

DOE OFFICE OF INDIAN ENERGY

Renewable Energy Market

Moderator - Dan Beckley, National Renewable Energy Laboratory



U.S. DEPARTMENT OF
ENERGY

Office of
Indian Energy



Meet our Panel

- Daniel Beckley, Principal Lab Program Manager, National Renewable Energy Laboratory
- Holmes Hummel, Senior Advisor, Office of the Undersecretary for Energy, U.S. Department of Energy
- Jeff Bedard, Senior Project Leader, National Renewable Energy Laboratory



■ Panel Overview

- Presentation: Renewable energy technical potential and military nexus with tribal lands
- Discussion: Renewable energy markets and Federal policy
- Discussion: Defense Department clean energy initiatives and activities

Indian Renewable Energy Matrix Analysis

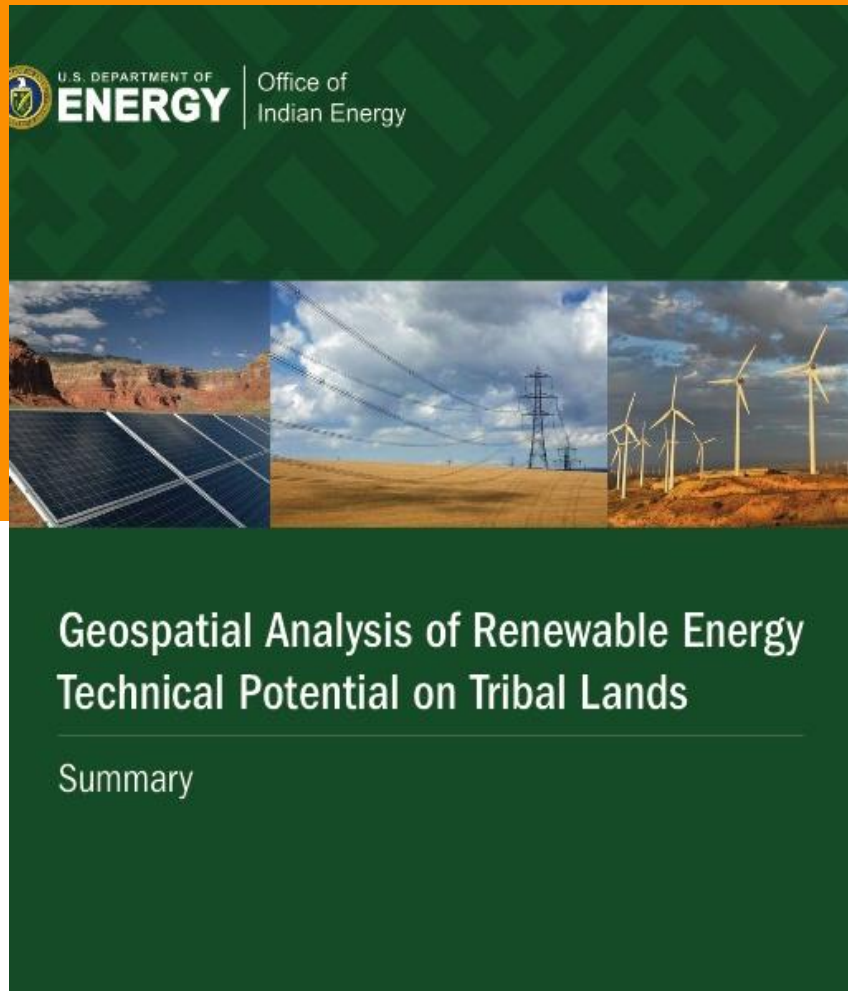


Presented by:

