

GRID CONNECTED

SOLAR FEASIBILITY REPORT

Date: January 1, 2020

Report #: [REDACTED]

Report Type: GRID CONNECTED

Name : JOHN SMITH
Email : [REDACTED]
Phone : [REDACTED]

Lowest Electricity Consumption : [REDACTED] kWh
Average Electricity Consumption : [REDACTED] kWh
Highest Electricity Consumption : [REDACTED] kWh

Address : [REDACTED]
City : [REDACTED]
Province / Territory : [REDACTED]
Country : [REDACTED]

INDEX

1. ABOUT MAPMYSUN	3
2. EXECUTIVE SUMMARY	3
3. TECHNICAL FEATURES	4
4. FINANCIAL FEATURES	5
5. CHART: SYSTEM INSTALLATION COST vs TOTAL SYSTEM COST (IN 25 YEARS)	6
6. COMPARISON: COST vs SAVINGS	7
7. GRAPH: COST vs SAVINGS	8
8. RETURN ON INVESTMENT	9
9. PANEL TILT ANGLE AND DIRECTION	10
10. METHODOLOGY	11
11. STEPS TO GO SOLAR	11
12. VENDOR SELECTION	12
13. ENVIRONMENTAL BENEFITS OF SOLAR	13
14. PROS & CONS OF SOLAR	13
15. OPERATION & MAINTENANCE OF A SOLAR PV SYSTEM	14
16. COMPONENTS OF A TYPICAL SOLAR PV SYSTEM	14
17. GLOSSARY OF TERMS	15
18. ASSUMPTIONS & FAQs	15

1. ABOUT MAPMYSUN

MapMySun Inc. is a Canadian Solar consulting company which aims at helping its users understand the cost and benefits of switching to solar. The MapMySun report is an easy-to-understand customized online solar Feasibility Report which provides users with techno-financial information of a solar Photovoltaic (PV) system for their chosen location helping them make an informed decision before investing in a solar PV system. The report provides information such as system size, 25 years worth of Cost vs Savings, Return on Investment, Payback Period, Environmental Benefits, and a lot more. MapMySun reports are of two types: Grid-Connected and Off-Grid Report.

2. EXECUTIVE SUMMARY

Congratulations, on taking the first step in becoming more energy independent! Using solar energy is one of the most natural and economic ways of powering your energy needs and is a fantastic sustainable lifestyle choice. However, investing in a solar PV system does not only require a substantial amount of initial investment but is also a long-term commitment. The purpose of this report is to ensure that the user is informed of the major steps and considerations when buying a solar PV system.



MapMySun is a simple to understand report which aims at providing all the essential information that is required before investing in a solar PV system including a 25-year Cost vs Savings analysis to get a long-term perspective of the investment. The only information required from the user is the location of the solar PV system and their lowest & highest electricity consumption within the past twelve months. This report provides its user with an option to choose between two system sizes; Average solar PV system (based on the yearly average electricity usage) and a Full capacity solar PV system (based on the month with highest electricity usage) with the potential to almost completely offset user's electricity bill. Both these systems are then compared based on several techno-financial information such as component sizing, cost vs savings, rate of return, payback period, levelized cost of electricity (LCOE), etc. The LCOE is the cost of electricity produced by the solar PV system and is typically warranted for the life of the system. This means the solar PV system will produce power at this same per unit rate throughout its life. This report uses images, graphs, charts, and tables to make things simpler and easy to understand.

