SPEEDIER

Smart, Proactive, Enabled, Energy Distribution: Intelligently, Efficiently, Responsive

GREENHOUSE GAS ACCOUNTING FOR DISTRIBUTED ENERGY RESOURCES

lakeland SOLUTIONS

In collaboration with
Scott McCrindle,
Georgian College

Experience Georgian

BACKGROUND

The Town of Parry Sound was seeking to become a net-zero sustainable community, fueled by a constraint on the Parry Sound Transmission Station (TS). The TS is owned by a third party, not the local utility (Lakeland Power), who had no plans to upgrade at the time.

Through Lakeland's search for a solution, the vision for this net-zero community led to the development of project SPEEDIER, a seamless microgrid on a portion of Parry Sound's grid.

Bracebridge Generation Ltd., under Lakeland Holding Ltd., submitted a successful application to the NRCan SmartGrid Program for this project; the premise being to demonstrate affordable options for using DERs to enhance the grid, increasing energy from renewable generation, reducing GHG emissions, and operating more efficiently.

Canada has committed to "nationally determined contributions" (NDCs) (UN, 2015, p. 3) of GHG emission reductions consistent with the Paris Agreement targets

The Pan-Canadian Framework on Clean Growth and Climate Change identifies electricity generation as "Canada's fourth-largest source of GHG emissions" (Environment and Climate Change Canada, 2016, p. 11)

The Smart Grid Program is one of Natural Resource Canada's targeted national programs addressing key infrastructure to advance the goals of the Pan Canadian Framework on Clean Growth and Climate Change (Natural Resources Canada, n.d.)

As part of the Smart Grid program, successful applicants were required to report to NRCan on GHG Reductions attributed to the project, annually for 5 years following project completion.

Through the Innovation and Research Department at Georgian College, Project SPEEDIER was introduced to Scott McCrindle, who was completing the Master of Arts – Environmental Practice program at Royal Roads University, focusing on the GHG impacts of Distributed Energy Resources (DERs). He is also working with a cross-disciplinary team at Georgian College to implement an academic microgrid for educational and research purposes. As this was a perfect fit, SPEEDIER became the basis for Scott's research paper. Once complete, Scott compiled the data required for reporting, creating the GHG Information System (GHGIS) that takes the daily information from the DERMS and produces the monthly reporting.

METHODOLOGY

Greenhouse Gas Protocol for Project Accounting is the primary framework used to build out the Greenhouse Gas (GHG) Information System (GHGIS) to account for and report on the GHG emission reductions made possible by the SPEEDIER project. Guidelines for Grid-Connected Electricity Projects provided additional guidance when building out the GHGIS.

Following these guidelines, the process began with creating a baseline to show the emissions that would have been generated in order to provide services equivalent to those proposed by the project assets. equivalent to those proposed by the project assets.

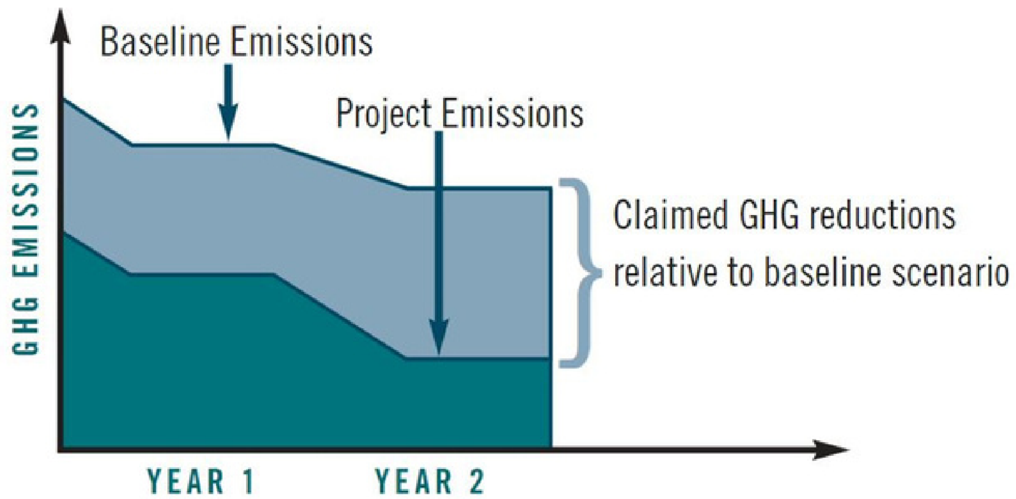

Figure 3: Comparison against a baseline scenario for project accounting (GHG Protocol, 2005, p. 13).

