

DOE OFFICE OF INDIAN ENERGY

Renewable Energy Screenings and Tools

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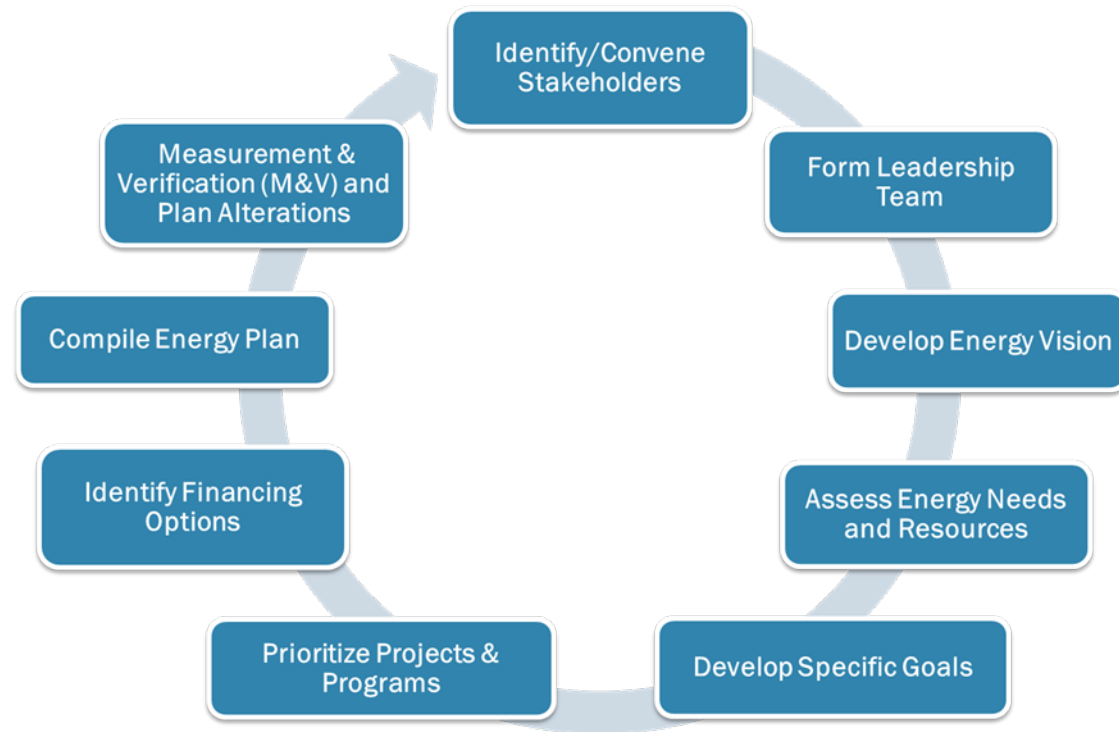
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What Is Strategic Energy Planning?

The strategic energy planning process is a framework that can be modified to meet each tribal community's need.

The nine-step process for community strategic energy planning helps tribes:

- Establish a comprehensive understanding of current energy use and costs
- Get insight into efficiency and conservation strategies already underway
- Identify valuable opportunities to further reduce future energy costs through new programs and activities.



Planning Ahead: Setting Goals and Prioritizing Projects

Setting Goals

- Establishing primary goals will help determine the best projects to meet those goals later on.
- Specific and actionable goals provide the framework for choosing among alternatives and designing actions.

Prioritizing

- Evaluate which strategies will achieve the greatest results with the least amount of effort (or money).
- There are several methods for evaluating cost-effectiveness, including:
 - Levelized Cost of Energy (LCOE)
 - Total Resource Cost



Photo by Bob Gough, NREL 15954

What does a Strategic Energy Plan do for You?