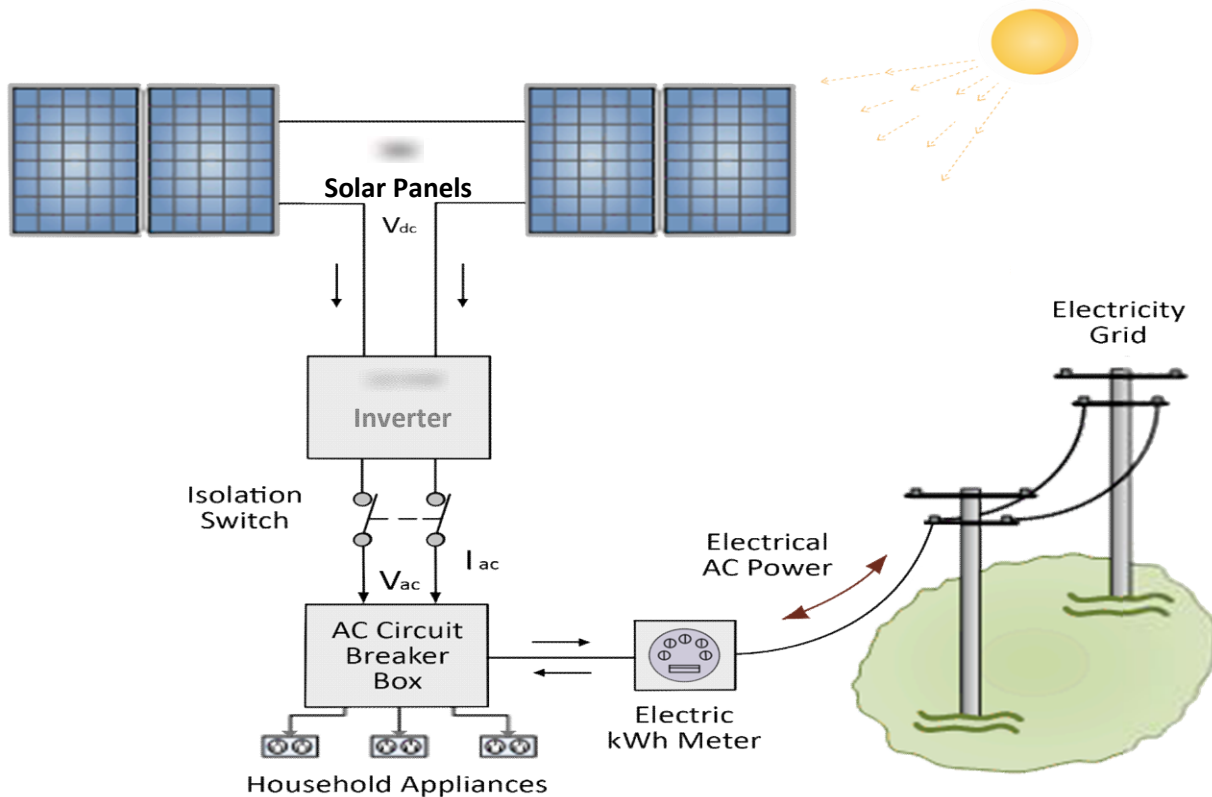
A solar PV system contributes significantly to the environment by reducing greenhouse gas emissions. This report highlights the environmental benefits gained by using the system over its lifetime as well as compares the benefits and drawbacks of installing the system. This report also touches upon the solar vendor selection criteria and explains the conflict resolution process with the vendor. Towards the end of this report there's some information pertaining to the making and maintaining of a solar PV system such as the list of components of a solar PV system and a stepwise Operation & Maintenance guide all of which are aimed at making a user's solar journey successful.

3. TECHNICAL FEATURES

This section provides a technical snapshot comparing both systems (i.e. system based on average electricity usage and system based on highest electricity usage). It also covers system sizing information such as number of solar panels, inverter size, etc. It provides an estimate of the area required to install the solar panels which helps you understand if your roof has adequate space to install the system.

[This section contains blurred text, likely a disclaimer or additional technical notes.]

DETAILS	BASED ON AVERAGE ELECTRICITY USAGE 	BASED ON HIGHEST ELECTRICITY USAGE 	UNIT
Your Solar System Size			kW
No. Of Solar Panels That You Will Need			Nos.
Area Required To Install The Panels			Sq.Ft.
Inverter Size			kW
Electricity Produced By Solar Per Year (Average)			kWh
Electricity Produced By Solar In 25 Years			kWh





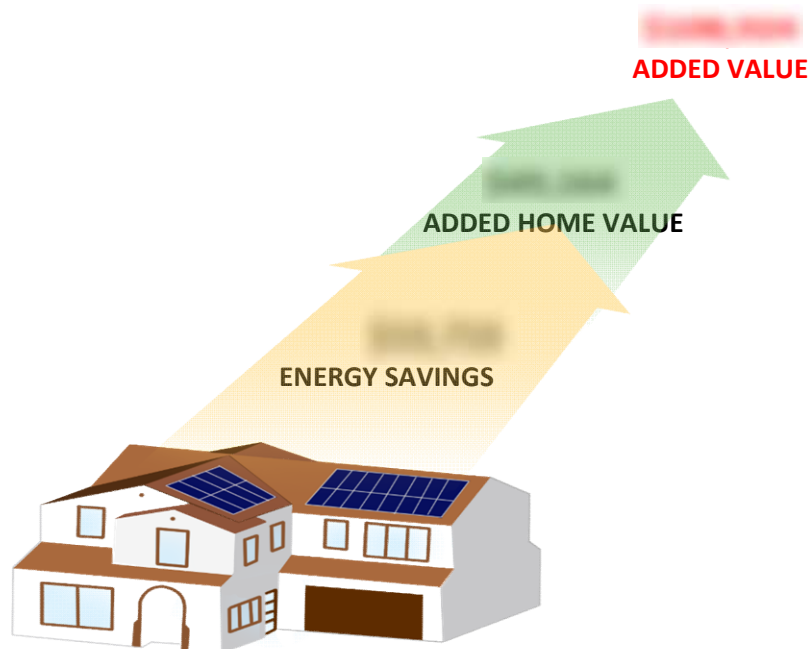
4. FINANCIAL FEATURES

The financial section provides information related to system costs which includes the initial upfront cost or Capital Expense (CapEx) and the Total System Cost for 25 years which is combination of CapEx and Operational Expense (OpEx). This section also includes the savings that the system can yield in 25 years which is calculated factoring in the inflation, panel degradation, etc. This is averaged out to get an estimate on yearly savings.

