NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Models & Tools for Evaluation of Project Options

Tribal Energy Program Review 2015

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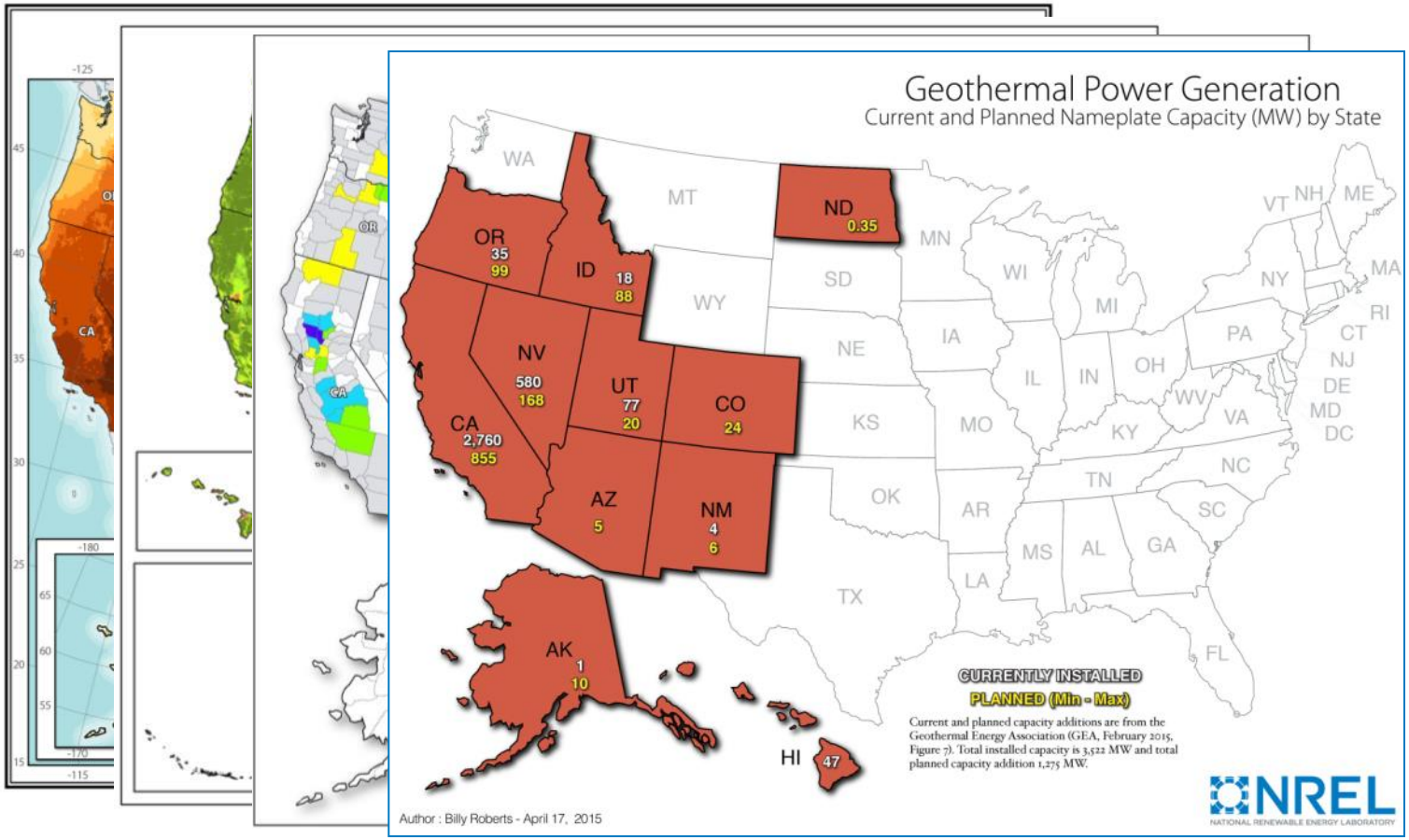
NREL is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.

