Measuring the economic value of distributed solar generation (DSG) is somewhat contentious among a variety of stakeholders (e.g., homeowners and utility companies). Homeowners receive revenue from utility companies for contributing excess electricity to the grid. Customers are generally reimbursed for electricity at the full retail rate. The federal and state governments are responsible for developing policies that determine the compensation process, such as Net Energy Metering (NEM), for surplus electricity from rooftop solar that can be “sold” to the electric grid. The benefits of distributed solar to utility companies and the public include reduced grid congestion, reduced local air pollution and greenhouse gas emissions that impact public health.

The movement to install rooftop solar systems, also known as distributed solar generation, is growing rapidly in the United States. These solar systems are small, on-site energy sources located at homes or businesses that operate as small electrical power plants. Many homeowners and businesses have installed rooftop solar panels to generate renewable energy and reduce carbon emissions that result from using fossil fuels to produce energy. Benefits to homeowners using solar systems include revenue for the surplus electricity contributed to the electric grid. The benefits of distributed solar to utility companies and the public include reduced grid congestion, reduced local air pollution and greenhouse gas emissions that impact public health.

The use of solar energy provides a variety of benefits. DSG generates renewable energy at the customer’s home or business. After installation of rooftop solar systems, the cost of solar is free. There are no transmission and distribution costs. Solar energy does not emit any pollutants. In addition, solar energy helps reduce the total cost for homeowners or businesses that may be using both renewable and non-renewable types of energy.

In contrast, non-renewable energy is typically generated at a power plant and delivered to customers through a transmission and distribution system. Consumers pay to have energy delivered to their house, as well as the cost of using fossil fuels, such as oil, gas and coal. The overall cost of fossil fuels fluctuates, due to a variety of factors.
Electricity production in the Great Lakes region is heavily reliant on coal-based generation, adding significant amounts of carbon dioxide to the atmosphere, with Michigan ranked as the 10th largest carbon dioxide emitter (in 2011) among states in the nation. In addition to its impacts on climate change, coal-fired generation also emits nitrogen oxides (NOx), sulfur oxides (SOx), and particulate matter (e.g., ash and soot), which can have adverse effects which degrade air quality and have adverse human health impacts, such as lung disease, cancer, and asthma.

**PRICING SOLAR**

The project team selected a few key factors to focus on to determine the value of solar, including:
1) A fuel price hedge to help stabilize the cost of fuel by locking in prices for a period of time
2) Environmental benefit
3) Reactive supply and voltage control, or the management of electricity to ensure that the transmission system is stable and efficient.

The total value from all three factors is $0.042/kWh (kilowatt per hour). See the cost estimate breakdown for each factor, below.

**Fuel Price Hedge** – Cost Estimate = $0.019/kWh
The economic benefit of solar power (renewable energy), assuming the investment in the installation is for the lifetime of the solar equipment (approximately 30 years). The use of solar would displace coal-and natural gas-fired generation (non-renewable energy). The availability and value of fossil fuels determines the price.

**Environmental Benefit** – Cost Estimate = $0.023/kWh
Reducing carbon emissions by using solar power is calculated by estimating the carbon emissions for the same power generation by fossil fuel. In addition, the social cost of carbon, established by the federal government, is applied to calculate the environmental benefit.

**Reactive Supply and Voltage Control** – Cost Estimate = $0.002/kVar (reactive power)
DSG may help reduce transmission losses, increase transmission capacity, and maximize power transfer capability.

**STAKEHOLDER FEEDBACK**

On behalf of the Michigan Public Service Commission, the U-M Dow Sustainability Fellows team conducted interviews with relevant stakeholders (e.g., individuals and organizations) to understand their positions on the proposed alternatives to assessing the total value of distributed solar generation. A few alternatives for calculating solar generation tariffs were discussed. Based on stakeholder feedback, there was no consensus about policies suggested by the Commission. However, some policy options were unclear, making it difficult to predict how the market or policy makers would react to changing the tariff.

**CONCLUSION**

The student group recommended that the Michigan Public Service Commission consider a Value of Solar tariff. This would provide a more accurate estimate of the value of DSG, rather than Net Energy Metering. In calculating the tariff, the Commission would identify the benefits from DSG, and compensate solar customers appropriately. This information would be used to determine a fair tariff system for all customers. Additional recommendations for the Commission included:

1) Continuing to engage stakeholders about transitioning from net energy metering (NEM) to a Value of Solar tariff.
2) Conducting a thorough analysis of the value of distributed solar for the State of Michigan.