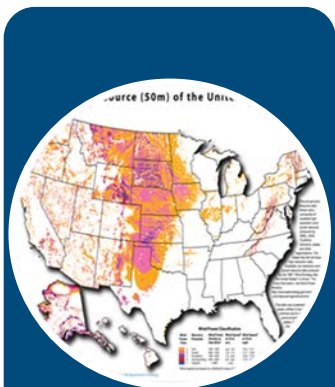
Having an energy plan in place—developed to meet identified objectives—clearly spells out your community’s priorities. These may include:

- Cost savings for tribal members
- Potential revenue from renewables
- A stronger economy
- Greater energy independence and security
- Local influence over energy facility siting
- More energy efficient communities
- Healthier communities
- A cleaner environment
- Regional tribal coordination and collaboration
- A chance to demonstrate leadership

The DOE Office of Indian Energy provides Tribes and Alaska Native communities with strategic energy planning technical assistance:

<https://energy.gov/indianenergy/request-technical-assistance>

Drivers of Renewable Energy Project Potential



Resource data



Roof and land availability



Utility energy costs



Inflation and escalation rates



State incentives and policies

Drivers of Renewable Energy Project Potential

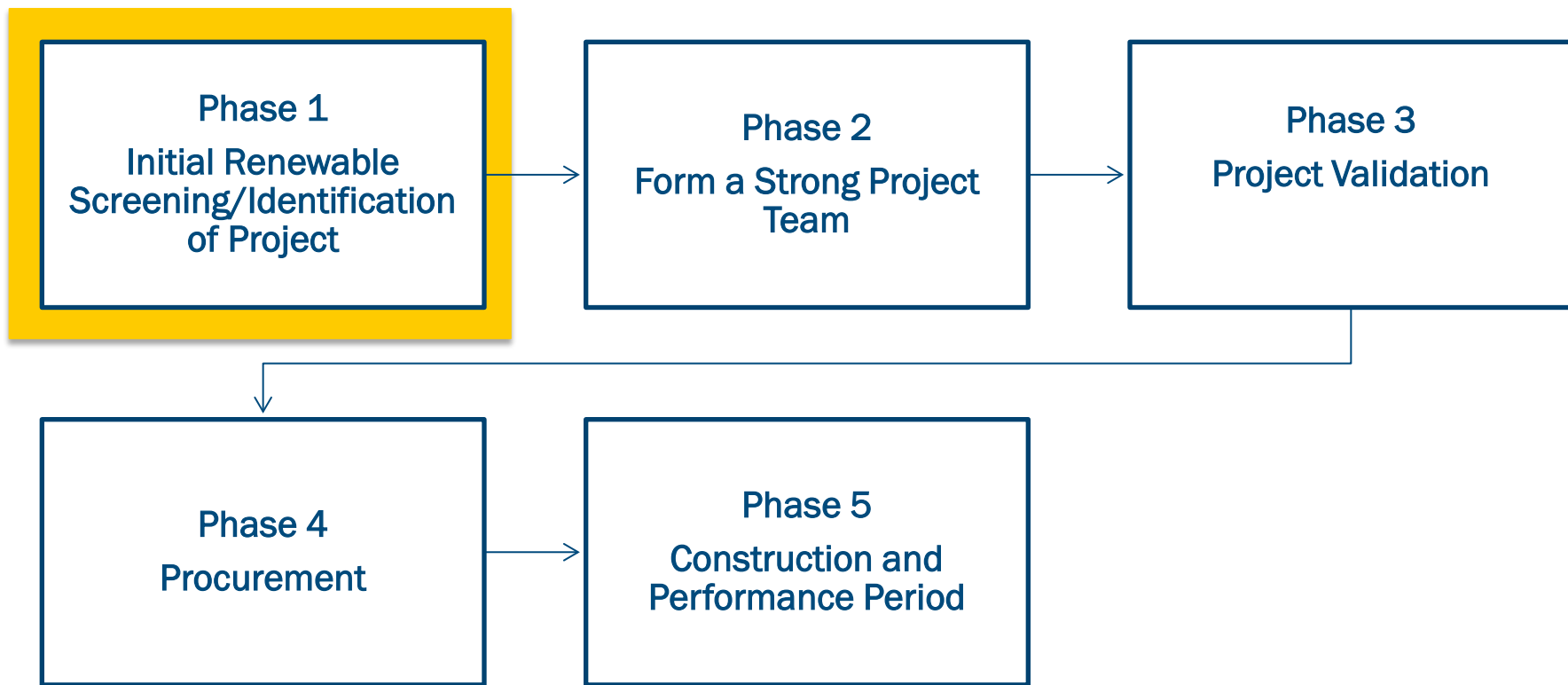
Many factors influence the potential of renewable energy projects and each needs to be considered