Energy Audits/Energy Evaluation

- Envelope/Weatherization
- Lighting
- HVAC
- Plug loads

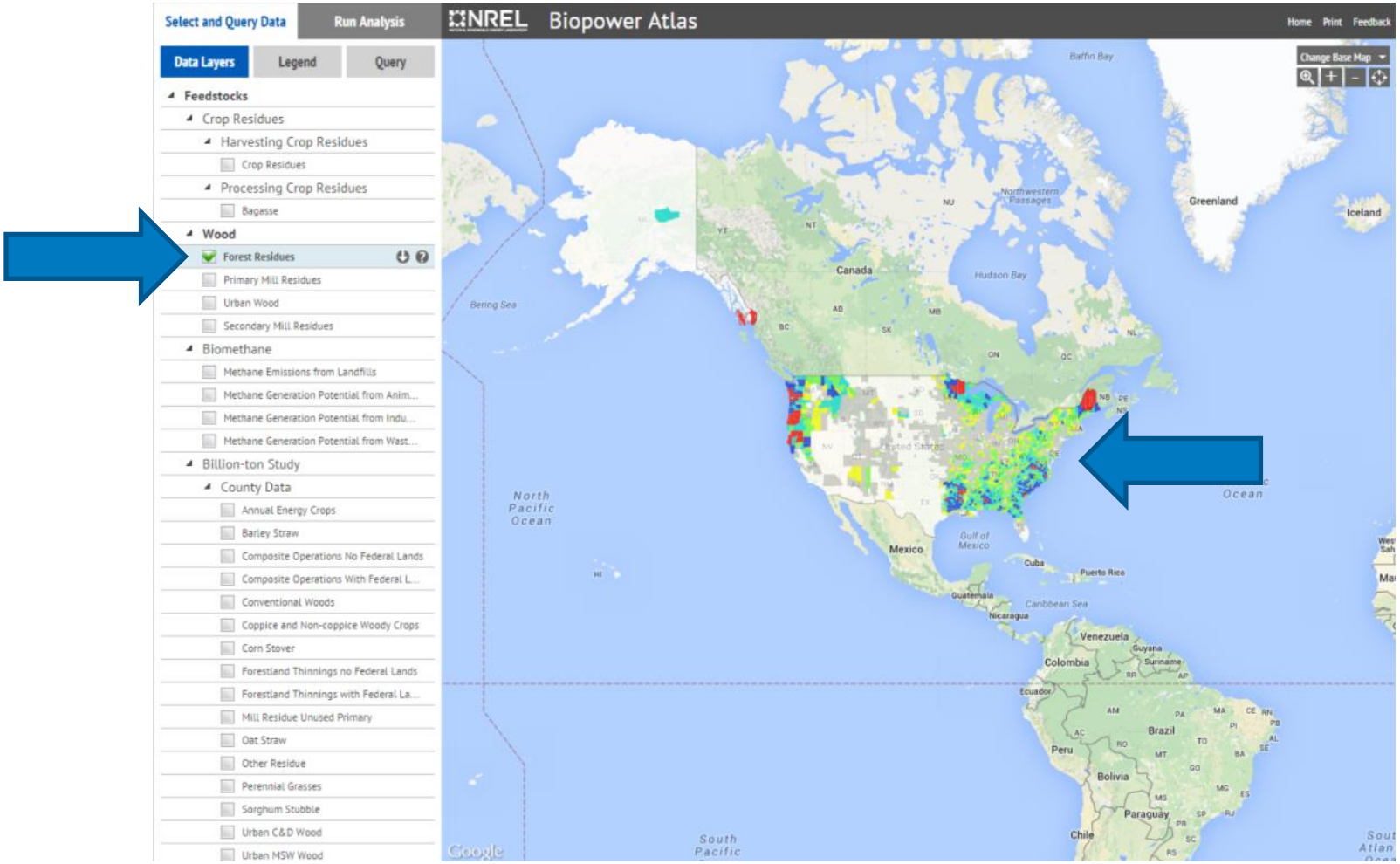
RE Resource Maps

- http://www.nrel.gov/gis/



RE Resource Maps