Dan Beckley

16 October 2012

Geospatial Analysis: RE Technical Potential

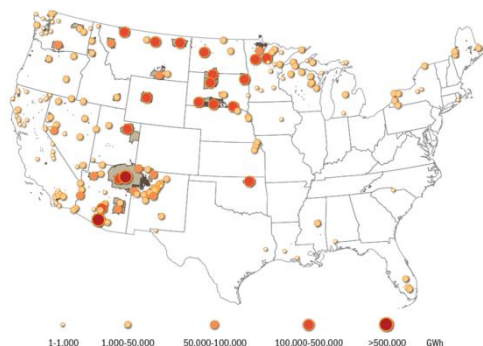


Technical Potential on Tribal Lands is 5% of the total national technical potential

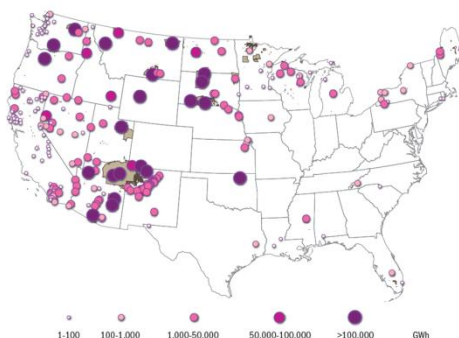
Increase in potential density on tribal lands

Why is geospatial analysis different?

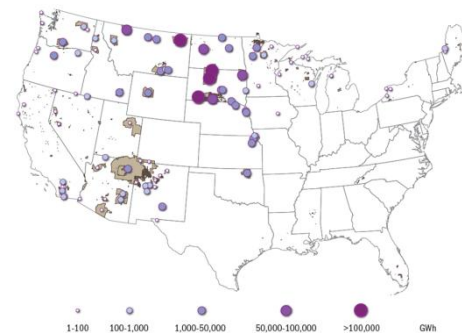
- A statistical approach to analyzing information that incorporates data that has a geographic component
- Using GIS software, NREL applies geospatial analysis to determine RE resources potential on tribal lands
- Allows for a more refined analysis or technical potential for all Tribes by parsing it to individual tribal lands



Solar PV (Rural) Generation Potential on Tribal Lands



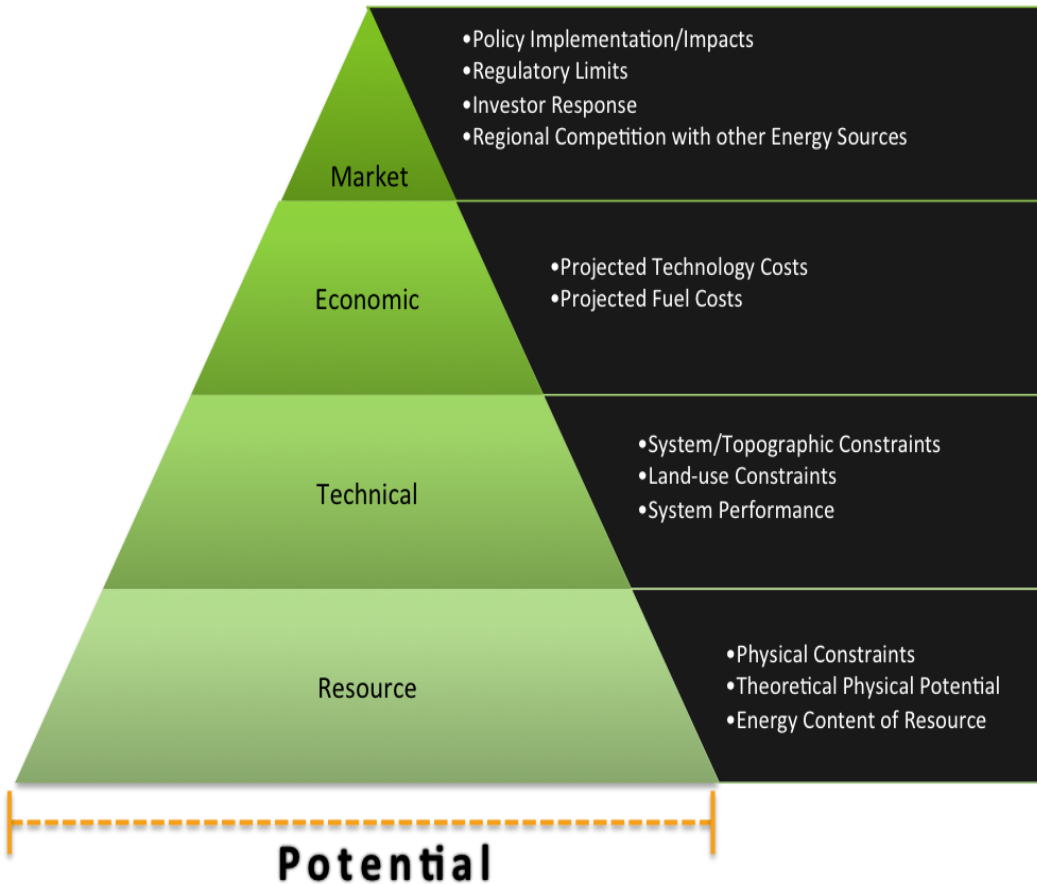
Geothermal Generation Potential on Tribal Lands



