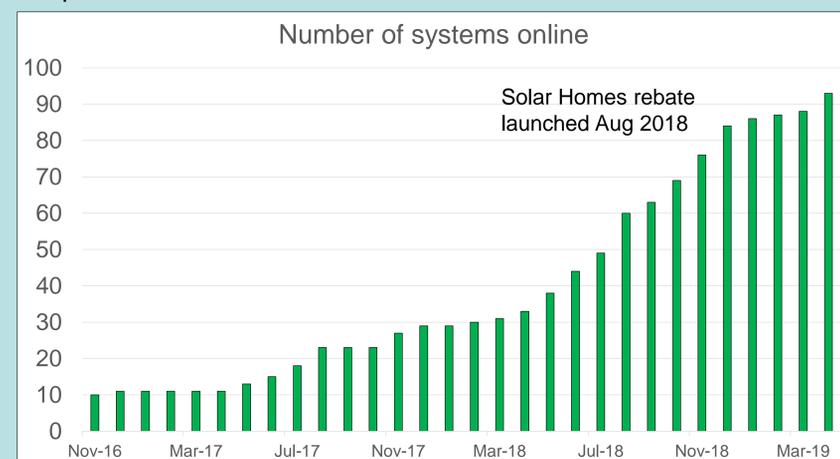


Solar City Overview

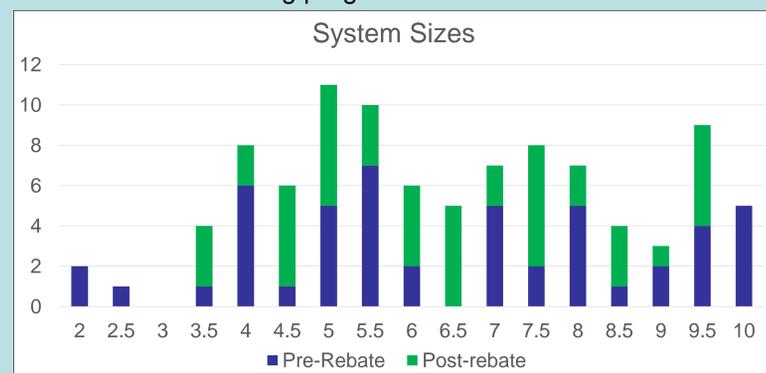
Falling photovoltaic panel prices combined with provincial and municipal incentives are making residential solar PV systems more economically desirable. HRM provides preferred financing options for solar projects such as PV, solar hot water, and solar hot air. As part of the Solar City program, some PV production data is collected and is accessible via the city's public data portal.

96 unique systems which use Enphase microinverters are currently providing AC system output on a 5 minute timestep. This data can help to inform future grid policy to manage increasing residential PV adoption.



Sizing

System size typically restricted by available roof space and terms of the enhanced net metering program.



Maximum power seen at any timestep was 570 kW. For comparison the rooftop PV array on the roof of IKEA in Dartmouth is nominally 800 kW.



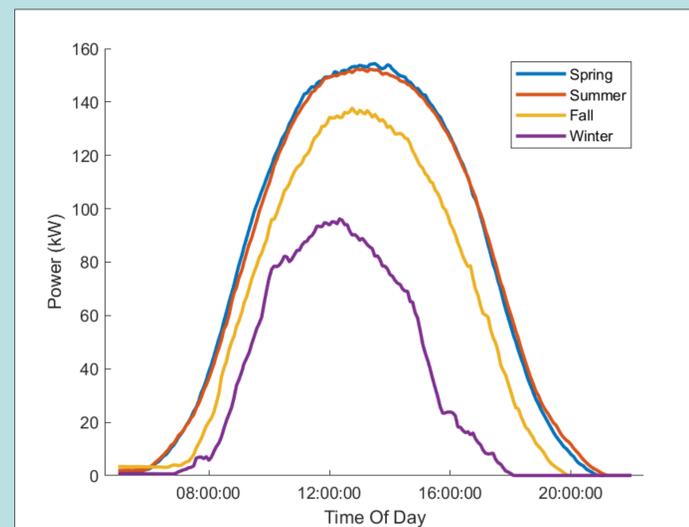
Performance

Capacity factor is a measure of the actual amount of energy a system produces as a percentage of its nominal generation capacity. Since the nominal power output of the system solar panels is unknown the maximum observed power of each system was used to determine its capacity factor.