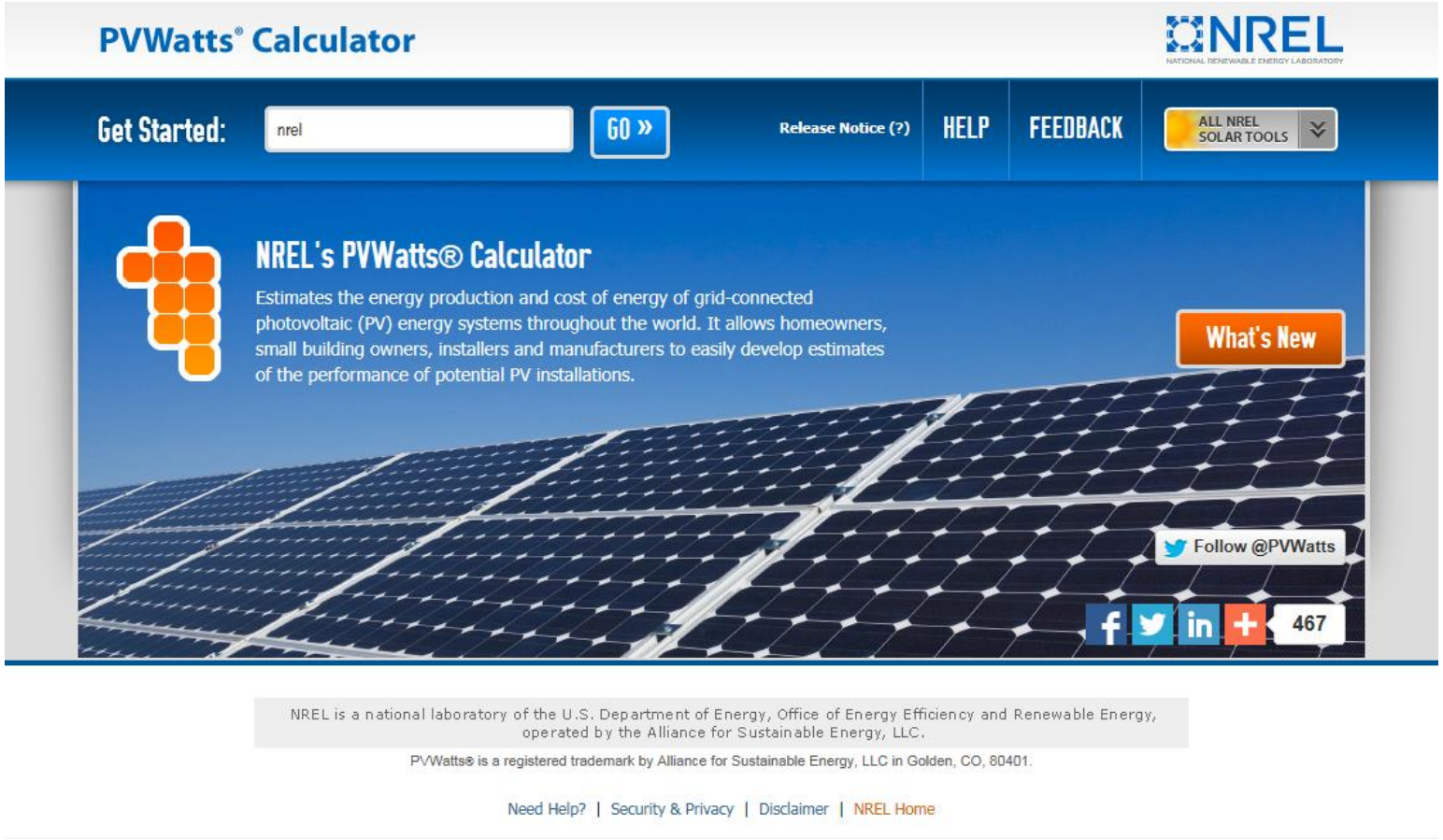
- Biopower Atlas



- https://mapsbeta.nrel.gov/biopower-atlas/

PV Watts

http://pvwatts.nrel.gov/



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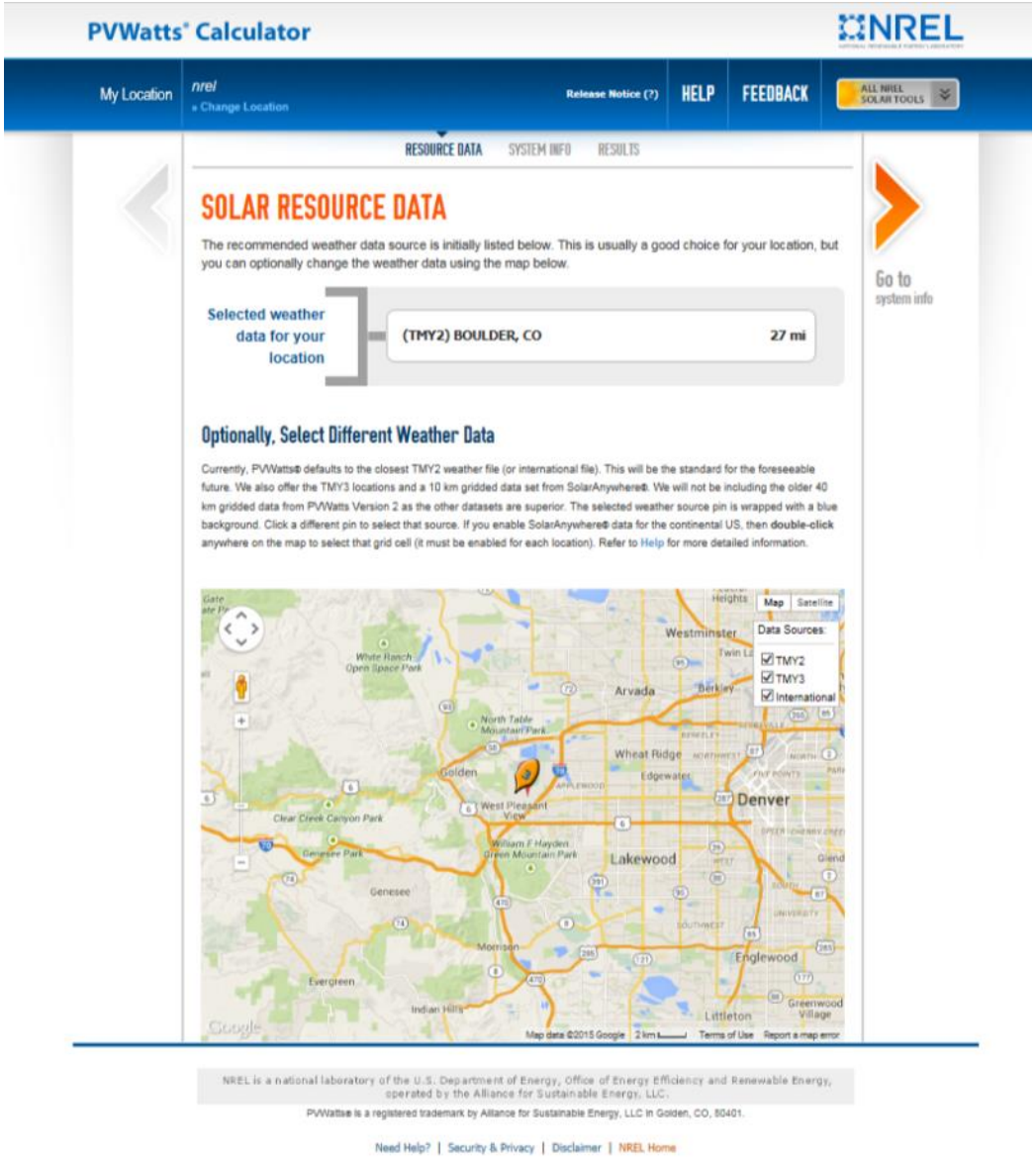

