North Carolina Solar Center
College of Engineering
North Carolina State University

Southern Mid-Atlantic Provider of Solar Instructor Training
SMAPSIT TEAM:

- **Pam Carpenter, Ph.D.** Program Manager for K-20 renewable energy technologies and science, technology, engineering, and mathematics (STEM) Education at NCSC. She serves as the principal investigator who coordinates the overall project.

- **Maria O’Farrell,** Program Manager for the ISPQ Accredited NCSC Training Programs, provides her expertise in renewable energy technologies and green building curriculum and hands on lab coordination as Director of Training for the SMAPSIT project.

- **Wade Fulghum, M.B.A,** Assistant Director of the Economic Development Partnership at NCSU, serves as the project economics and project finance instructor for the SMAPSIT training and develops the comprehensive online renewable energy economic calculators.

- **Henry Tsai, M.B.A,** Associate Director of Finance at the North Carolina Solar Center, handles the in-depth budgetary allocations, contract management, and long term strategic planning for the SMAPSIT project.
SMAPSIT: APPROACH AND FOCUS

• Highly Skilled Trainers
• Coordination with National Administrator
• Intensive/ comprehensive high level training
  ▪ Technical piece
  ▪ DSIRE and financial calculators
  ▪ Curriculum development
  ▪ Hands-on lab training
• Moodle Environment
• Assessment and Fulfillment of Industry Needs
• Partnership Development
• Outreach

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COLLABORATION AND OUTREACH

North Carolina Solar Center
Southern Mid-Atlantic Provider of Solar Instructor Training
Training Equipment and Facilities
David Del Vecchio
Instructor

North Carolina Solar Center
Southern Mid-Atlantic Provider of Solar Instructor Training
Creating a Skilled and Trained Workforce
Solar Financial Modeling Tools

The SMAPSIT team has created both solar photovoltaic and solar heating and cooling financial modeling tools that can be used to calculate solar project’s return on investment with associated cash flows (in table and interactive chart formats) for the states in our scope of work.

The user interface is broken up into logical and manageable sections including:

- Instructions
- Project Variables
- DSIRE Feed
- Cash Flow Charts
- Cash Flow Tables
- Project Information (snapshot)
- Learning
Solar Financial Modeling Tools

The financial modeling tools were built to be completely flexible and can handle:

• federal and state investment tax credits
• pricing information for electricity sales and REC’s
• custom rebates/discounts
• performance based incentives
• capacity based incentives
• various annualized costs

A novel feature is that live DSIRE feeds are filtered into the financial tool in real time for all solar financial incentives and policies for each state so as the policy and incentives change the tool user can incorporate the latest information into calculated returns.
Solar Photovoltaic Project Variables

Select the project type:
- Residential
- Commercial
- Non-Tax Paying Entity
### Solar Photovoltaic Project Variables

<table>
<thead>
<tr>
<th>Technical Variable</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation Size (Watts DC)</td>
<td>8,000.00</td>
</tr>
<tr>
<td>Est. Annual Production (kWh/yr)</td>
<td>1,262,947</td>
</tr>
<tr>
<td>Power Output Warranty Step 1 (% Guaranteed)</td>
<td>90%</td>
</tr>
<tr>
<td>Power Output Warranty Step 1 (Until Year)</td>
<td>12</td>
</tr>
<tr>
<td>Power Output Warranty Step 2 (% Guaranteed)</td>
<td>80%</td>
</tr>
<tr>
<td>Power Output Warranty Step 2 (Until Year)</td>
<td>25</td>
</tr>
<tr>
<td>Annual Degradation</td>
<td>1.00%</td>
</tr>
<tr>
<td>Warranty period</td>
<td>25</td>
</tr>
</tbody>
</table>
Solar Photovoltaic Project Variables

Choose the solar degradation method:
- Annual degradation Method
- Power Output Warranty Method
Solar Photovoltaic Project Variables

Cost Variables

- Estimated installation cost: $5,500,000
- Inverter Replacement (After Every Xth Year): 25
- Inverter Replacement Cost:
- Operations & Maintainence (Annual):
- Net Metering Costs (Annual):
- Insurance Cost (Annual):
Solar Photovoltaic Project Variables

State Variables

- State Tax Credit Percentage: 35%
- Years To Apply State Tax Credit: 5
- State Tax Credit Maximum: $2,500,000

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Solar Photovoltaic Project Variables

- Estimated federal tax rate: 34%
- Federal Investment Tax Credit: 30%
- Years To Apply Federal Tax Credit: 1
- Take Federal Bonus Depreciation?:

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Solar Photovoltaic Project Variables
**Solar Photovoltaic Project Variables**

### Market Variables

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retail Price Electricity ($/kWh)</td>
<td>$0.1500</td>
</tr>
<tr>
<td>REC Price Buy All Sell All (per kWh)</td>
<td>$0.1100</td>
</tr>
<tr>
<td>REC Contract Period Buy All Sell All</td>
<td>25</td>
</tr>
<tr>
<td>Avoided Cost (Wholesale)</td>
<td>$0.0700</td>
</tr>
<tr>
<td>REC Price Net Meter (per kWh)</td>
<td>$0.11</td>
</tr>
<tr>
<td>REC Contract Period Net Metered</td>
<td>20</td>
</tr>
<tr>
<td>Energy Escalation Rate</td>
<td>6%</td>
</tr>
<tr>
<td>Annual Electric Bill</td>
<td>$1,200.00</td>
</tr>
</tbody>
</table>
Solar Photovoltaic Project Variables

Choose interconnection method:

- Net Meter
- Buy All Sell All
DSIRE Feed Screenshot, SMAPSIT Solar Photovoltaic Financial Modeling Tool
Select Your State

Select Incentive

Website Links
### Clean Energy Production Tax Credit (Corporate)

**Incentive Title**

<table>
<thead>
<tr>
<th>State</th>
<th>Category</th>
<th>Eligible Systems</th>
<th>Credit Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maryland</td>
<td>Income Tax Credit</td>
<td>Solar Thermal Electric, Photovoltaic, Landfill Gas, Wind, Biomass, Hydroelectric, North American Solar, Commercial, Industrial, Residential, Utility, Agricultural</td>
<td>Assessor $0.006/MWh, $0.006/MWh for co-fuel electricity</td>
</tr>
<tr>
<td>Maryland</td>
<td>Corporate Tax Credit</td>
<td>Same as above</td>
<td>Maximum incentive $2.5 million (total credits allowed, five-year period)</td>
</tr>
</tbody>
</table>

Eligible systems have specific system size requirements, but a credit certificate issuance will be in Corporate form. Credit can be claimed in renewable up to 10 years, effective July 1, 2011. Credit will be refundable.

**Incentive Description**

For more information, visit [ncenergyinfo.com](http://ncenergyinfo.com).
Custom Variables Screenshot, SMAPSIT Solar Photovoltaic Financial Modeling Tool
Select to apply Incentive to the model

Type in a custom name
<table>
<thead>
<tr>
<th>Incentive Type</th>
<th>Type Specific Incentive Name</th>
<th>Incentive Amount</th>
<th>Number of Years to Apply</th>
<th>Incentive Payable Taxpayer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity Based</td>
<td>Type Capacity Based Incentive Rate</td>
<td>$1,000</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Performance</td>
<td>Type Performance-Based Incentive Rate</td>
<td>$0.21</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Rebate/Discount</td>
<td>Type-Utility Rebate/Discount Rate</td>
<td>$1,000</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Capacity Based I</td>
<td>Sensitivity 1</td>
<td>$0.00</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Performance I</td>
<td>Sensitivity 2</td>
<td>$0.00</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Rebate/Discount I</td>
<td>Sensitivity 3</td>
<td>$0.00</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Capacity Based II</td>
<td>Sensitivity 4</td>
<td>$0.00</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Performance II</td>
<td>Sensitivity 5</td>
<td>$0.00</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Rebate/Discount II</td>
<td>Sensitivity 6</td>
<td>$0.00</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Capacity Based III</td>
<td>Sensitivity 7</td>
<td>$0.00</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Performance III</td>
<td>Sensitivity 8</td>
<td>$0.00</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Rebate/Discount III</td>
<td>Sensitivity 9</td>
<td>$0.00</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Cumulative Cash Flows Screenshot, SMAPSIT Solar Photovoltaic Financial Modeling Tool
Project Information Summary Screenshot, SMAPSIT
Solar Photovoltaic Financial Modeling Tool
Google Maps Screenshot, SMAPSIT Solar Photovoltaic Financial Modeling Tool
Cash Flow Charts Screenshot, SMAPSIT Solar Photovoltaic Financial Modeling Tool
Net-Metering vs. Buy-All-Sell-All Screenshot, SMAPSIT Solar Photovoltaic Financial Modeling Tool
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• Pam Carpenter  pam_carpenter@ncsu.edu