Studies have shown that solar system increases the value of a home by drawing buyers who are seeking ways to reduce utility bills, save energy and help the environment. This report shows by how much a property value could increase by installing solar.

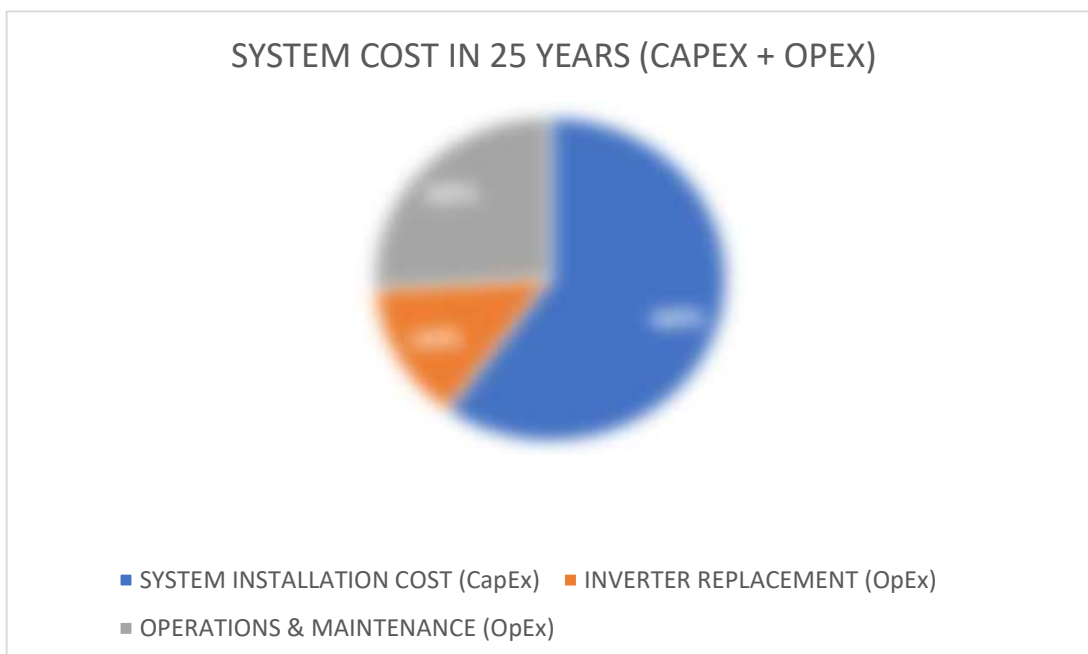
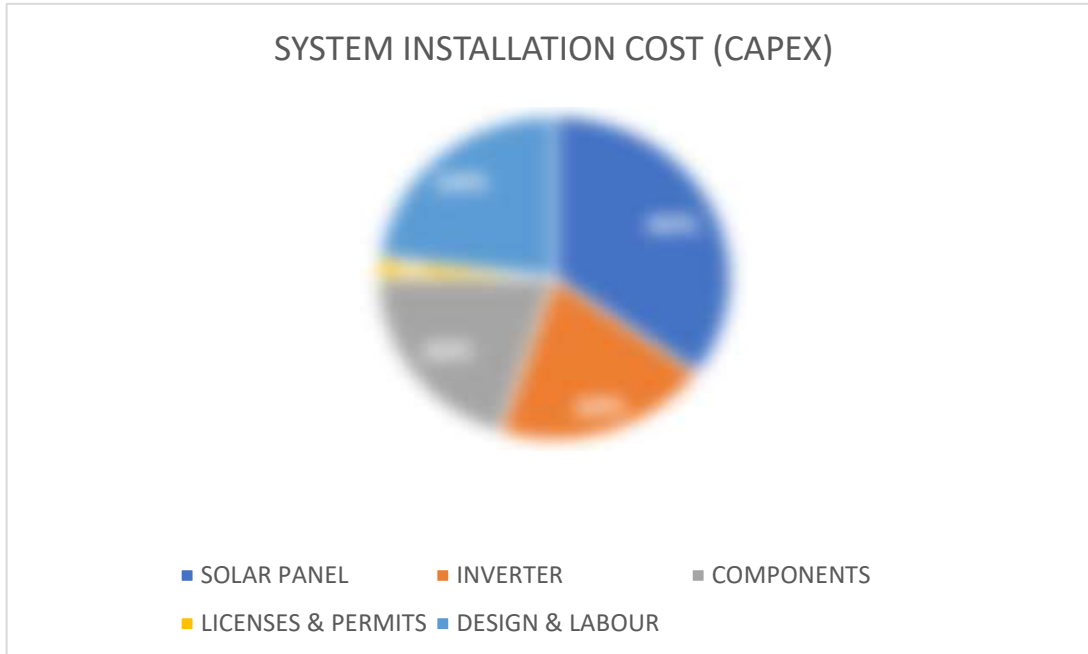
The above information is based on the current market conditions and is subject to change. The actual results may vary based on the specific details of the project and the local market conditions.