Wind Generation Potential on Tribal Lands

Potentials

Key Assumptions



Sample Exclusions

- Slope > 3%
- Urban Areas
- Wetlands
- Parks (Federal, Wilderness Areas, refuges etc.,)
- Distance to excluded areas

Strengths of this new report

- **Reflects the latest knowledge of what we have on commercial technologies**
- **Generation Potential (MWh) refines resource potential**
- **Removes undevelopable land and Federally designated exclusions sites**
 - **Opportunity** – share shape files with Tribal Economic Development Offices to identify culturally sensitive sites – refine potential even further

How Can Tribes Use the Information?

- **Understand renewable energy resource**
- **Supports Development Decisions**
 - scale of project, purpose of project, cultural sensitivity avoidance
- **Assessing potential project viability and economics**
 - prioritize the development of renewable energy resources either for community scale on-tribal land use or for revenue generating electricity sales

Report Findings

Technology	Tribal Generation Potential (MWh)	National Generation Potential ¹ (MWh)	% National Generation Potential
Wind (80m ht, >=30% GCF)	1,105,178,858	32,784,004,656	3.4%
Solar PV (Utility-Scale, Rural)	9,342,469,810	280,613,216,903	3.3%
Solar PV (Utility-Scale, Urban)	15,368,543	2,231,693,746	0.7%
Solar CSP	6,139,851,743	116,146,244,587	5.3%
Geothermal (EGS)	6,017,487,000	31,344,696,024	19.2%
Geothermal (Hydrotherm.)	5,050,724	236,780,000	2.1%
Biomass (Solid)	4,340,642	399,774,091	1.1%
Biomass (Gaseous)	673,465	88,551,445	0.8%
Hydropower	13,302,352	258,953,000	5.1%
Total²	22,643,723,138	464,103,914,451	4.9%

Technical Potential on Tribal Lands is 5% of the total national technical potential

% of National Generation Potential:

Solar PV - 3.3%
 Wind - 3.4%
 Hydro - 5.1%
 Solar CSP - 5.3 %
 Geothermal – 19%

Electric Capacity – measure of how much electricity a generator can produce under specific conditions

Electric Generation – measure of how much electricity a generator can produce over a specific period of time

Transition

Applying Technical Potential to Market Potential

DoD Market Potential Energy

- **DoD accounts for 80% of Federal energy consumption**
- **Spent \$19.4 B on energy in 2011**
- **507 permanent installations**
 - More than 300,000 buildings and 200,000 other structures.
 - ~28 million acres of land in the US and overseas
 - More than 2.2 billion square feet of facilities space
- **Broad recognition in DoD that energy is a national security issue**