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On-Site Project Implementation Process



A successful on-site renewable energy project includes multiple phases; this presentation will focus on the first step: Screening and identifying renewable energy projects



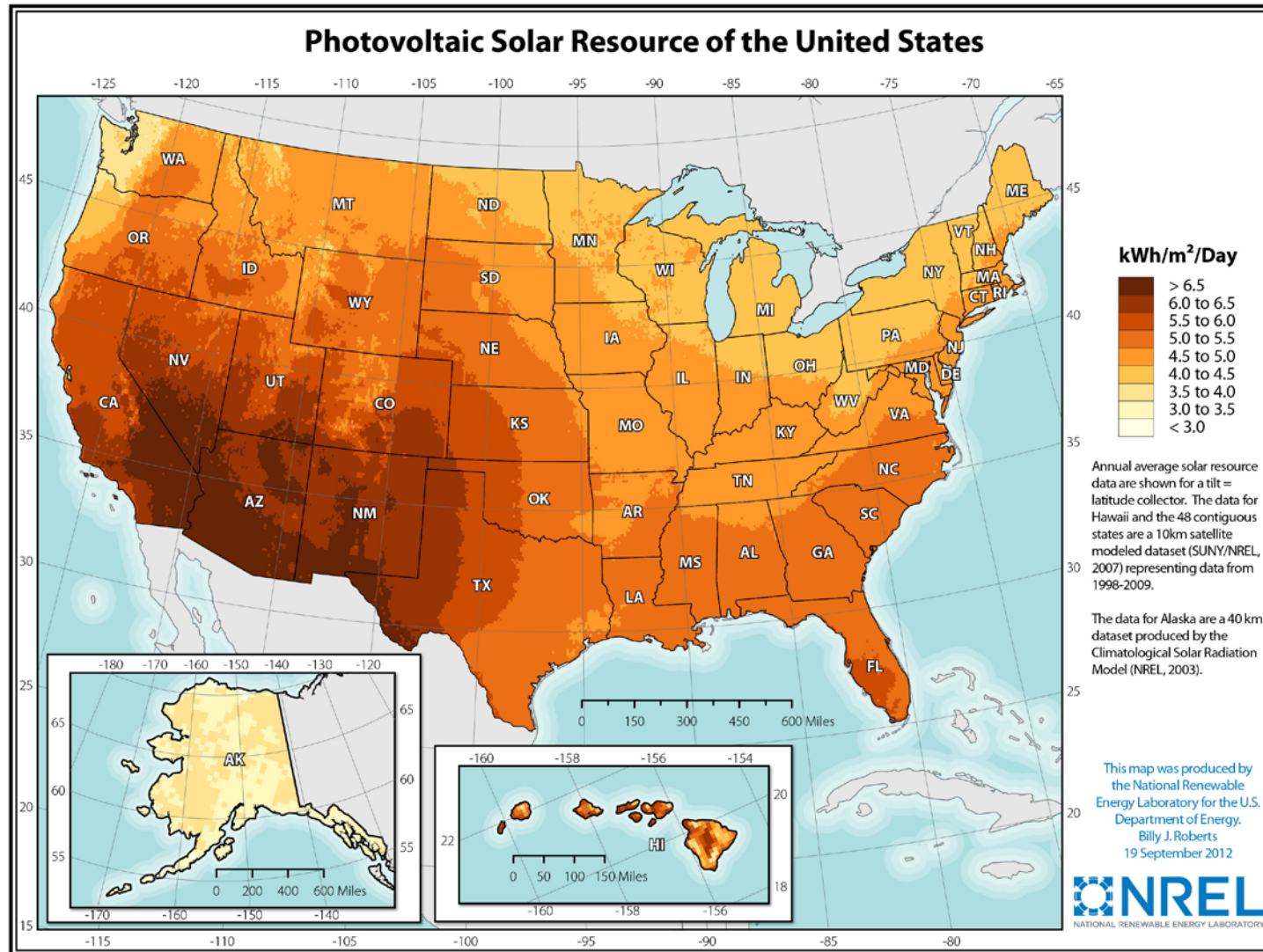
Prescreening Tools

Prescreening is used to select technologies that merit further consideration and rule out others

Resources for pre-screening include:

- NREL renewable energy resource maps
- FEMP renewable energy financial analysis maps
- Levelized Cost of Energy (LCOE) Calculator tool
- PVWatts

