Becoming Net Zero: Strategies to Eliminate Carbon Emissions at St. John's University

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Abstract

In 2007 Saint John's President Dietrich Reinhart signed the American College and University Presidents' Climate Commitment (ACUPCC). The ACUPCC requires St. John's University (SJU) to reduce their Greenhouse Gas (GHG) emissions to net zero by the year of 2035. This study aims to determine the most feasible forms of renewable energy sources to achieve this goal at SJU by considering Community Solar Gardens, Photovoltaic Energy (PV), and purchasing carbon offsets as potential solutions to eliminate carbon emissions. By collecting and analyzing data from metered buildings at SJU, this study determined the economic and technical feasibility of converting Mary Hall, Tommy Hall, the Flynntown Apartments, and total University to net zero emission by 2035.

Methods

In order to determine the technical and economic feasibility of alternative energy at SJU, I collected and analyzed annual energy demand from Mary Hall, Tommy Hall, the Flynntown Apartments, as well as the total SJU energy demand. After determining the average kWh demand for each unit, I calculated the capacity factor for solar modules at St. John's. I was then able to determine how many of Community Solar Gardens subscriptions, photovoltaic energy modules, and carbon offsets were needed to eliminate carbon emissions. I calculated feasibility by estimating land required for solar panels and comparing them with the costs. This comparison allowed feasibility to be determined by technical implementation, economic reliability, and general acceptance.

Figure 1: This figure shows the amount of land required for photovoltaic energy at St. John's University to offset carbon emissions from energy production.

Results

Solution 1

Table 1: Necessary Community Solar Garden subscription to offset energy consumption in Mary Hall, Tommy Hall, Flynntown Apartments, and St. John's University total energy use. The Xcel Community Solar Garden Program limits purchasers to have a maximum of 40% of one Community Solar Garden; therefore, one subscription could produce roughly 550,000 kWh.

Community Solar Gardens		
	Average Energy Use (kWh)	1 MW Community Solar Gardens
St. John's University	9,479,923	100% x 17
Mary Hall	249,775	18%
Tommy Hall	363,985	26%
Flynntown Apartments	178,629	13%

* St. John's University requires 100% of 17 individual Community Solar Gardens

Solution 2

Table 2: Estimated cost for traditional PV solar to offset the energy demand of Mary Hall, Tommy Hall, the Flynntown Apartments, and the University as a whole. This table also shows the estimated amount of land or roof space needed for PV solar at St. John's University.

Photovoltaic Energy (PV)			
	Total MW Required	Total Land	Estimated Cost
St. John's University	7 MW	34.3 Acres	$9,940,000
Mary Hall	180 kW	38,420 ft²	$383,400
Tommy Hall	260 kW	55,495 ft²	$553,800
Flynntown Apartments	120 kW	27,747 ft²	$255,600

Solution 3

Table 3: Total metric tons of carbon produced by Mary Hall, Tommy Hall, the Flynntown Apartments, and the University from energy production. This tables then shows the estimated cost to offset the carbon emissions through carbon offset programs such as the purchasing of renewable energy credits (RECs).

Carbon Offsets		
	Metric Tons of Carbon	Cost of Carbon Offset
St. John's University	7055	$105,825
Mary Hall	186	$2,790
Tommy Hall	271	$4,065
Flynntown Apartments	133	$1,995

Acknowledgements & References

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What is required for St. John's University to eliminate carbon emissions from energy production by 2035?

Community Solar Gardens

- 17 subscriptions to 40% of 1 MW

Photovoltaic Energy

- 7 MW solar farm
- 34.3 acres of open land
- Estimated Cost: $9,940,000

Carbon Offsets

- Purchas carbon offsets from renewable energy credits (REC's)

Recommendations

The most feasible solution to eliminating carbon emissions at SJU is to purchase carbon credits at a low rate to offset the energy use. However, rather than initially spending the estimated $105,825 on carbon offsets, I propose SJU allocates this money toward carbon reducing implementations on campus. With an additional $105,825 allocated annually toward carbon reducing implementations, such as upgrading energy efficiency and replacing outdated infrastructure, SJU could reduce emissions substantially. This would lower the cost of carbon offsets for the future, making carbon neutrality more feasible to the institution. After emission have been decreased and carbon production cannot be avoided, SJU should purchase carbon offsets to counter the unavoidable energy costs.

Conclusion

The results of this research suggest purchasing carbon offsets is the most feasible way to eliminate carbon emissions from energy use at SJU. Carbon offsets require no additional infrastructure or technical implementation therefore illuminating the technical feasibility of carbon offsets. Along with technical feasibility, carbon offsets are currently the most inexpensive option to eliminate carbon emissions from energy production. Carbon offsets provide SJU with the opportunity to not only offset emissions from electricity use, but also eliminate total emissions created by the University.