiums achieve predictions that renewable energy will meet 60% of the energy needs by the year 2070? And, if so, how will this be communicated? The answer to these questions remains to be seen.

Conflicts of Interest

The authors declare no conflict of interest.

References

1. Wolff, A. As global warming changes the planet, it is changing the sports world. To counter the looming environmental crisis, surprising and innovative ideas are already helping sport adapt. Available online: http://si.printthis.clickability.com/pt/cpt?action=cpt&title=SI.com+-+More+sports+-+Alexander (accessed on 18 July 2013).
2. Mallen, C.; Chard, C. "What could be" in Canadian sport facility environmental sustainability. *Sport Manag. Rev.* **2012**, *15*, 230–243.
3. Shafiullah, G.; Amanullah, M.; Ali, A.; Jarvis, D.; Wolfs, P. Prospects of renewable energy: A feasibility study in the Australian context. *Renew. Energy* **2011**, *39*, 183–197.
4. World Wildlife Federations (WWF). Energy Report. Available online: http://wwf.panda.org/what_we_do/footprint/climate_carbon_energy/energy_solutions22/renewable_energy/sustainable_energy_report/ (accessed on 18 July 2013).
5. Li, Y.; Wang, X.; Jin, Y.; Ding, Y. An integrated solar-cryogen hybrid power system. *Renew. Energy.* **2012**, *37*, 76–81.

6. United Nations. 96th Plenary meeting, United Nations General Assembly Report to the World Commission on the environment and development. Available online: http://conspect.nl/pdf/Our_Common_Future-Brundtland_Report_1987.pdf (accessed on 18 July 2013).
7. Turner, C. *The Geography of Hope: A Tour of the World We Need*; Random House: Toronto, ON, Canada, 2007.
8. Organization for Economic Co-operation and Development (OECD). *Energy: The Next 50 Years*; OECD Publication Services: Paris, France, 1999.
9. Mallen, C.; Chard, C.; Sime, I. Web communications of environmental sustainability initiatives at sport facilities hosting major league soccer. *J. Manag. Sustain.* **2013**, *3*, 115–130.
10. Ziek, P. CSR Infrastructure for communication of the Nike controversy. *J. Manag. Sustain*. **2013**, *3*, 63–73.
11. Wallace, L.; Wilson, J.; Miloch, K. Sporting Facebook: A content analysis of NCAA organizational sport pages and Big 12 conference athletic department pages. *Int. J. Sport Commun.* **2011**, *4*, 422–444.
12. Davis, S.M.; Dunn, M. *Building the Brand-Driven Business*; Jossey-Bass: San Francisco, CA, USA, 2002.
13. Knapp, D.E. *The Brand Mindset*; McGraw-Hill: Toronto, ON, Canada, 2000.
14. Keller, K.L. Conceptualizing, measuring, and managing customer-based brand equity. *J. Mark*. **1993**, *57*, 1–22.
15. Aaker, D.A. *Building Strong Brands*; The Free Press: New York, NY, USA, 1996.
16. Horne, J. Architects, stadia and sport spectacles: Notes on the role of architects in the building of sport stadia and making world-class cities. *Int. Rev. Sociol. Sport* **2011**, *46*, 205–227.
17. Global environment outlook 4: Summary for decision makers. Available online: http://www.unep.org/geo/geo4/media/GEO4%20SDM_launch.pdf (accessed on 18 July 2013).
18. Schmidt, C. Putting the earth in play: Environmental awareness and sports. *Environ. Health Perspect.* **2006**, *114*, A286–A295.
19. Holden, A. Winter tourism and the environment in conflict: The case of Cairngorm, Scotland. *Int. J. Tour. Res*. **2000**, *2*, 247–260.
20. Spector, S.; Chard, C.; Mallen, C.; Hyatt, C. An analysis of the ski industry environmental sustainability evaluation and reporting program. *Sport Manag. Rev*. **2012**, *15*, 416–433.
21. Chard, C.; Mallen, C. Examining the linkages between automobile use and carbon impacts of community-based ice hockey. *Sport Manag. Rev*. **2012**, *15*, 476–484.
22. Wheeler, K.; Nauright, J. A global perspective on the environmental impact of golf. *Sport Soc.* **2006**, *9*, 427–443.
23. Emery, P. Past, present, future major sport event management practice: The practitioner's perspective. *Sport Manag. Rev.* **2010**, *13*, 158–170.
24. Ciletti, D.; Lanasa, J.; Ramos, D.; Luchs, R.; Lou, J. Sustainability communication in North American professional sports leagues: Insights from web-site self-presentations. *Int. J. Sport Commun*. **2010**, *3*, 64–91.
25. Mallen, C.; Stevens, J.; Adams, L. A content analysis of environmental sustainability research in a sport-related journal sample. *J. Sport Manag.* **2011**, *25*, 240–256.