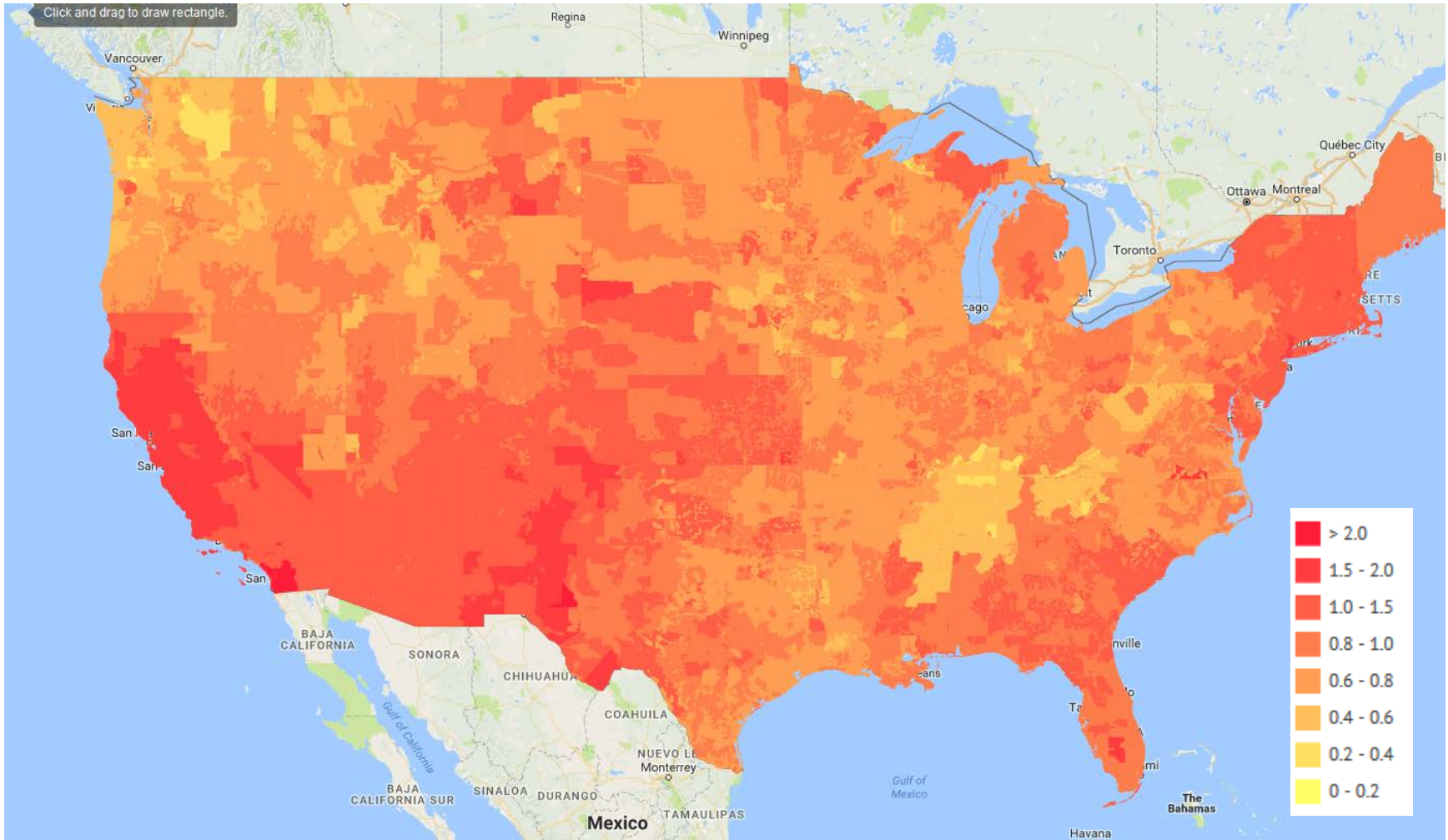
Resource Maps



http://www.nrel.gov/gis/images/eere_pv/national_photovoltaic_2012-01.jpg

FEMP Financial Maps

Savings to Investment Ratio (SIR)



<https://maps.nrel.gov/femp/>



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LCOE Calculator

- Levelized Cost of Energy (LCOE)
 - Common metric for renewable energy electricity generating technologies
 - LCOE facilitates comparison of the combination of capital cost, O&M, performance and fuel cost
- The calculator determines if the LCOE of the RE system is less than current or expected utility energy costs over the life of the system; if so, it's a good investment

The screenshot shows the NREL website's 'Energy Analysis' section. The header includes the NREL logo, '40 Years of Advanced Energy Innovation', and navigation links for 'ABOUT', 'RESEARCH', 'WORKING WITH US', and 'CAREERS'. The main content area is titled 'Levelized Cost of Energy Calculator' and includes a brief description of the tool, a note about its limitations, and instructions on how to use it. A sidebar on the left lists various energy analysis capabilities and resources. Below the main text, there are several tabs for different calculator types: 'Capital Cost', 'Operations & Maintenance', 'Utility-Scale Capacity Factors', 'Useful Life', 'Land Use by System Technology', and 'LCOE Calculator'. The 'Simple Levelized Cost of Energy Calculator' is currently selected, showing a form with input fields and sliders for various parameters. The results section at the bottom displays the calculated LCOE values.

Parameter	Value
Periods (Years)	20
Discount Rate (%)	3.0
Capital Cost (\$/kW)	1050
Capacity Factor (%)	43.6
Fixed O&M Cost (\$/kW-yr)	75
Variable O&M Cost (\$/kWh)	0.002
Heat Rate (Btu/kWh)	10000
Fuel Cost (\$/MMBtu)	0
Electricity Price (cents/kWh)	12
Cost Escalation Rate (%)	3.0
Levelized Cost of Utility Electricity (cents/kWh)	
Simple Levelized Cost of Renewable Energy (cents/kWh)	