DETAILS	BASED ON AVERAGE ELECTRICITY USAGE 	BASED ON HIGHEST ELECTRICITY USAGE 	UNIT
System Installation Cost (CapEx) (Component costs + Design + Manpower + Installation)	\$12,000	\$12,000	CAD (\$)
System Cost In 25 Years (CapEx + OpEx) (Installation Cost + Component Replacement + O&M Expenses)	\$12,000	\$12,000	CAD (\$)
Your Savings From Solar Per Year (Average)	\$1,000	\$1,000	CAD (\$)
Your Savings From Solar In 25 Years	\$25,000	\$25,000	CAD (\$)
Levelized Cost Of Electricity (LCOE) (Electricity Cost Per Unit Produced By The Solar System)	\$0.10	\$0.10	CAD (\$)
Your Property Value Could Increase By	\$12,000	\$12,000	CAD (\$)





5. CHART: SYSTEM INSTALLATION COST vs TOTAL SYSTEM COST (IN 25 YEARS)

The first pie chart compares the percentage share of costs of individual components to the total cost of a typical system. Solar panels and Inverters are the two components which constitute more than 50% of the project cost. Other components include structures, electrical accessories, junction boxes, cables, etc. listed in Section 16. In the second chart below it can be seen that replacing an inverter is about 10% of the system lifetime cost. Thus, it is imperative that inverters should be properly operated and maintained to ensure their useful life of 10 years. Check out section 15 for tips on how to operate and maintain the system.



6. COMPARISON: COST vs SAVINGS

This section compares a year-on-year Cost and Savings from installing the solar PV system at a 5 year interval upto the system life of 25 years. The savings are determined by calculating the cost of electricity produced by the solar PV system using local electricity rates factoring in the inflation and panel degradation.

YEAR(S)	BASED ON AVERAGE ELECTRICITY USAGE 				BASED ON HIGHEST ELECTRICITY USAGE 			
	ELECTRICITY PRODUCED (SOLAR) (kWh)	AVERAGE SYSTEM COST (CAD \$)	SAVINGS FROM SOLAR (CAD \$)	NET SAVINGS (CAD \$) (SAVINGS FROM SOLAR - AVG. SYSTEM COST)	ELECTRICITY PRODUCED (SOLAR) (kWh)	AVERAGE SYSTEM COST (CAD \$)	SAVINGS FROM SOLAR (CAD \$)	NET SAVINGS (CAD \$) (SAVINGS FROM SOLAR - AVG. SYSTEM COST)
1								
5								
10								
15								
20								
25								

'Electricity Produced' by solar decreases every year due to panel degradation

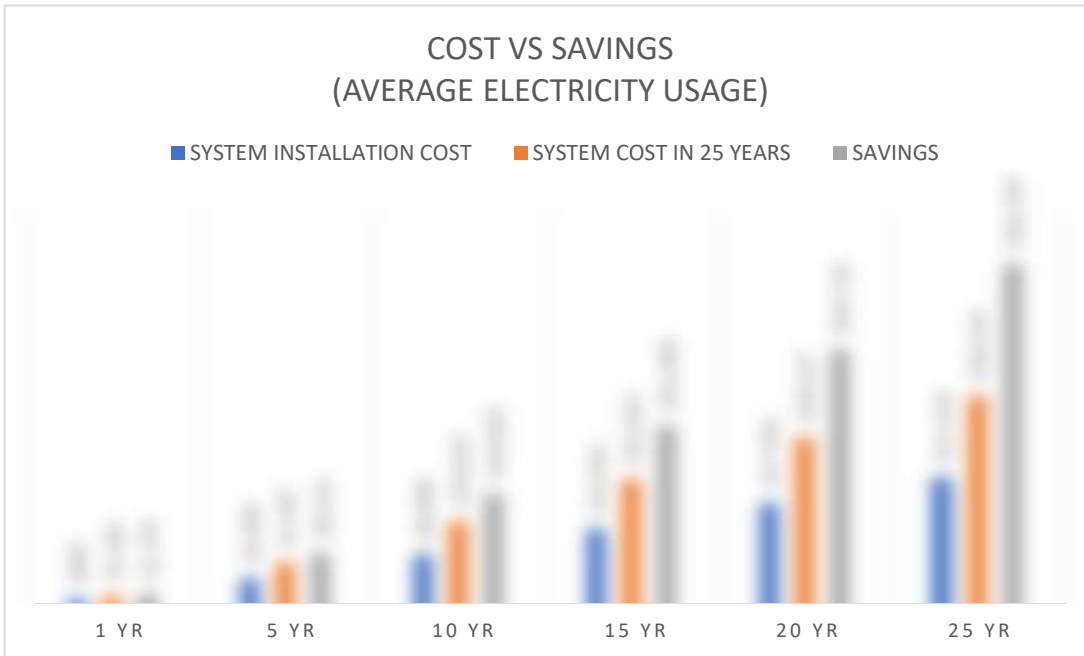
'Average System Cost' is the cost of the solar PV system averaged out per year

'Savings From Solar' is the amount of electricity generated by the solar PV system in a year considering the local electricity tariffs, inflation, panel degradation, etc

'Net Savings' is the final savings from solar achieved by deducting the 'Average System Cost' from 'Savings From Solar'



7. GRAPH: COST vs SAVINGS

The below graphical illustration provides a quick overview of the long-term investment. The Cost and Savings from the solar system are compared at a five-year interval up to the system life of 25 years. At each interval, a comparison is made between installation cost, lifetime cost and savings from the system. This provides you with a clear picture of how the Cost vs Savings looks like at each interval. The savings are calculated considering inflation as well as the local electricity tariffs escalated at a rate of 3% annually.