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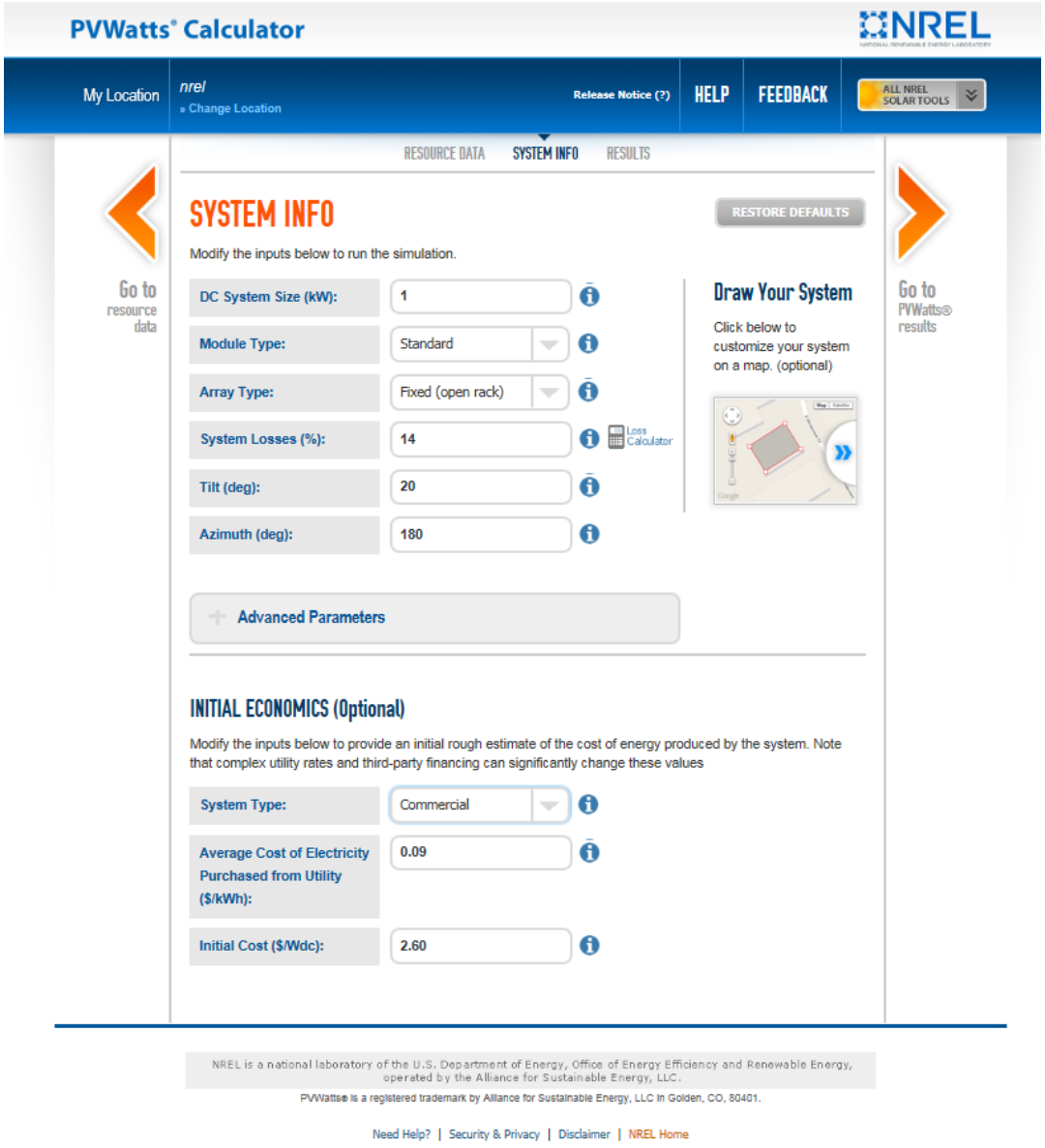