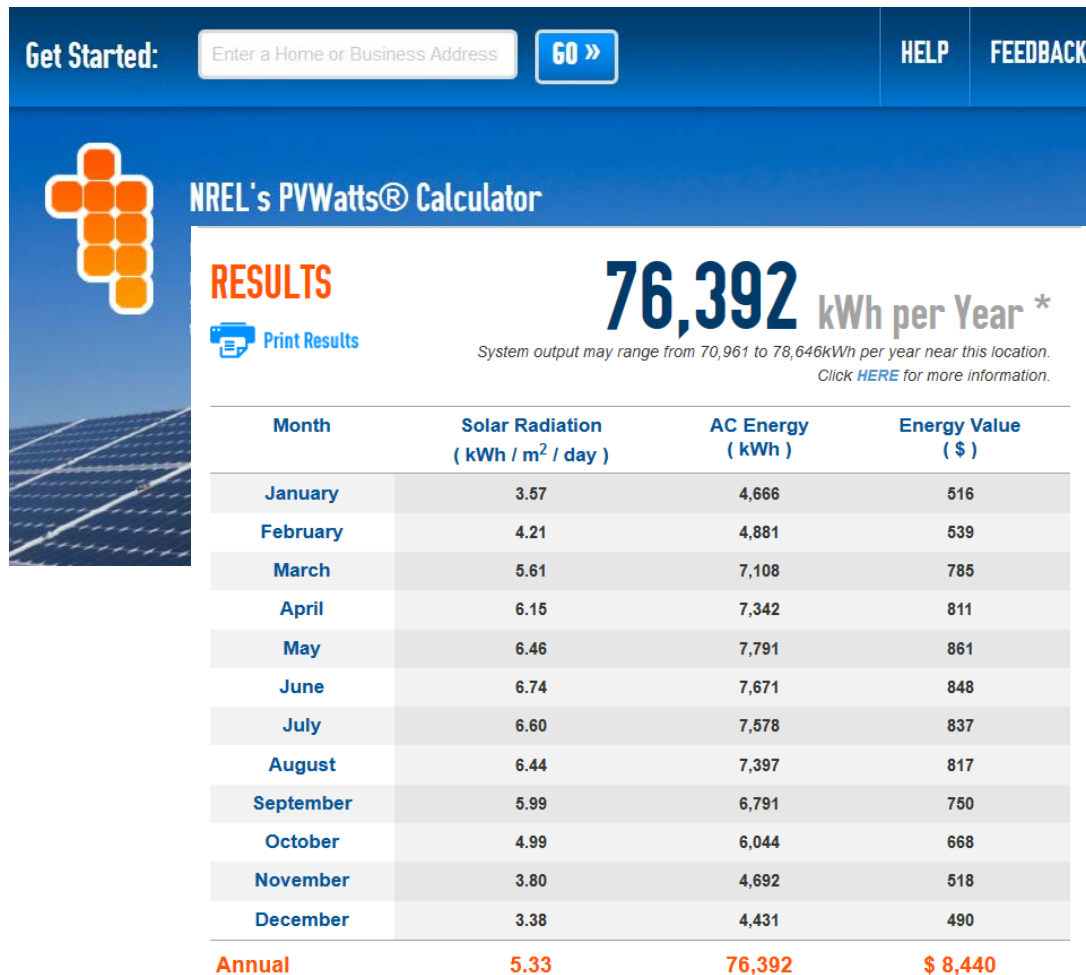
www.nrel.gov/analysis/tech_lcoe.html

PVWatts


PVWatts uses solar resource data and energy production models to estimate energy production from PV systems in a given location

Users enter their location and PV system size in a simple interface

<http://pvwatts.nrel.gov/>



Get Started: [GO »](#) [HELP](#) [FEEDBACK](#)

 NREL's PVWatts® Calculator

RESULTS [Print Results](#)

76,392 kWh per Year *
System output may range from 70,961 to 78,646kWh per year near this location.
Click [HERE](#) for more information.

Month	Solar Radiation (kWh / m ² / day)	AC Energy (kWh)	Energy Value (\$)
January	3.57	4,666	516
February	4.21	4,881	539
March	5.61	7,108	785
April	6.15	7,342	811
May	6.46	7,791	861
June	6.74	7,671	848
July	6.60	7,578	837
August	6.44	7,397	817
September	5.99	6,791	750
October	4.99	6,044	668
November	3.80	4,692	518
December	3.38	4,431	490
Annual	5.33	76,392	\$ 8,440

Screening Tools

- Estimates are made of economic and technical performance. This includes system capacities, incentives, and interconnection limits.
- During the screening step, an expert makes complex calculations to identify best opportunities. This step usually does not require a site visit.
- Screening results can later be used in RFPs, budgeting, and engineering studies.