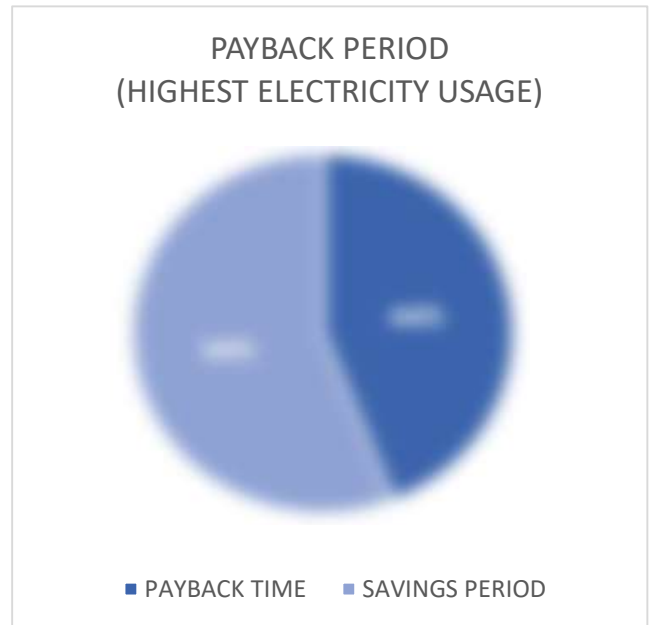
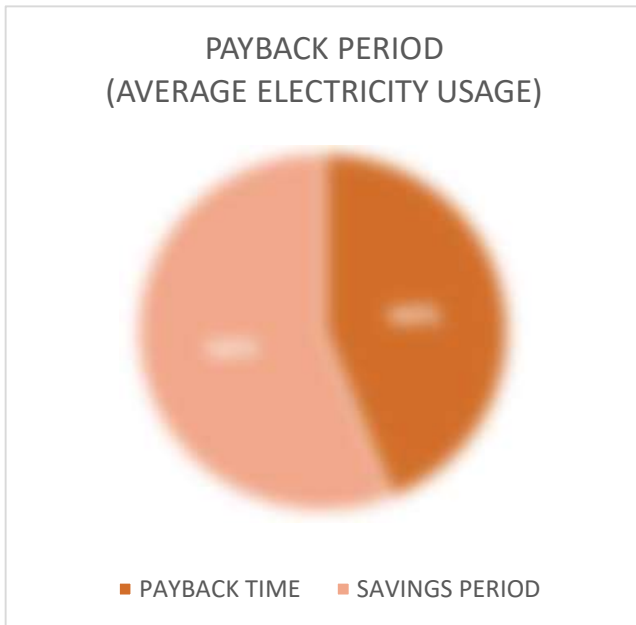


8. RETURN ON INVESTMENT

This section focuses on the returns that the system can yield. It demonstrates the profitability by providing Internal Rate of Return per year as well as the Return on Investment in 25 years. Further this section presents the payback period which is the amount of time the system takes to pay for itself.

DETAILS	BASED ON AVERAGE ELECTRICITY USAGE 	BASED ON HIGHEST ELECTRICITY USAGE 	UNIT
Internal Rate Of Return (IRR) Per Year	%	%	%
Return On Investment (ROI) In 25 Years	%	%	%
Payback Period	Years	Years	Years

The pie charts below show the 'Payback Time' as a percentage of the total system life as well as the 'Savings Period' which is the savings time left after the system has paid for itself to the end of system life.