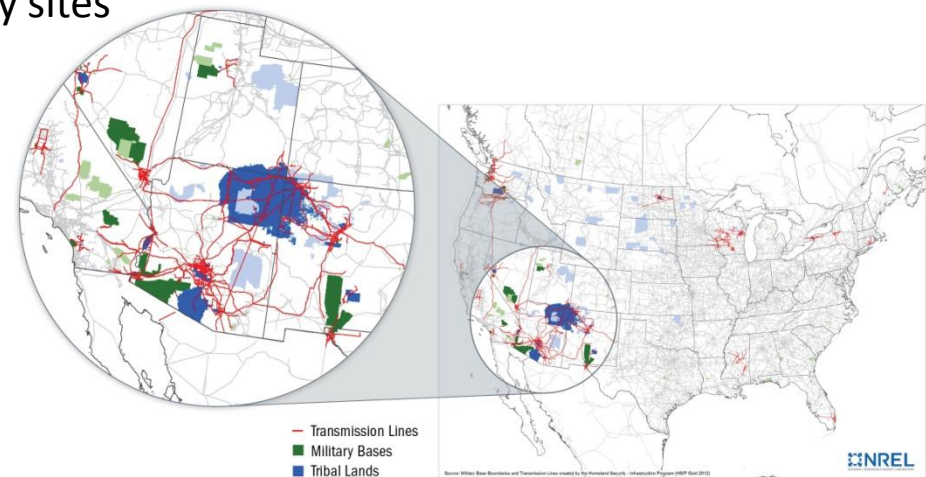
Tribal / Military Analysis

- **Preliminary Analysis**

- Back of the envelop
- Used the 2012 Homeland Security Infrastructure Protection (HSIP) geospatial dataset to determine proximity of tribes to military bases

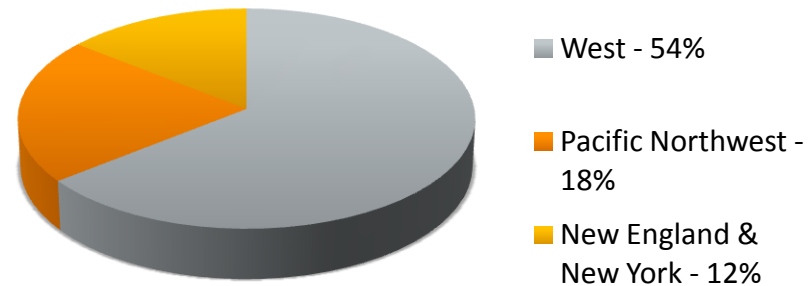
- **Criteria**

- Technical Potential
- Proximity to offtaker, especially military sites
- Proximity to transmission lines
- Electric rates
- Policy and regulatory environment



Preliminary Findings: Site Analysis

Fifty-three Tribes have been identified as being located in close proximity to military bases



Of those 53 Tribes:

- 53 reservations are located less than 10 miles to 65 military sites
- 20 reservations are located near multiple military sites
- Five Tribes are located directly adjacent to a military installation

Preliminary Findings: Adjacent Sites

Tribe	Military Bases
Arizona	
Tohono O’odham [START Partner]	Barry M Goldwater Air Force Range Casa Grande Military Reservation Florence Military Reservation
Maine	
Passamaquoddy Tribe of Indian Township [START Partner]	Fallon Naval Air Station Bombing Range Hawthorne Army Depot U.S. Naval Reservation Target Area
New Mexico	
Pueblo of Zuni	Fort Wingate Military Reservation
Nevada	
Walker River	Fallon Naval Air Station
Washington	
Nisqually	Camp Murray National Guard Fort Lewis Military Reservation McChord Air Force Base

What is Indian Energy doing?

DOE-IE exploring how to leverage energy resources in Indian Country:

- Educating tribal leaders and military leadership on energy partnerships
- Analyzing and mapping most promising opportunities
- Working with NREL to provide technical assistance to Tribes



Tribal Resources

Office of Indian Energy Policy and Programs Offerings:

Technical Assistance

- **START - Strategic Technical Assistance Response Teams**
- **Tribal Leader Forums**