RETScreen

RETScreen:

- Excel-based software analysis tool
- Determines the technical and financial viability of potential renewable energy projects
- Includes databases for:
 - Product
 - Project
 - Benchmark
 - Hydrology
 - Climate

WWW.  **CLICK HERE for the RETScreen software suite and user manual**



The screenshot shows the Natural Resources Canada website for RETScreen International. The header includes the Canadian flag and the text 'Natural Resources Canada' in both French and English. The main navigation bar contains links for 'Français', 'English', 'Accueil', 'Home', 'Contactez-nous', 'Contact Us', 'Aide', 'Help', 'Recherche', 'Search', and 'canada.gc.ca'. The main content area is titled 'RETScreen® International' and features a 'Download Free' section for the 'RETScreen Software Suite'. The text in this section states: 'Downloading and running RETScreen Software Suite on your computer will install two separate programs, RETScreen 4 and RETScreen Plus, described below. Click here to download RETScreen Suite'. Below this, there are two columns of text: 'RETScreen 4 is an Excel-based clean energy project analysis software tool that helps decision makers quickly and inexpensively determine the technical and financial viability of potential renewable energy, energy efficiency and cogeneration projects.' and 'RETScreen Plus is a Windows-based energy management software tool that allows project owners to easily verify the ongoing energy performance of their facilities.' To the right, there is a 'Latest News' section with several articles, including one about '381,542 users in 222 countries' and another about 'Saudi Arabia Builds Clean Energy Capacity'.

Technologies include PV, solar thermal, wind, small hydro, biomass, ground source heat pump, combined heat & power (CHP), energy efficiency

System Advisor Model

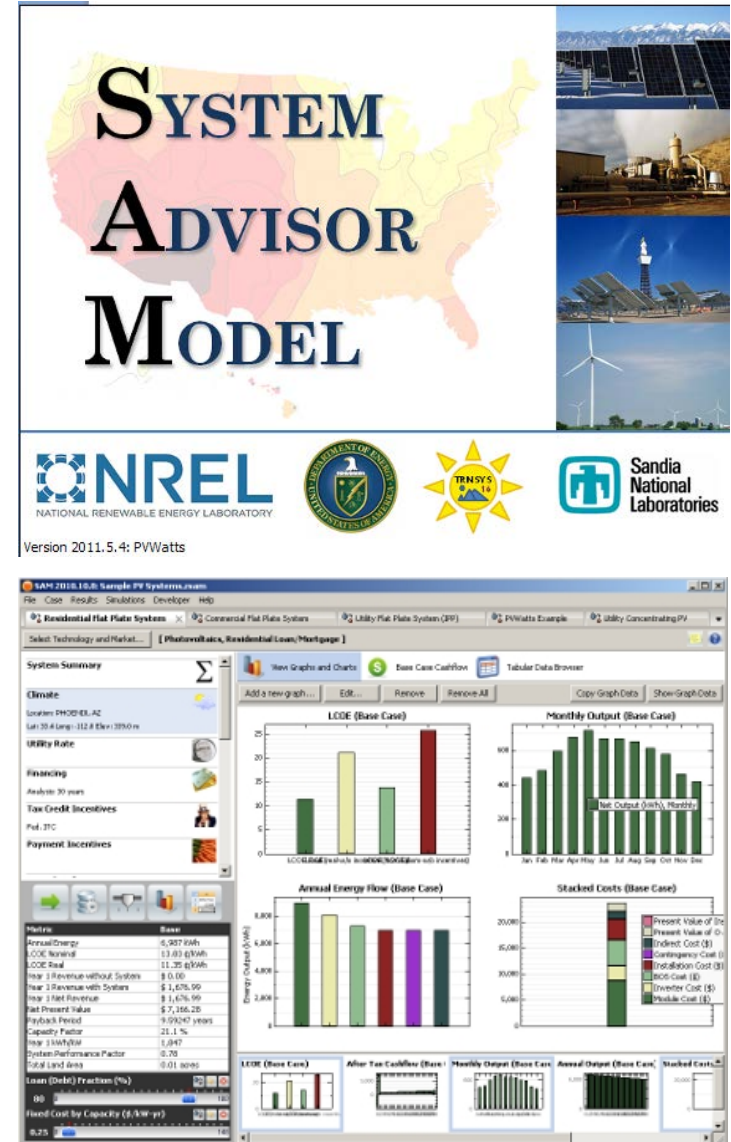
Sophisticated software tool that can run very detailed RE models