26. Krippendorff, K. *Content Analysis: An Introduction to its Methodology*, 2nd ed.; Sage Publications, Inc.: Thousand Oaks, CA, USA, 2004.
27. Weber, R. *Basic Content Analysis*; Sage Publications, Inc.: Beverly Hills, CA, USA, 1985.
28. Mallen, C.; Stevens, J.; Adams, L.; McRoberts, S. An assessment of the environmental performance of an international multi-sport event: Understanding the organizational barriers to event sustainability. *Eur. Sport Manag. Q.* **2010**, *10*, 97–122.
29. BC Place. Available online: http://www.bcplacestadium.com/index.php/roof.html (accessed on 18 July 2013).
30. Stadium & Arena Management. Stadiums Are Taking 'Green' Seriously. Available online: http://en.montrealalouettes.com/article/environmentals-in-the-news (accessed on 18 July 2013).
31. Air Canada Centre. Available online: http://www.theaircanadacentre.com/ (accessed on 18 July 2013).
32. Air Canada Centre (ACC). Maple Leaf Sports and Entertainment Team Up Green: Energy. Available online: http://www.theaircanadacentre.com/about/GreeningMLSE.asp (accessed on 18 July 2013).
33. Bank of Montreal Field. Available online: http://www.bmofield.com (accessed on 18 July 2013).
34. Provincial Priority Reduction Plan (PPRP) Summary for Exhibition Place. Available online: http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/documents/nativedocs/stdprod_083127.pdf (accessed on 18 July 2013).
35. Windshare. Availability tops 94%, 2009 and 2010. Available online: http://www.windshare.ca/explace/the_wind_turbine.html (accessed on 18 July 2013).
36. Ontario Ministry of the Environment. Recognizing Ontario's Environmental Leaders. Available online: http://www.ene.gov.on.ca/environment/en/about/EnvironmentalExcellence/STDPROD_083064 (accessed on 18 July 2013).
37. BC Place Stadium. Available online: http://www.bcplacestadium.com (accessed on 18 July 2013).
38. BC Pavilion Corporation (PavCo). 2011 Carbon Neutral Action Report. Available online: http://www.livesmartbc.ca/attachments/carbon_neutral_action_reports/PAVCO_2011.pdf (accessed on 18 July 2013).
39. Bell Centre. Available online: http://www.centrebell.ca (accessed on 18 July 2013).
40. The goal is green. Available online: http://canadiens.nhl.com/club/page.htm?id=66762 (accessed on 18 July 2013).
41. Commonwealth Stadium. Available online: http://www.edmonton.ca/attractions_recreation/sport_recreation/commonwealth-stadium.aspx (accessed on 18 July 2013).
42. Ivor Wynne Stadium. Available online: http://www.ticats.ca/page/ivorwynne (accessed on 18 July 2013).
43. Audit Program. City of Hamilton Ivor Wynne Stadium. Available online: http://www.las.on.ca/PDFs/Services/Energy-Consulting/Audit/Hamilton.aspx (accessed on 18 July 2013).
44. McMahon Stadium. Available online: http://www.ucalgary.ca (accessed on 18 July 2013).
45. Mosiac Stadium. Available online: http://stats.cfldb.ca/team/saskatchewan-roughriders/stadiums/ (accessed on 18 July 2013).
46. MTS Centre. Available online: http://www.mtscentre.ca/ (accessed on 18 July 2013).
47. Percival Molson Stadium. Available online: http://en.montrealalouettes.com/page/percival-molson-stadium_102961 (accessed on 18 July 2013).

48. Rexall Place. Available online: http://www.rexall-place.com/ (accessed on 18 July 2013).
49. Berger, K. Greenhouse gas report 2006 GHG update. Available online: http://www.ghgregistries.com/registry/out/rf_3758_243.pdf (accessed on 18 July 2013).
50. Rogers Arena. Available online: http://rogersarena.com/ (accessed on 18 July 2013).
51. Rogers Centre. Available online: http://www.rogerscentre.com/ (accessed on 18 July 2013).
52. Scotiabank Saddledome. Available online: http://www.scotiabanksaddledome.com/site/saddledome/ (accessed on 18 July 2013).
53. Scotiabank Place. Available online: http://www.canadiantirecentre.com/en/ (accessed on 18 July 2013).
54. Scotiabank Place. Think Green. Go Red. With the Ottawa Senators and Scotiabank Place. Available online: http://senators.nhl.com/club/news.htm?id=481692 (accessed on 18 July 2013).
55. Belles, N. Air Canada conducts first flight cooking-oil biofuel. Available online: http://ca.news.yahoo.com/blogs/good-news/air-canada-conducts-first-flight-cooking-oil-biofuel-152813003.html (accessed on 18 July 2013).
56. Smith, J. The AC of tomorrow? Tapping deep water for cooling. Available online: http://news.nationalgeographic.com/news/2004/09/0910_040910_deeplake.html (accessed on 18 July 2013).
57. Stadium Business Summit (SBS). Awards 2011. Available online: http://sba2011.stadiumbusinessawards.com/stadium-business-awards-winners-announced/ (accessed on 18 July 2013).