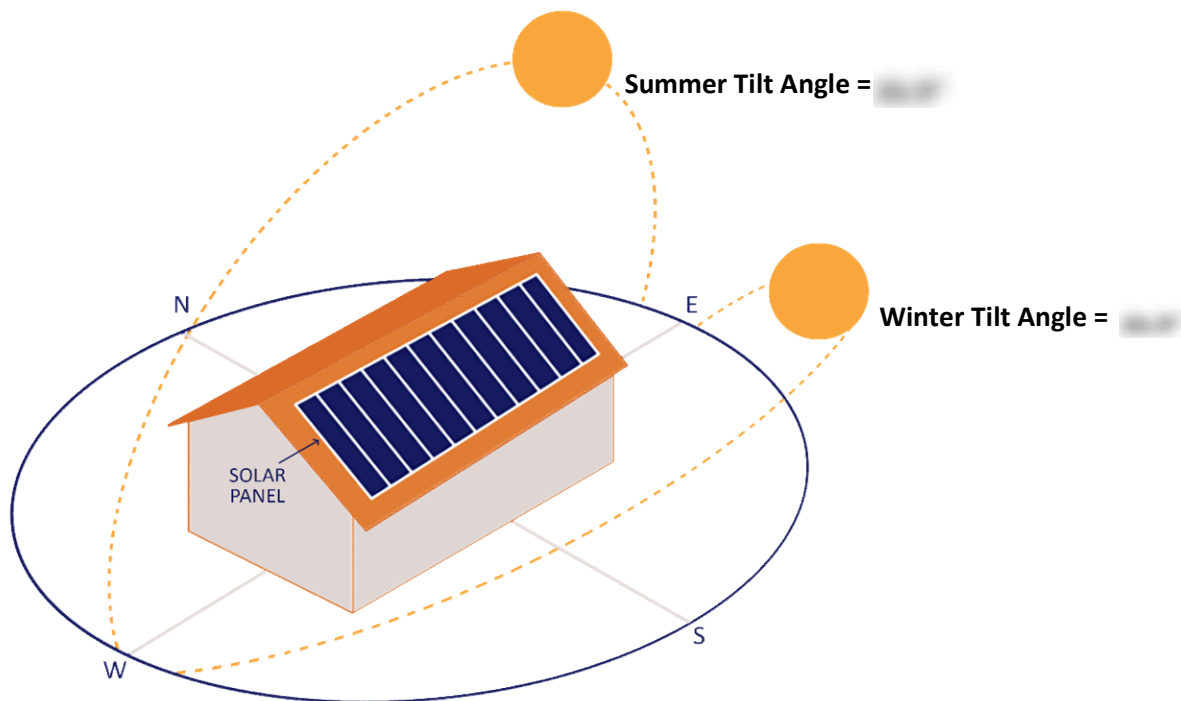
9. PANEL TILT ANGLE & DIRECTION

Solar panels need the maximum amount of sunlight to produce optimum solar power. Solar panels produce best

This is called the 'Panel Direction'.

'Tilt Angle' is the angle at which the solar panels are mounted with the horizontal plane (ground level). This angle is calculated based on the latitude of the solar system's location. As the sun has different positions during summers and winters one can capture the most of it by changing the Tilt Angle seasonally. The seasonal change in tilt is possible only in systems with adjustable tilts or with trackers. While this is not mandatory, it is recommended to get the most solar energy over the whole year. Moreover, as Canada experiences snow during winters, adjusting the panels to a _____ angle in winter makes it more likely that they will shed snow. A panel covered in snow produces little or no power.

DETAILS	VALUE	UNIT
Panel Tilt Angle In Summer	_____	Deg
Panel Tilt Angle In Winter	_____	Deg
Panel Direction (Ideal)	_____	Direction