- Photovoltaics
- Solar Hot Water
- Concentrating Solar Power
- Small Wind
- Large Wind
- Geothermal Power

Detailed Economic Models

- Cost of generating electricity (LCOE)
- Type of financing
- Applicable tax credits and incentives
- Can model variety of rate structures

<https://www.nrel.gov/analysis/sam/>



Renewable Energy Optimization (REopt)

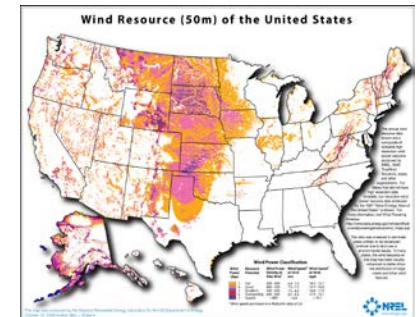
Planning tool to evaluate RE, EE, microgrid, and operational energy opportunities

Recommends a mix of technologies and an operating strategy that meets client goals at minimum lifecycle cost

- Considers interactions between multiple technologies
- Estimates costs and energy savings

Draws on site data, NREL GIS resource data, DSIRE incentive database, and RE technology info

Has been used to assess opportunities at 8,000+ sites



Technologies currently modeled:

- PV
- Wind
- Solar hot water
- Solar vent preheat
- Biomass
- Waste to energy
- Landfill gas
- Diesel and natural gas generators
- Battery storage



Provided as a service by NREL (not available for download)

REopt Web Tool – Coming Soon!

- Estimates the optimal size of PV and battery that minimizes the cost of energy to a site.
- Allows homeowners, building owners, and installers to evaluate the economics of PV and battery storage.

The screenshot shows the REopt web tool interface. At the top, there is a blue header with the 'REopt' logo on the left and the 'NREL NATIONAL RENEWABLE ENERGY LABORATORY' logo on the right. Below the header, there is a 'Log In/Register' link. The main section is titled 'Site and Utility Information' and contains several input fields: 'Site location' (text input), 'Land available (acres)' (text input with 'Unlimited' selected), 'Roofspace available (sq ft)' (text input with 'Unlimited' selected), 'Type of building' (dropdown menu), 'Annual energy consumption (kWh)' (text input), and 'Electricity rate' (dropdown menu). Below these fields, there is a section for 'Do you want to evaluate PV and/or Battery?' with radio buttons for 'PV', 'Battery', and 'Both'. At the bottom of the form, there is a 'GET RESULTS' button and a 'Required field' label.

REopt
Integration and Optimization

Mission: Provide access to site-specific, optimized, and integrated renewable energy decision analysis

Vision: Advance data-driven decision-making and deployment of renewable energy and energy storage technologies

Renewable Energy Screening Process

1. Define goals of analysis

2. Collect and review site and other data

3. Perform initial analysis

Adjust data and analysis goals if needed
Run additional iterations to refine analysis

4. Identify sites for more in-depth assessment



Resource for Renewable Energy Screenings

- Technology Cost and Performance Matrix
 - http://www.nrel.gov/analysis/tech_cost_dg.html
- Resource Data
 - <http://maps.nrel.gov/femp>
- Incentives and Utility Policies:
 - <http://www.dsireusa.org/>
- REopt
 - http://www.nrel.gov/tech_deployment/tools_reopt.html
- PVWatts
 - <http://pvwatts.nrel.gov/>
- System Advisor Model (SAM)
 - <https://sam.nrel.gov/>

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