Solar Energy in Agriculture: Considerations for Investing in Photovoltaic Solar Systems

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INTRODUCTION

According to the 2013 Annual Energy Outlook Report, the national average cost for electricity in the industrial sector, which includes agricultural and irrigation, is projected to increase from 6.4¢ per kWh in 2013 to 12.8¢ per kWh in 2040 (USDOE/EIA, 2013). An increase in energy costs will generally raise the prices of agricultural products and reduce farm income, limiting the potential for growth. Energy inputs are important to agriculture, with direct and indirect energy-related expenses representing roughly 13% of total farm production expenses in 2005–2008. To stabilize energy input cost and maximize profitability on the farm, many agricultural producers are now considering investments in energy efficiency and on-farm solar electric generation.

PHOTOVOLTAIC SOLAR ENERGY TRENDS

Advances in technology and policy mandates that require the installation of photovoltaic (PV) solar have contributed to the reduction of system costs. For example, the average installed solar price for mid-sized systems (between 10 kW and 100 kW) has dropped from more than $10 per watt in 2000 to $3.46 per watt in 2016 (USDOE/NREL, 2016). The declining cost of equipment and installation makes installing a behind-the-meter PV solar system enticing for many agricultural producers. As a result, PV panels are increasingly common sights on farms and rural properties across Ohio.

SOLAR ELECTRIC INVESTMENT ANALYSIS BULLETIN SERIES

Evaluating the financial prudence of an investment in solar requires careful consideration of system costs, the value of production, and operation and maintenance costs. Unfortunately, some proposals are hard to understand making it difficult to make fully informed investment decisions. This six-part bulletin series was developed in collaboration between the University of Wyoming and Ohio State University to increase participants’ knowledge of PV solar energy development and the financial considerations to guide informed decision-making with future investments.

Part 1: Estimating System Production

Site-specific factors such as shading, orientation, tilt, temperature, and panel degradation can influence the amount of electricity produced by a PV solar system.

Part 2: Assessing System Cost

A better understanding of direct system costs, indirect capital costs, operations and maintenance, and standard assumptions provides a more accurate financial analysis, fostering informed investment decisions.

Part 3: Forecasting the Value of Electricity

To calculate energy savings for a project, one must consider important variables, including the details of the individual rate structure and the assumed energy escalation rate that influence the value of electricity a PV system produces.

Part 4: Understanding Incentives

Despite declining costs for PV solar, incentives are important to the cost-effectiveness of a project. Incentives come from four primary sources – federal, state and local government, and utility companies. Incentives greatly affect the financial viability of a PV installation.

Part 5: Conducting a Financial Analysis

Understanding the solar resource production, system cost, value of electricity, and available incentives enables a robust financial analysis. Accurately evaluating the viability of a solar project requires understanding financial concepts such as simple payback, net present value, and the levelized cost of energy.

Part 6: PV Solar Example

The National Renewable Energy Laboratory, developed the System Advisory Model (SAM) to help developers, installers, and potential system owners estimate the system production and financial impacts of renewable energy projects.

KEY QUESTIONS TO ASK

1. Is shading, orientation, angle, and temperature included in production estimates?
2. Does the lifetime production include annual declines from panel degradation?
3. Can I easily identify the direct and indirect cost of the system?
4. What is the installed cost per watt?
5. Are the operations and maintenance costs included and defined in the proposal?
6. Is the value of electricity based on an average utility rate, or are fixed fees, demand charges, and energy charges evaluated separately?
7. What is the energy escalator rate used to calculate energy savings in future years? Is it real or nominal?

HOW TO ACCESS THE MATERIALS

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1. energyeohio.osu.edu/farm-solar-energy-development
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