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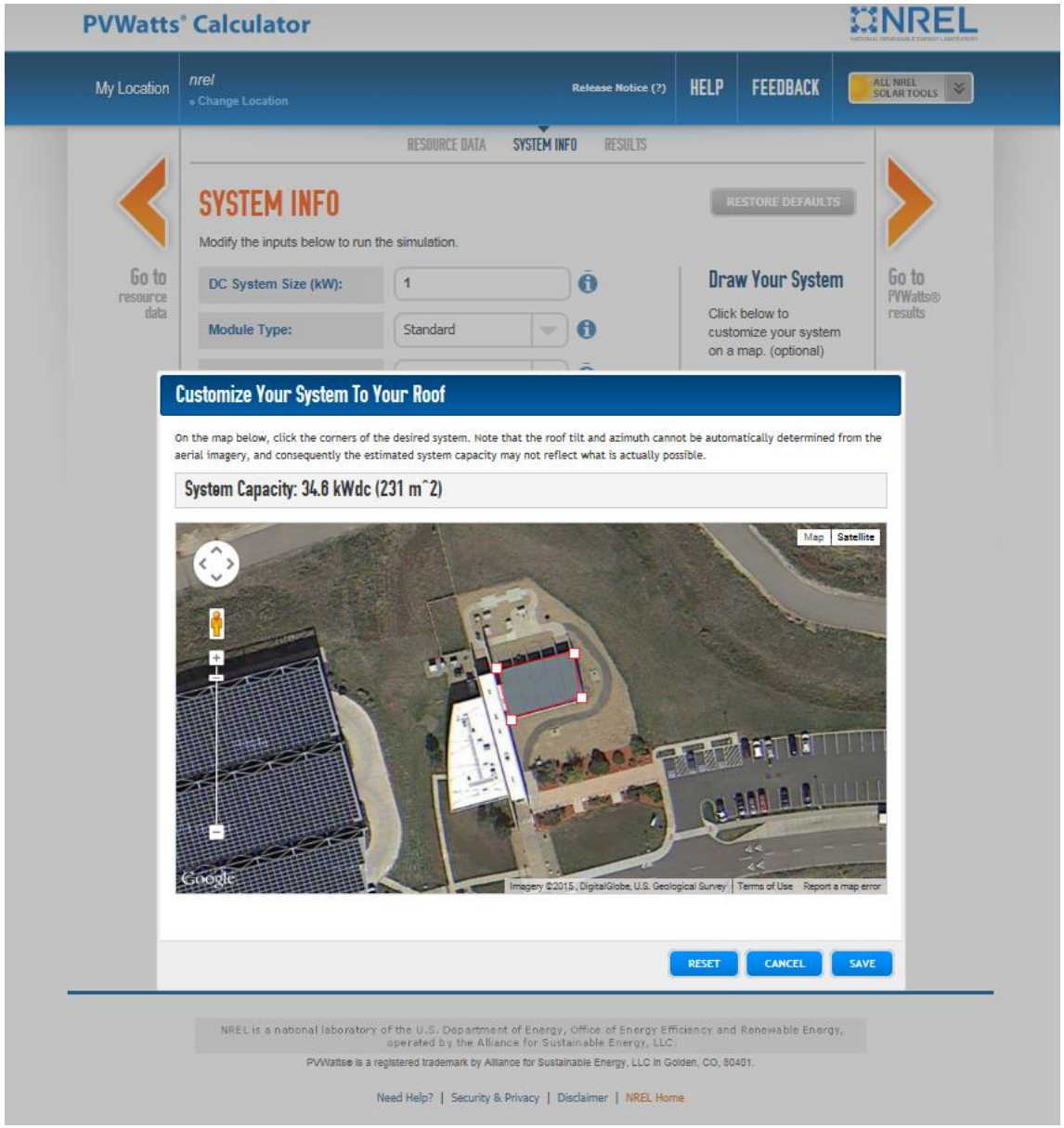

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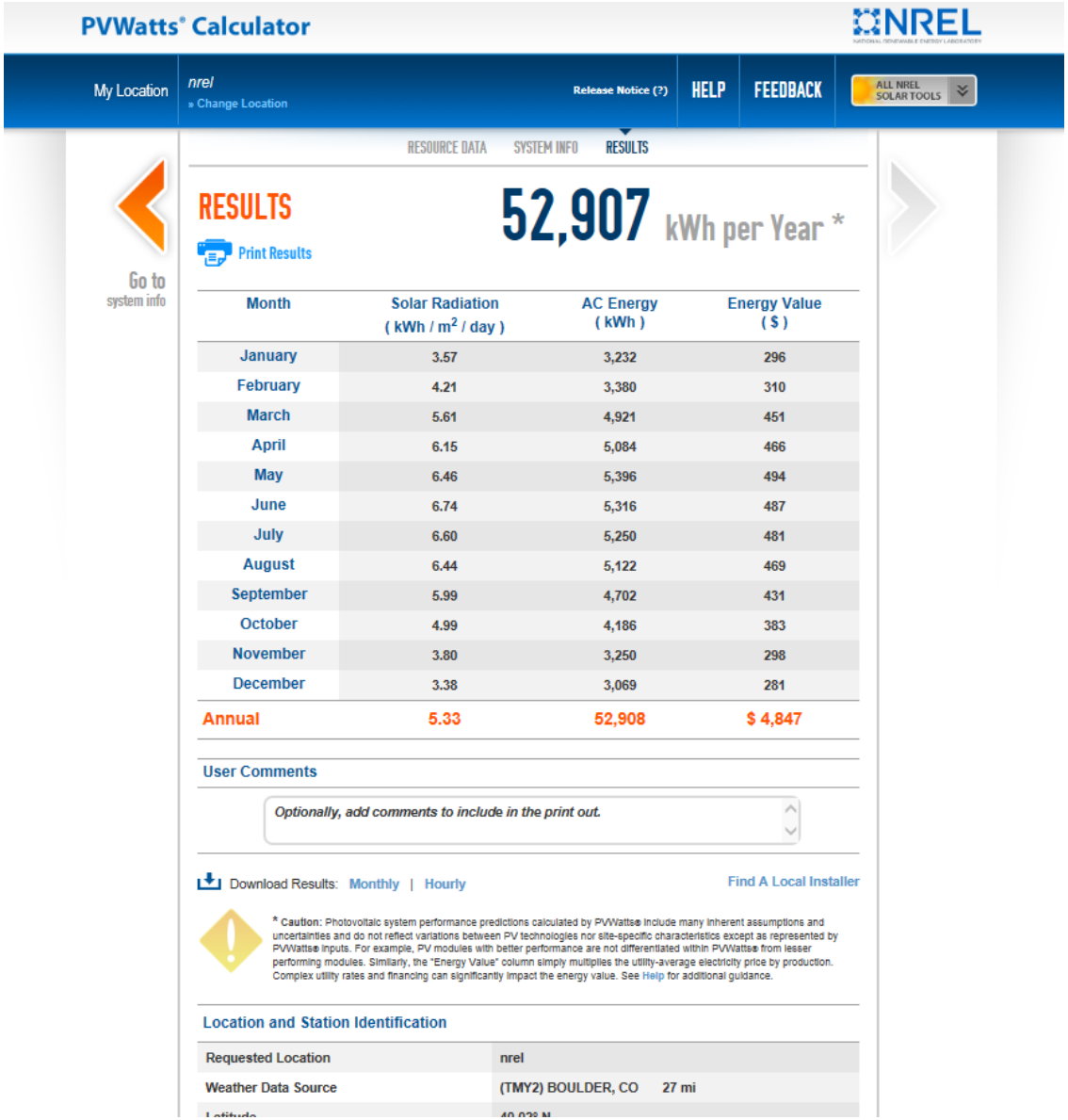