In the absence of Project SPEEDIER, equivalent energy capacity would have been required, affecting the utilization of the existing capacity – referred to as the Operating Margin (OM). Decisions regarding the deployment of new capacity are known as the Build Margin (BM). Each project asset (or activity) was evaluated to assign its baseline a weight against the BM, and a reciprocal OM weight.

PROJECT ACTIVITIES:

* Grid-Scale Battery Energy Storage System (GBESS)
* Photovoltaic (PV) Solar Array
* Load-Control Managed Hot Water Tanks (HWT)
* Electric Vehicle (EV) DCFC Public Charging Station
* Electric Vehicle (EV) L2 Residential Charging Stations
* Residential Battery Energy Storage Systems (RBESS)

Details of the SPEEDIER calculations and processes can be found in Scott McCrindle's paper:
Greenhouse gas accounting for distributed energy resources: The SPEEDIER project in Parry Sound, Ontario
which is available on the Speedier Website (www.speedier.ca) under GHG and on the Georgian College Website.

OUTCOME

The end result was a series of formulas that could be applied to each asset's activities, resulting in GHG emission reductions representing the difference between the baseline GHG profile and the emissions generated by the operation of the asset itself as the alternative. The individual data is collected, run through formatting, applied to the formulas, and used to create outputs: tables, graphs and pictographs.

The final outcome is a projected annual savings of 261 tCO_2/yr, when the project is fully operational on a daily basis.

Baseline SSR Description	Emissions ($tCO_2e/year$)	Enabled Emissions ($tCO_2e/year$)
Photovoltaic solar array - 500 kW AC	18.3535	
Utility Battery Energy Storage System - 2514 kWh	234.2271144	
Electric Vehicle DCFC Public Charging - 50 kW DC (1 unit)		12.05519966
Electric Vehicle Level 2 Public Charging - 7 kW (3 units)		6.17002004
Residential Energy Storage System - 13.5 kWh (10 units)	12.02786982	
Load-Control Managed Hot Water Tanks - 40/60 gallon (50 units)	18.41236849	
Total Baseline Emissions (Annual)	283	18
Project SSR Description	Emissions ($tCO_2e/year$)	Enabled Emissions ($tCO_2e/year$)
Photovoltaic solar array - 500 kW AC	0	
Utility Battery Energy Storage System - 2514 kWh	33.55892468	
Electric Vehicle DCFC Public Charging - 50 kW DC (1 unit)		0.47458314
Electric Vehicle Level 2 Public Charging - 7 kW (3 units)		0.242898298
Residential Energy Storage System - 13.5 kWh (10 units)	1.6721964	
Load-Control Managed Hot Water Tanks - 40/60 gallon (50 units)	4.313292764	
Total Project Emissions (Annual)	40	1
	Emissions Reduction ($tCO_2e/year$)	Total Emissions Reduction w/Enabled ($tCO_2e/year$)
Annual project GHG emissions reduction (post commissioning)	243	261

The process and calculations have been through a validation process completed by 3rd party auditors hired by NRCan as part of the Smart Grid Program Funding. The audit team was very impressed with the thoroughness of the SPEEDIER reporting, and the depth of knowledge held by McCrindle and the team.

GHG REPORTING

Monthly reports, including infographics illustrating the GHG Savings from the project, can be found at www.speedier.ca under GHG.

CONCLUSIONS

- Qualifying and justifying the GHG baselines for project activities is time and resource intensive.
- Obtaining appropriate data to quantify GHG baselines can be a significant challenge
- Assessment boundary must be very clear, or there is a risk of double-counting of GHG savings.
- Accounting and reporting of GHG emissions is still a nascent discipline
- Effective mitigation of GHG emissions will require verifiable and stringent measurement processes

Project outputs regarding the GHG emission reductions are being incorporated into discussions by environmental groups. Most recently, the economic and environmental impacts of the project are of interest to a large financial institution, the authors of a net-zero paper.

Contact Us

www.lakelandsolutions.com

705-645-1550

info@lakelandsolutions.com

Our Team

Vince Kulchycki
Chief Operating Officer

Marjorie MacDonald
Process Lead

Peter Ewald
Technical Lead

Sean Mehrvarz
Engineering Specialist

Karen Raaflaub
Administrator

Experience Georgian

REFERENCE:
McCrindle, S. (April 25, 2021). Greenhouse gas accounting for distributed energy resources: The SPEEDIER project in Parry Sound, Ontario
https://content.georgiancollege.ca/wp-content/uploads/Scott-McCrindle-Greenhouse-Gas-Accounting-for-Distributed-energy-resources-The-Speedier-Project.pdf

lakeland SOLUTIONS