

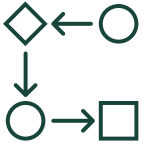
# PV Operations Economic Impact Simulation Model

# Motivation



- Objective:
  - Develop actionable information on expected economic outcomes of utility-scale PV installations and operations on rural economies
- Goal:
  - Create a turnkey simulation model like the *National Renewable Energy Laboratory's Jobs and Economic Development Impact* (JEDI) model for PV solar that even civic leaders can employ
    - Develop an MS Excel-based economic simulation model that is:
      - Detailed,
      - Easy to use,
      - Generalizable, and
      - Modifiable/scalable

# PV Economic Impact Simulation Model



- Economic Effects Follow two Phases of the facility's life
  - Installation Phase (*8-24 months*)
  - Operations and Maintenance (O&M) Phase (*25-30 years*)
- Default values overridable by the user
  - Default values derived from multiple sources
    - Surveys/interviews
    - Prior economic impact estimation projects
    - National Renewable Energy Laboratory (*NREL*) reports

# Installation Phase



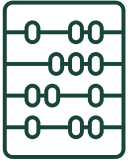
- Installation phase is one of intense economic activity over a short period of time
  - Relevant costs for consideration exclude soft site-selection, planning and negotiating costs
    - Limited to the operational costs of installing the designed solar installation
    - Excludes option contracts with property owners
- NREL Baselines (*standard single axis solar arrays*)
  - Cost shares for installation components
  - Expected total cost per name-plate capacity
    - All component default values can be overridden by the user

# O&M Phase



- O&M phase is recurring over the life of the installation
  - Costs are entered on a per unit of output basis
    - Hence, estimates start with specifying the energy conversion rate from PV solar nameplate capacity to energy produced, requiring the user to provide:¥
      - Planned inverter load ratio
      - Expected capacity factor
      - Acres under solar cells plus perimeter
  - Default costs per annual unit of output and component shares are pulled from NREL
    - Values based on average annual values per life of installation
    - All component default values can be overridden by the user
  - Actual projected annual operating expenditures increase year throughout the life of the installation

# Economic Impact Simulation



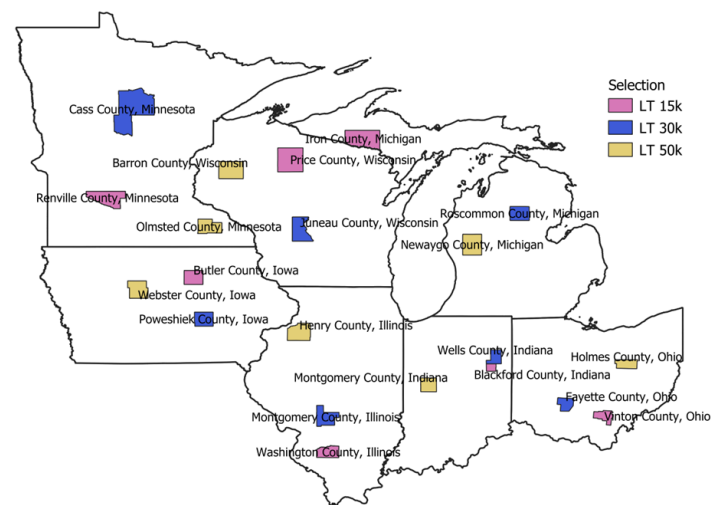
- Measuring economic impacts entails simulating net changes in the economy and tracing out how dollars are spent and re-spent in the local economy
  - Simulation model follows the structure of the local economy
    - Local economy is defined to be no larger than a rural county
    - Data and models underlying economic simulations should reflect the economy of the underlying community
  - Simulation model should account for effects over the life of the project
  - Economic effects must equitably represent new activities introduced to the local economy by the PV project as well as activities supplanted by the PV project over all years

# Economic Impact Simulation

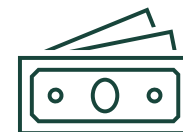


- Given the high number of potential counties for analysis
  - Three representative counties were assigned by state to represent a class of counties by the size of the respective economy
    - Small economy
    - Medium-sized economy
    - Large economy
  - All 407 rural counties were assigned an agricultural productivity category based on grain yields

	LT 15k	LT 30k	LT 50k
IA	Butler County	Poweshiek County	Webster County
IL	Washington County	Montgomery County	Henry County
IN	Blackford County	Wells County	Montgomery County
MI	Iron County	Roscommon County	Newaygo County
MN	Renville County	Cass County	Olmsted County
OH	Vinton County	Fayette County	Holmes County
WI	Price County	Juneau County	Barron County



# Economic Impact Simulation



- Besides tracking direct expenditures captured by the local economy for the PV operations...
  - Household use of lease proceeds
  - Opportunity costs of lost agricultural output
  - Expected annual tax revenues from property tax
    - Reflecting state taxing policies
  - Explore wealth effects of changes in property valuations but found little evidence suggesting that neighboring property values are negatively impacted by proximity to utility-scale PV installations<sup>¥</sup>
- What is omitted
  - Consideration of non-property tax state tax incentives offered and its overall effect on local tax generation
  - Opportunities for deploying agri-voltaics and associated impacts

*¥ an early study suggested that properties within half a mile of a utility-scale PV installation may see a reduction of 1.5 percent of property value. Equity in home makes up about 50% of household wealth and estimates of the wealth effect on spending from changes in housing wealth suggest that for every one dollar change in housing wealth, households spending changes from anywhere between two cents to nine cents. That is, any perceived change change in household wealth is likely not sufficient to drive changes in household behavior.*