Capacity Building

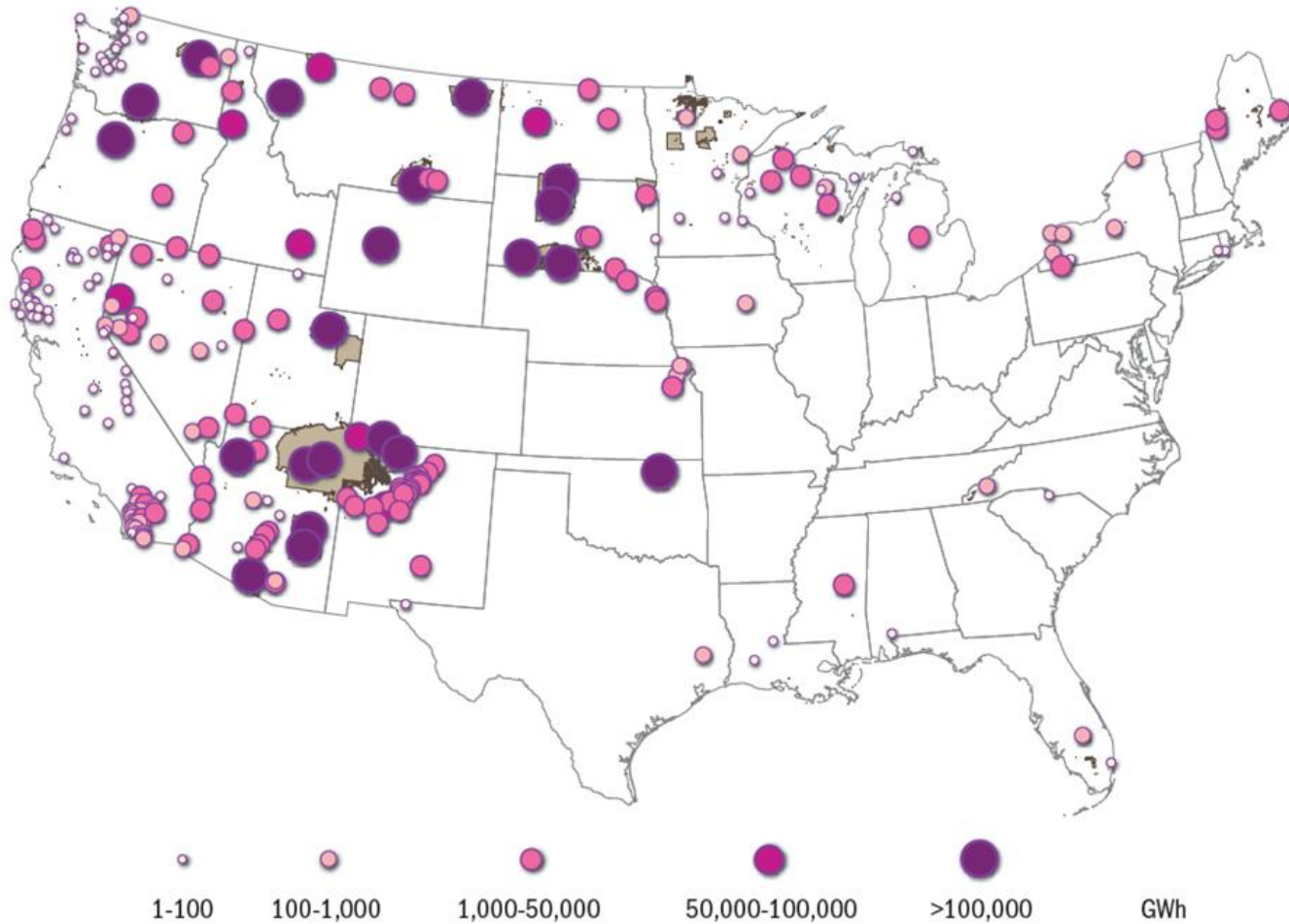
- **Resource Library**
 - Strategic Planning Guide
 - Foundational Courses
 - Project Development & Finance Courses
 - Project Checklists
 - Legal and Regulatory clearinghouse

