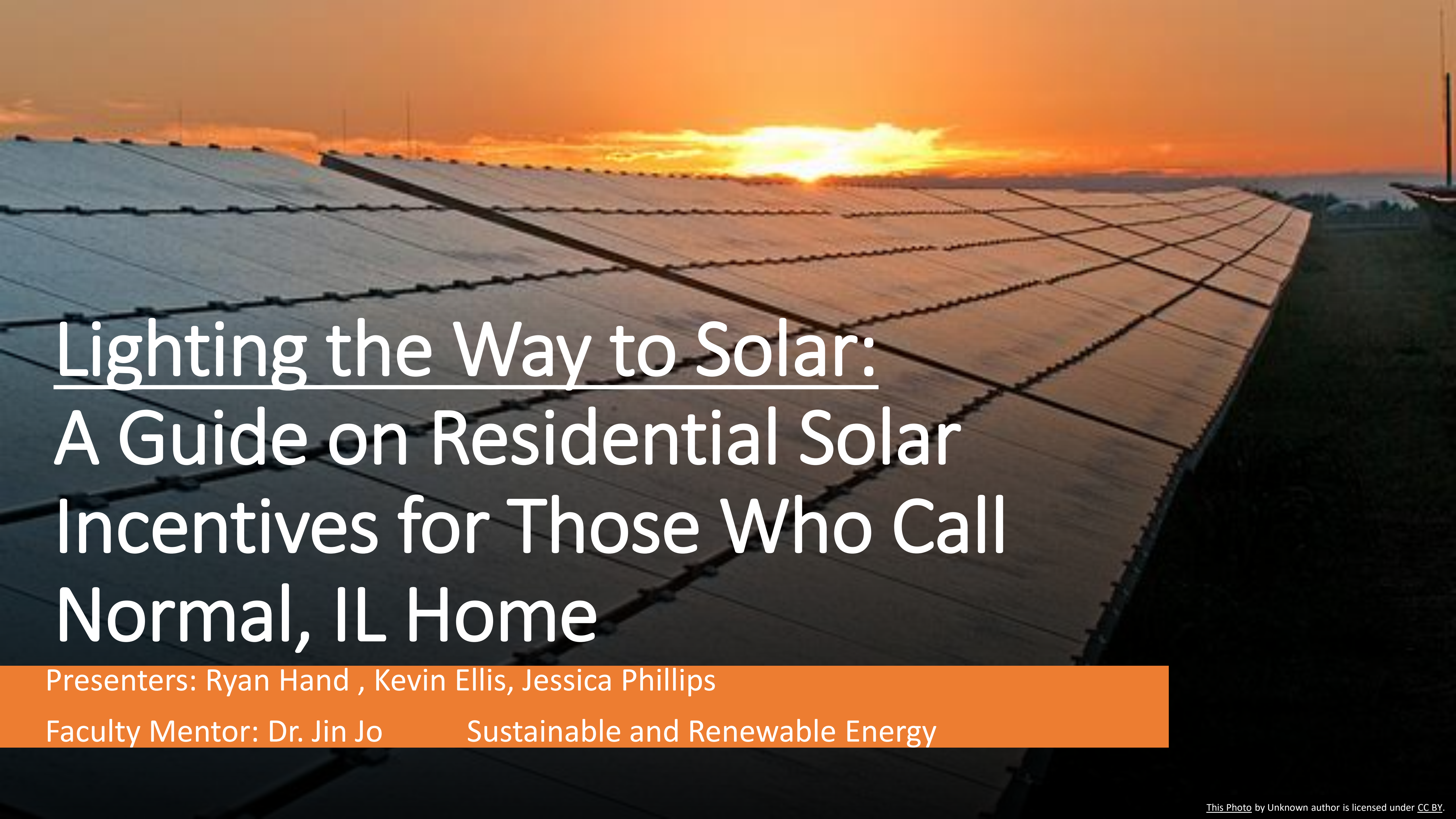

Lighting the Way to Solar: A Guide on Residential Solar Incentives for Those Who Call Normal, IL Home

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Abstract

The path to installing a solar photovoltaic (PV) system on one’s own roof can be both confusing and expensive. Although the cost of solar is declining, it remains a barrier to many potential adopters. To combat this and promote clean energy, the government at both state and federal levels offer incentives including personal tax credits, direct cash payments, and solar renewable energy credits. This research study pertains to single-family homeowners serviced by the utility company Corn Belt Energy Corporation, in Normal, Illinois. However, the framework of this study may apply to other residents within the United States who want to understand what incentive structures are available to them. After explaining the different incentive types, this report discusses those which are available to the residents of Normal. The program tool “PVWatts” is used to generate financial metrics on various combinations of incentives. Through comparative analysis, financial feasibility is determined by the impact of the incentive on net present value (NPV) and simple payback period (SPP). The significance of this study is to show residents what the available options are, along with the benefits in hopes of increasing the rate of residential solar adoption in Normal, IL. Recommendations will also be provided on how Illinois could improve its residential solar adoption based on the actions and results of the incentives provided by other states.

Research Questions

What are the solar incentives available to single-family homeowners in Normal, IL?

What are some ways these incentives could be changed or replaced to lower the cost of residential solar installation?