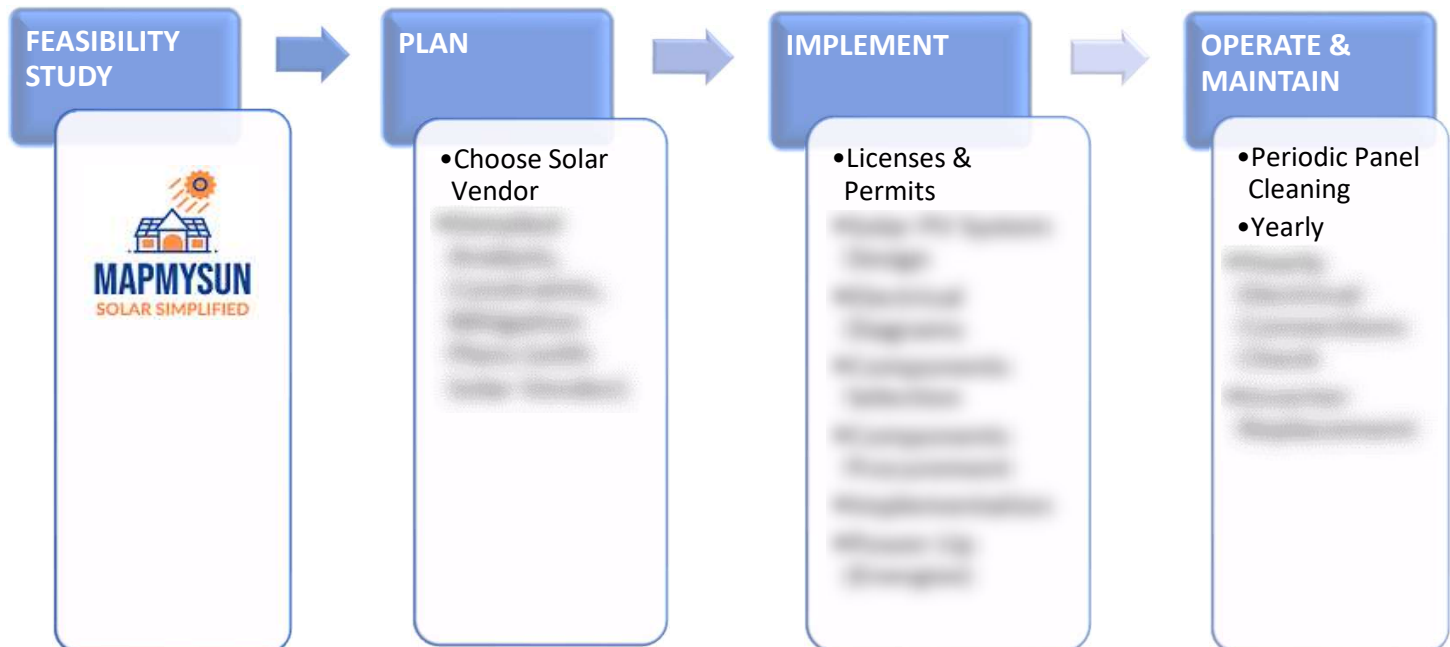
10. METHODOLOGY

This report uses MapMySun modelled calculations which are endorsed by the best-in-class solar installation companies. The solar radiation data is obtained from one of the most trusted sources; the National Renewable Energy Laboratory (NREL). For each province, a yearly average of solar data is obtained for a chosen few city to get the solar data for that province. While solar systems last even longer, for calculations, the life span of the solar system is considered as 25 years and a solar panel of 300 watt is used. Inverter sizing calculations assume a margin of 10%, considering the safety factor. For mounting solar panels, it is recommended that the panels should be facing south. The recommended panel tilt angle values are provided for summer and winter months for maximum solar irradiation.

The electricity tariffs are obtained from various utility providers (as per province and territory) and are updated regularly. Average price of electricity is considered based on monthly electricity consumption of 10 kWh which includes both fixed and variable costs. From historical data available by the Canada Energy Board, an annual electricity tariff escalation of 3% is considered for the purpose of calculations. Some provinces and territories may have rebate programs for residential, commercial, and community projects. However, due to their intermittent nature, these are not considered in calculations.

The installation cost of the solar PV system is based on rates from local installers and is comprised of design, build, component, and manpower costs. The lifetime system cost includes the system installation cost, Inverter replacement cost as well as costs for operating and maintaining the system. Inverter replacement cost is based on the fact that it will be replaced once in 10 years, assuming that it is properly operated and maintained. The savings from solar system are derived by calculating how much would it cost to buy the amount of electricity produced by the solar PV system using local electricity tariffs.

11. STEPS TO GO SOLAR



12. VENDOR SELECTION

If you have decided to go ahead with a solar PV system, the next and one of the most important decisions to make is the selection of a qualified solar Installation company / vendor. The solar installer must be someone who you look forward to working with over the period of design, installation, and ongoing delivery of power. Below are some points to consider while selecting an installer and what questions to ask them:

A. Vendor Selection:

1. Check the vendor's references and reviews with previous customers to ensure you do not choose the wrong vendor.
2. Check the vendor's license and insurance coverage.
3. Check the vendor's experience and financial strength of the company to ensure they will be around for the long-term to deliver on warranty coverage.
4. Check with the vendor if the cost comparison and installation by competitors of your system. Always remember, the most cost is not always the best option. Quality and customer service.

B. Costs:

1. Check the vendor's estimate and the cost breakdown. Design, installation, transportation, equipment, and operation & maintenance.
2. Check who will be responsible for the system components. Make sure to check if there are any hidden costs in the quote.
3. Make sure you get the cost for any additional work, such as obtaining the permit if your local code is to be followed.
4. Check if the installation of a solar system will have implications for your home insurance. Contact your insurance provider.

C. Site/Equipment Selection:

1. Check that the system is free from any shading from nearby trees, chimneys, or any other obstruction to the site of the system.
2. The vendor should conduct a site survey to determine the optimal array orientation.

D. Performance warranty in the contract:





1. Check if any performance guarantee or warranty coverage is included in the contract.
2. Make sure the contract is signed with the manufacturer's authorized dealer.

DISPUTE RESOLUTION WITH YOUR SOLAR VENDOR


1. Check the vendor's warranty and service policy.
2. Check the vendor's dispute resolution policy, including arbitration and legal costs.
3. Consider that disputes can be resolved by arbitration, negotiation, mediation, or litigation. Litigation is the most costly and time-consuming way, while mediation and arbitration through the court system.

13. ENVIRONMENTAL BENEFITS OF SOLAR

Solar energy is one of the cleanest sources of energy. Today solar not only helps to reduce greenhouse gas emissions and threat to climate change but is also an economically viable option. This section will help you understand how your system can contribute to the environment by reducing CO2 emissions.