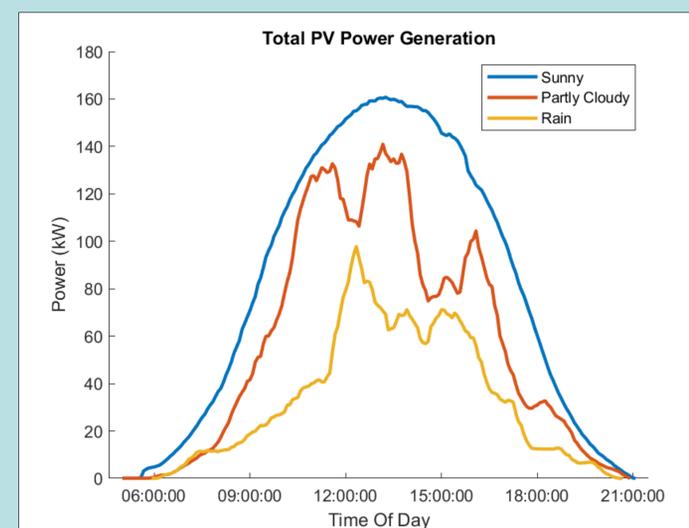
Capacity factor of PV systems in HRM

	Mar-May	Jun-Aug	Sep-Nov	Dec-Feb	Annual
Min	4.0	8.6	5.8	2.5	5.5
Max	20.4	25.4	15.5	14.3	18.1
Mean	15.9	20.0	11.2	7.8	13.9

Unexpectedly, the sum of all systems active for all of 2018 (27 total) showed that Spring months had a 95th percentile power generation roughly equal to Summer months. This is not mirrored in the fall, which shows an expected drop in production. Daylight savings time results in peaks which are shifted to the right in all seasons except for winter.

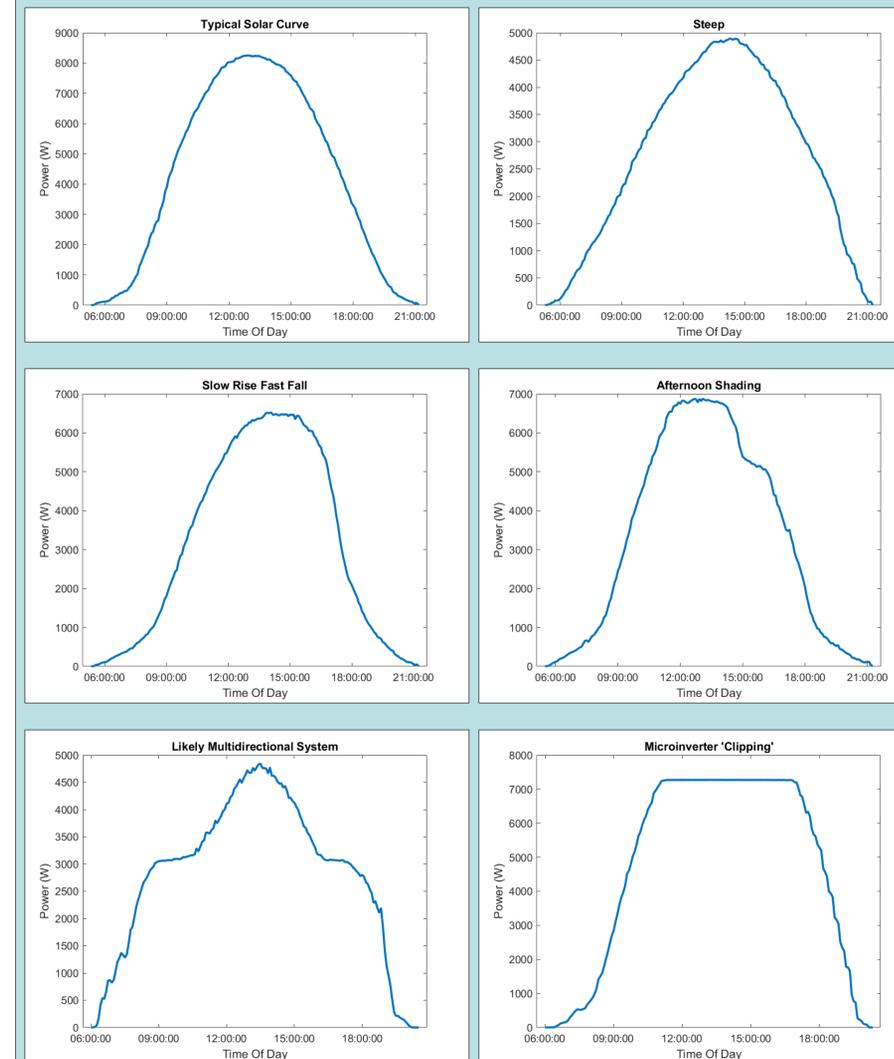


Production is heavily dependant on weather, heavy cloud cover can reduce PV output by more than 50%. On cloudy and rainy days there is also a large number of sudden changes to power output.



System Profiles

Each system has a unique solar profile which is determined by the layout of the panels (slope, direction) and the surrounding environment.



Future work

- Microinverters represent a subset of total photovoltaic systems in Halifax. Adding more systems to the analysis is a priority.
- Contrast commercial and industrial PV systems (such as IKEA) with residential aggregated systems.
- Modeling of energy storage for residential markets and informing future energy market policy.

Acknowledgments

We would like to thank Wayne Groszko, Dane George, Thomas Crowell, and Joon Son from NSCC's Energy Research Team for assisting with data collection and for support in future work, and HRM for providing the data. We would also like to thank the Department of Mines and Energy, ACOA, and NSCC for providing funding for this research project.