PVWatts® Calculator

NREL

My Location | nrel » Change Location | Release Notice (?) | HELP | FEEDBACK | ALL NREL SOLAR TOOLS

RESOURCE DATA | SYSTEM INFO | RESULTS

Go to system info

RESULTS

Print Results

52,907 kWh per Year *

Month	Solar Radiation (kWh / m² / day)	AC Energy (kWh)	Energy Value ($)
January	3.57	3,232	296
February	4.21	3,380	310
March	5.61	4,921	451
April	6.15	5,084	466
May	6.46	5,396	494
June	6.74	5,316	487
July	6.60	5,250	481
August	6.44	5,122	469
September	5.99	4,702	431
October	4.99	4,186	383
November	3.80	3,250	298
December	3.38	3,069	281
Annual	5.33	52,908	$ 4,847

User Comments

Optionally, add comments to include in the print out.

Download Results: Monthly | Hourly

Find A Local Installer

* Caution: Photovoltaic system performance predictions calculated by PVWatts® include many inherent assumptions and uncertainties and do not reflect variations between PV technologies nor site-specific characteristics except as represented by PVWatts® inputs. For example, PV modules with better performance are not differentiated within PVWatts® from lesser performing modules. Similarly, the "Energy Value" column simply multiplies the utility-average electricity price by production. Complex utility rates and financing can significantly impact the energy value. See Help for additional guidance.

Location and Station Identification

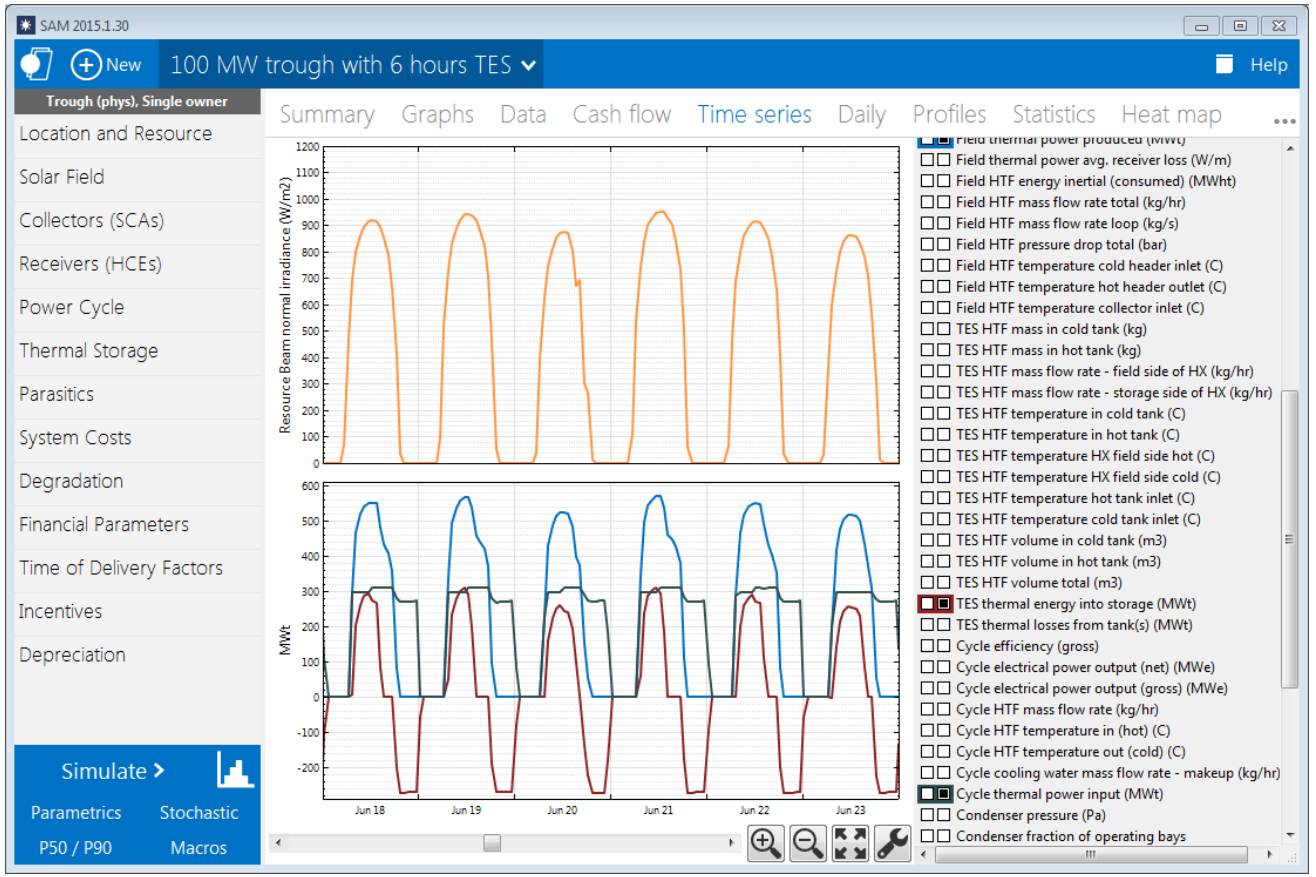
Requested Location	nrel
Weather Data Source	(TMY2) BOULDER, CO 27 mi