DETAILS	BASED ON AVERAGE ELECTRICITY USAGE 	BASED ON HIGHEST ELECTRICITY USAGE 	UNIT
CO2 Emissions Avoided In 25 Years			lbs
No. Of Trees Saved In 25 Years			
No. Of Cars Avoided For 25 Years			

14. PROS & CONS OF SOLAR




PROS

- 1. Renewable energy source
- 2. Low maintenance costs
- 3. Long lifespan (25+ years)
- 4. Reduces carbon footprint
- 5. Energy independence
- 6. Government incentives
- 7. Stable energy prices
- 8. Low operating costs
- 9. Increased property value
- 10. Clean and safe energy

CONS

- 1. High initial investment
- 2. Weather-dependent production
- 3. Limited space requirements
- 4. Energy storage costs
- 5. Potential shading issues
- 6. Net metering requirements
- 7. Grid connection fees
- 8. Potential aesthetic concerns
- 9. Theft risk
- 10. Recycling challenges



15. OPERATION & MAINTENANCE OF A SOLAR PV SYSTEM

Operation & Maintenance is the key to ensure that the solar PV system gives the best possible power generation throughout its life. Below are a few simple points which if followed on a regular basis can help improve longevity and ensure optimum power generation:

1. Inspect solar panels for damage
2. Regular cleaning of solar panels (taking care of dust, snow, bird droppings, etc.)

3. Monitor system performance
4. Monitor system components
5. Check inverter output (range available for system setting)
6. Inspect and clean all electrical connections
7. Check system for any other issues

16. COMPONENTS OF A TYPICAL SOLAR PV SYSTEM

1. Solar panels
2. Solar inverters

3. Solar mounting system
4. DC cables
5. AC cables
6. Inverter rack
7. AC/DC distribution board
8. Electrical connection components (MC4)
9. Protection equipment (lightning protection, surge protection, earthing, etc.)
10. System monitoring system
11. System cabinet (if grid-connected system)
12. Energy storage (if distributed by an inverter)

17. GLOSSARY OF TERMS

AC (Alternating Current): Electric current which periodically changes direction

DC (Direct Current): Electric current which flows only in one direction

kW (Kilowatt): A measure of 1000 watts of electrical power

kWh (Kilowatt Hour): 1kWh = 1 unit of energy

PV (Photovoltaic): Photovoltaics is the conversion of light into electricity using semiconducting materials that exhibit the photovoltaic effect

V (Voltage): An electromotive force or potential difference expressed in volts

LCOE (Levelized Cost of Electricity): Measure of the average net present cost of electricity generation for a generating system over its lifetime

CapEx (Capital Expense): Expenditure which includes upfront cost for design, installation, and commissioning of the system

OpEx (Operational Expense): Day to day costs that are required for running the solar PV system

IRR (Internal Rate of Return): This is the measure of the solar systems rate of return

ROI (Return on Investment): Performance measure use to evaluate the efficiency of an investment

CO₂ (Carbon dioxide): Colorless gas with a density about 60% higher than that of dry air

EPC: Engineering, Procurement & Construction

Grid: An electrical grid is an interconnected network for delivering electricity from producers to consumers

Grid-Connected: An electricity generating solar PV system that is connected to the utility grid

Off-Grid: An electricity generating solar PV system that is not connected to the utility grid

NREL (National Renewable Energy Laboratory): A federal laboratory dedicated to research, development, and deployment of renewable energy technologies

O&M (Operation & Maintenance): All services that ensure maximum efficiency of the solar PV system

18. ASSUMPTIONS & FAQs

All currency values are in Canadian Dollars (CAD \$)

Calculations are based considering typical life of a solar system of 25 years

Solar irradiation values are obtained from NREL. A yearly average value of irradiation of selected few cities in each province is considered

The system is designed for worst month (winter sun hours are considered)

Ideal conditions, temperature, a shade-free area and a south facing roof are considered

Inverters if properly maintained typically have a lifespan of 10-15 years. Calculations assume that Inverter will be replaced once in the lifetime of solar plant

300Wp solar panels have been considered in calculations

Panel degradation rate of 0.5% annually is considered

The electricity tariffs used in calculations include both, fixed and variable tariff components

The electricity production values does not consider tilt angles

The latitudes used in calculations are rounded off for provinces



www.MapMySun.com



sales@mapmysun.com



[Like Us On Facebook](#)



[Follow Us On Instagram](#)

Have Questions? Check our FAQs @ www.mapmysun.com/pages/faqs

625D Chapman Mills Drive, Ottawa, ON, K2J 0V5 - CANADA

DISCLAIMER AND LEGAL INFORMATION:

MapMySun Inc. shall not be liable for any direct, incidental, consequential, indirect, or punitive damages arising or alleged to have arisen out of use of the MapMySun report. The values obtained and the components listed in this report are to be used solely as a general guide and should not be used for system sizing / design purpose. Neither MapMySun nor any of its employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information in this report. This report is intended to provide an estimate of what could potentially be the system technical / financial parameters. Actual system size and costs will depend on the exact location of the system, the angle to the sun (north-south vs. east-west), the amount of shade if any, the type and angle of roof, electrical connections, local electricity tariffs, local installation rates, component costs, etc. The user of this report is recommended to arrange for a qualified solar professional to undertake a detailed assessment of their site before proceeding with the installation of their solar PV system.