Incentives & Amounts

Investment Tax Credit (ITC)

- Also known as "Federal solar tax credit"
- Provided by United States Federal Government
- 26% tax credit - by deducting 26% of the cost of installing a solar energy system from your federal taxes – until 2022
- 22% tax credit in 2023
- Program ends in 2024 unless extended by congress
- Currently available [4]

Illinois Power Agency (IPA)

- Also known nationally as Solar Renewable Energy Credit (SREC)
- Supports development of new photovoltaic distributed generation and community solar projects in Illinois
- Block program
  - $0.0851/kWh for systems under 10 kWdc capacity
- Not accepting new applicants [5]

Methodology

1. Gathered incentive data and amounts
2. Determined average system size and parameters to form assumptions
3. Communicated with Corn Belt Energy to obtain electrical rate structure
4. Preformed analysis using PVWatts modeling program
5. Altered incentive variables to compare financial impacts
6. Interpreted results to form conclusions

Assumptions

Residents live in Normal, IL

Utility provider is Corn Belt Energy

Resident's homes can support suggested system size

Resident purchases the solar PV system with a standard loan

System has a 25-year lifetime warranty

Our analysis does not consider the value of externalities such as CO2 reduction and increase in property value.

PVWatts Parameters

System Nameplate Capacity: 5 kWdc

DC to AC Ratio: 1.2

Inverter Efficiency: 96%

Fixed Roof Mount

Tilt: 20 degrees

Azimuth: 180 degrees

Total system losses: 14.08%

Annual AC Degradation Rate: 0.5%/year

Total Installed cost per capacity: $2.72/Wdc

Fixed O&M costs by capacity: $29.00/kW-year

Analysis period: 25 years

Inflation Rate: 2.2%

Discount Rate: 6.4%

Loan term: 20 years

Loan rate: 5%/year

Total installed cost: $13,607.50

Use (kWh)	Peak (Jun – Aug)	Off-Peak (Sep – May)
< 600	10.25 ¢/kWh	7.451 ¢/kWh
>600 <1800	10.25 ¢/kWh	6.834 ¢/kWh
>1800	10.25 ¢/kWh	5.2 ¢/kWh

Figure 1. Rates provided by Corn Belt employee [11].

Results

Net present value is the net different of cash flow in and out adjusted for the time value of money

Simple payback period (SPP) is an estimated time needed for the savings provided by the system to equal its cost.

Discounted payback period is a more accurate estimate because it includes the time value of money. All values were greater than 25 years.

Levelized cost of energy is analogues to the price per kWh on a utility bill.

Incentive(s) Applied	Net Present Value	Simple Payback Period	Levelized Cost of Energy (nominal)
26% ITC	$-2,503	24.9 years	13.63¢/kWh
26% ITC and SREC	$1,089	12.4 years	8.03¢/kWh
SREC	$-2,155	18.2 years	13.08¢/kWh
No incentives	$-5,748	>25 years	18.63¢/kWh

Figure 2. Incentives available for Illinois residents applied to a PVWatts model and calculated by the PVWatts program [1].

Comparative Analysis:

Effective Incentives for Residential Solar in Other States

Incentive Name	Summary	Requirement(s)	Result	Why Apply it to Illinois
Mass Solar Loan [9]	Avoids complications involved with third-party agreements	Homeowners with low credit scores and adequate incomes	Fixed, low interest payments on systems (5.5% for 10 years)	Decrease payback periods
NY-Sun [2]	Allows solar developers and contractors to work directly with residents	Interest in installing solar energy	Increase in solar installations	Residents receive accurate information
Solar Energy System Equipment Credit [3]	Tax credit residents can apply for and claim on taxes	-Recent purchase of equipment -Lease for system equipment -Entered 10-year lease for purchase of power generated by another system (not-owned by resident	Receive tax credit worth $5,000 or 25% of system cost	Allows homeowners to see/earn payback from their system installed

Figure 3. Description of incentives offered for residential solar in other states.

What-If Scenarios:

Applying Mass Solar and Solar Energy System Equipment Credit to Illinois

Incentives Applied	Net Present Value	Simple Payback Period	Levelized Cost of Energy (nominal)
Mass Solar Loan, Solar Energy System Equipment Credit	$-1,970	18.7 years	12.80 ¢/kWh
Mass Solar Loan, Solar Energy System Equipment Credit, and SREC	$1,623	8.9 years	7.20 ¢/kWh

Figure 4. Values calculated from applying additional incentives to a PVWatt model [1].

As seen in Figure 4, bundling the Mass Solar Loan, Solar Energy System Equipment Credit, and SREC could have the potential of increasing the net present value, offer a shorter simple payback period, and lower the levelized cost of energy for residents in Illinois.

Conclusion

- Overall, Illinois does not have much to offer its residents other than the Federal ITC which will be ending in 2024. The SREC program should also be refunded in order to encourage residents to invest in solar PV systems and increase the amount of energy generated by renewable sources in Illinois.
- Illinois would benefit by offering a combination of incentives similar to the Mass Solar Loan, Solar Energy System Equipment Credit, and SREC. These incentives have the potential of making residential solar financially feasible in the state of Illinois and in the town of Normal.

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