System Advisor Model

https://sam.nrel.gov/

- **Detailed Performance and Economic Model**
  - Component level inputs, hourly outputs

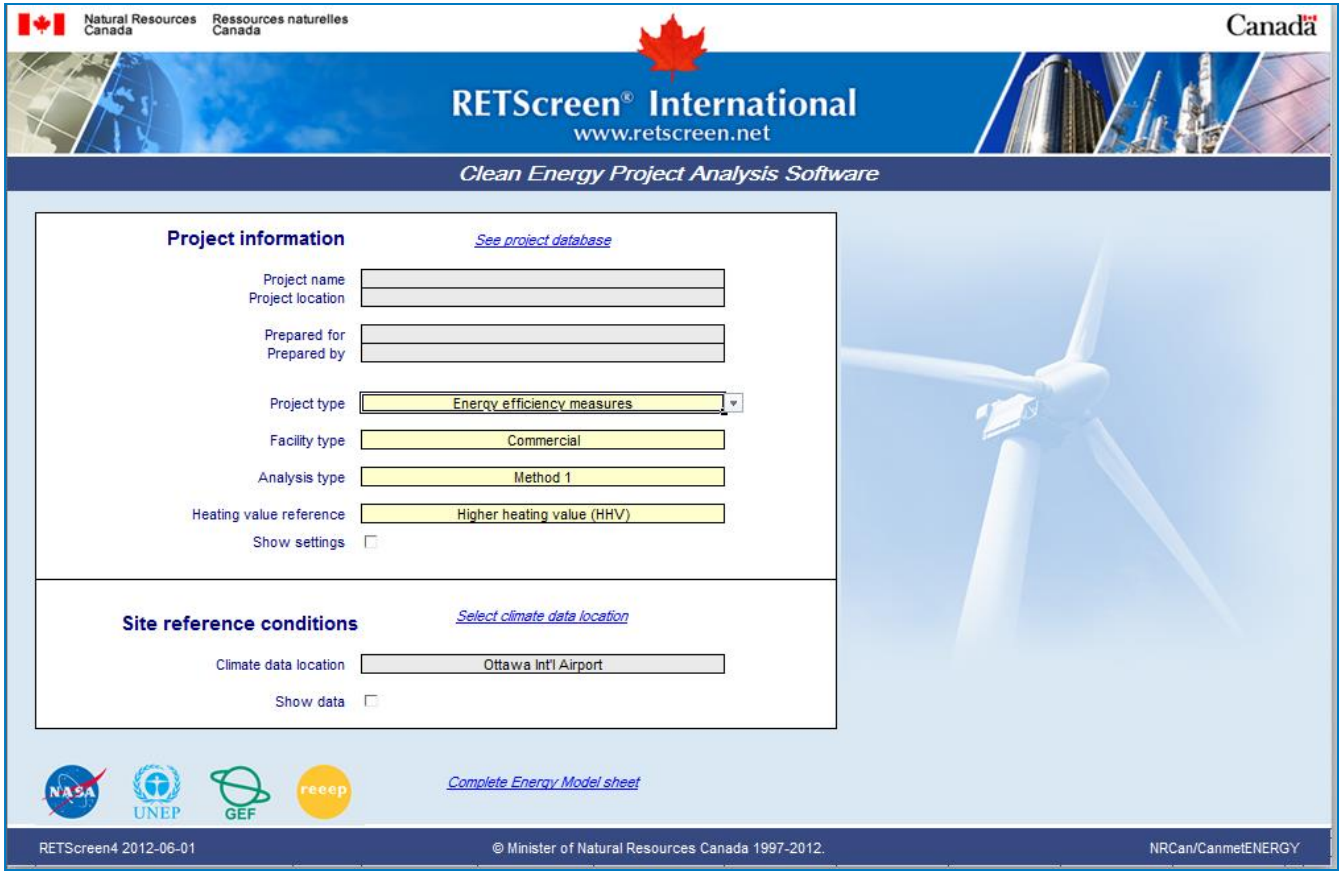
- **Analysis Types**
  - Photovoltaic (PV)
  - Solar Hot Water
  - Concentrating Solar Power
  - Wind
  - Biomass Power
  - Geothermal Power
  - Generic System



RETScreen International http://www.retscreen.net/

- **Screening Level Evaluation Tool**
  - Excel based tool with extensive technology list for EE and RE Systems

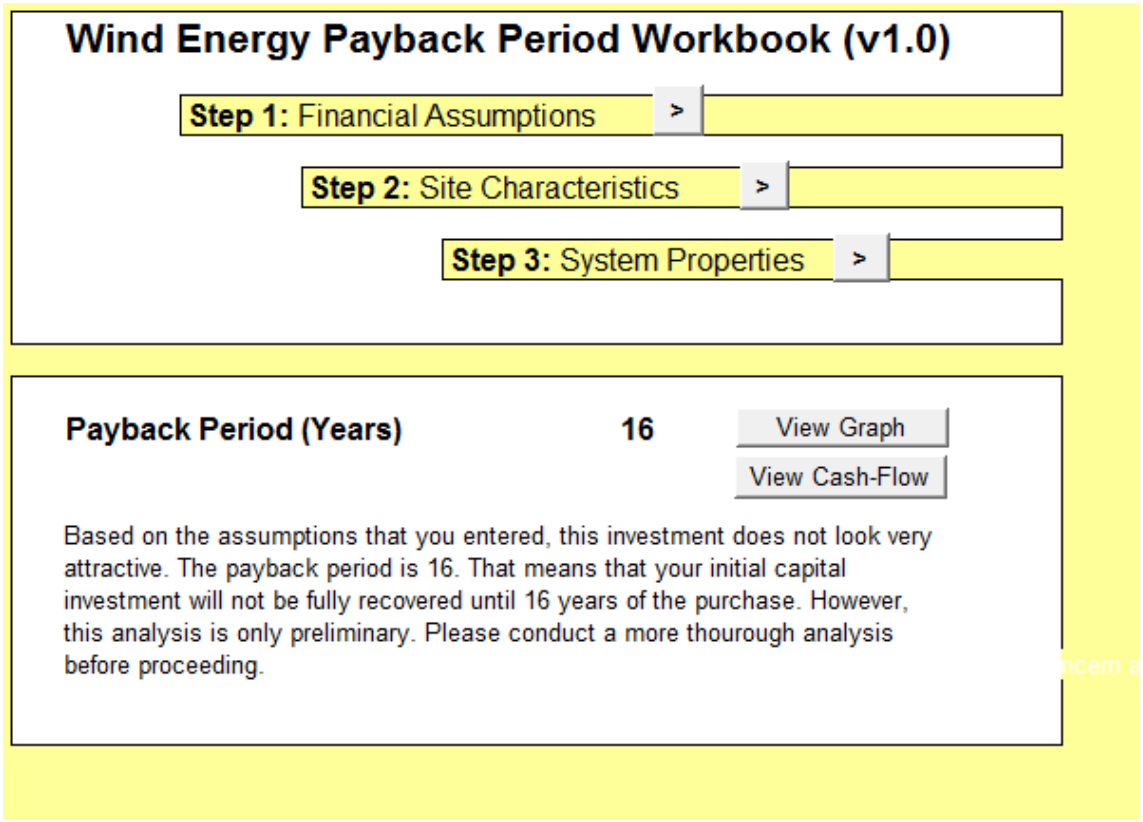
- **Analysis Types**
  - Photovoltaic (PV)
  - Solar Hot Water
  - Concentrating Solar Power
  - Wind
  - Biomass Power
  - Geothermal Power
  - Tidal Power
  - Wave Power
  - Heat pump
  - Solar Vent Preheat
  - Envelope



Small Wind Economic Model

- **Wind Exchange Website**
  - http://apps2.eere.energy.gov/wind/windexchange/economics.asp

- **Key Features**
  - Simple Analysis
  - Pre-built turbine models
  - Several implementation models



Other Useful Resources

- Open EI – www.openEI.org
- DSIRE USA – www.dsireusa.org
- Tribal Energy Program Website - http://apps1.eere.energy.gov/tribalenergy/index.cfm
- NREL Website - www.nrel.gov
- Regional Resource Centers DOE - http://apps2.eere.energy.gov/wind/windexchange/regional.asp

Priorities: Where to Install Solar

1. **On the "Built Environment" where unshaded – size to capacity (kW) and load (kWh & thermal)**
   a. **On existing building roofs that have an expected life of at least 15 more years and can accept added load. Reduces solar load on building. NEPA categorical exclusion.**
   b. On ALL new buildings – all new building should be "solar ready", see http://www.nrel.gov/docs/fy10osti/46078.pdf
   c. Over parking areas, pedestrian paths, etc. – energy generation and nice amenity.
2. **On compromised lands such as landfills & brownfields.**
   a. Saves green fields for nature.
3. **IF installed on green fields minimize site disturbance, plant native low height vegetation as needed.**

Examples of RE Analysis with Tribes

- **Pascua Yaqui Tribe near Tucson, AZ**

Scenario 1 – System Purchase

System Capacity:	2,865 kW
LCOE Nominal:	$0.193/kWh
LCOE Real:	$0.148/kWh
Annual Energy Savings:	5,209,462 kWh/yr
Implementation Costs:	$10,399,950
Simple Payback Period:	21.9 years

Scenerio 2 – Power Purchase Agreement (PPA)

System Capacity:	2,865 kW
LCOE Nominal:	$0.104/kWh
LCOE Real:	$0.117/kWh
Annual Energy Savings:	5,209,462 kWh/yr
Implementation Costs:	$0
First Year PPA Price:	$0.104/kWh

Examples of RE Analysis with Tribes

- Pueblo of Picuris outreach
  - Hosted TEP Strategic Energy Planning Workshop August 2014
  - Created a strategic energy plan with the Northern Pueblo Housing Authority.
  - Performed a feasibility analysis of rooftop vs community solar through leveraging TA with NREL, NAU, and Grid Alternatives.
  - Kit Carson Utility has since agreed to purchase any extra solar power produced. Picuris have indicated they will be applying for START assistance to finish all of the feasibility work needed to get the project going.

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Thanks!

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