<http://energy.gov/indianenergy/office-indian-energy-policy-and-programs>

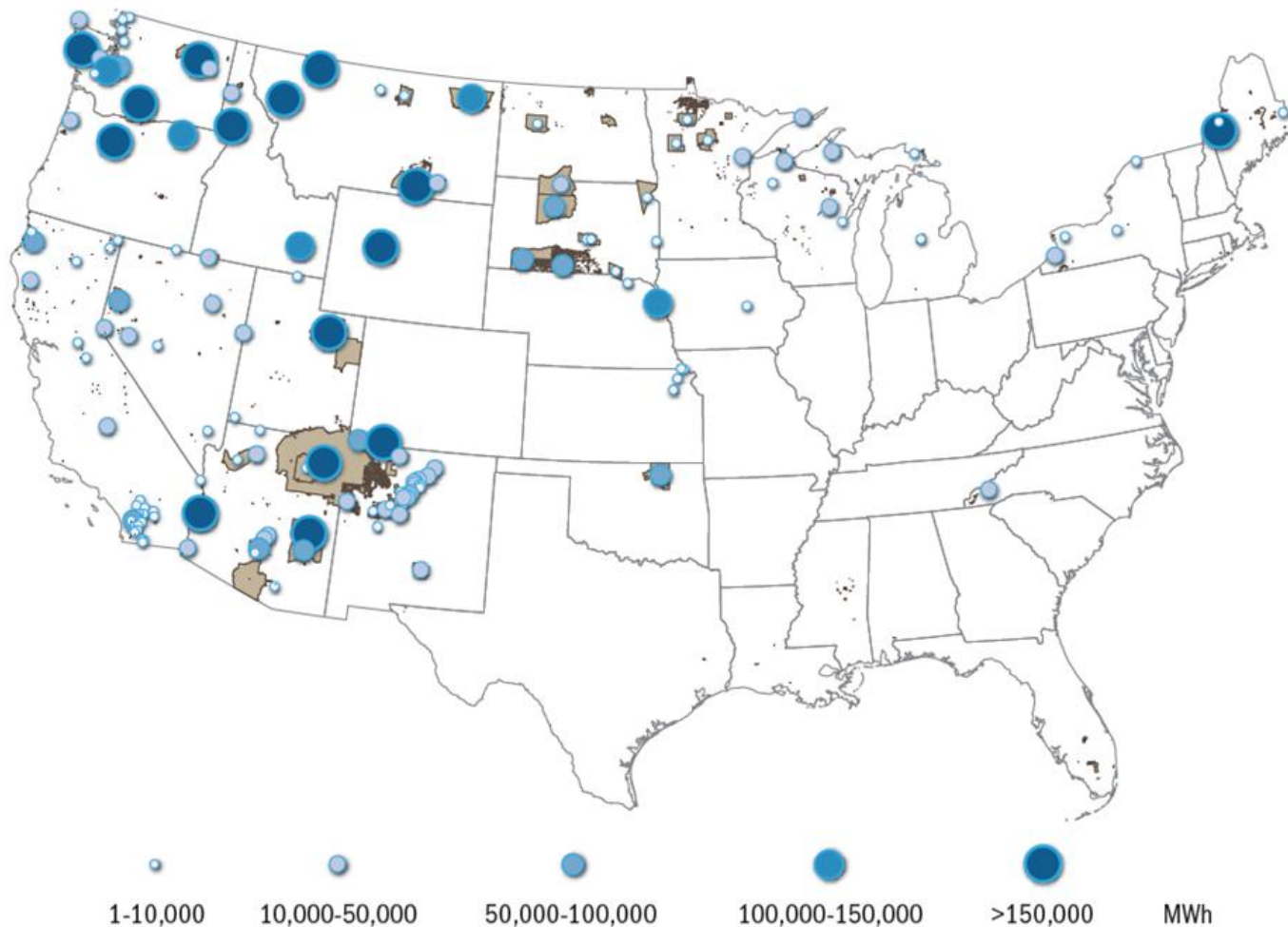
Questions?



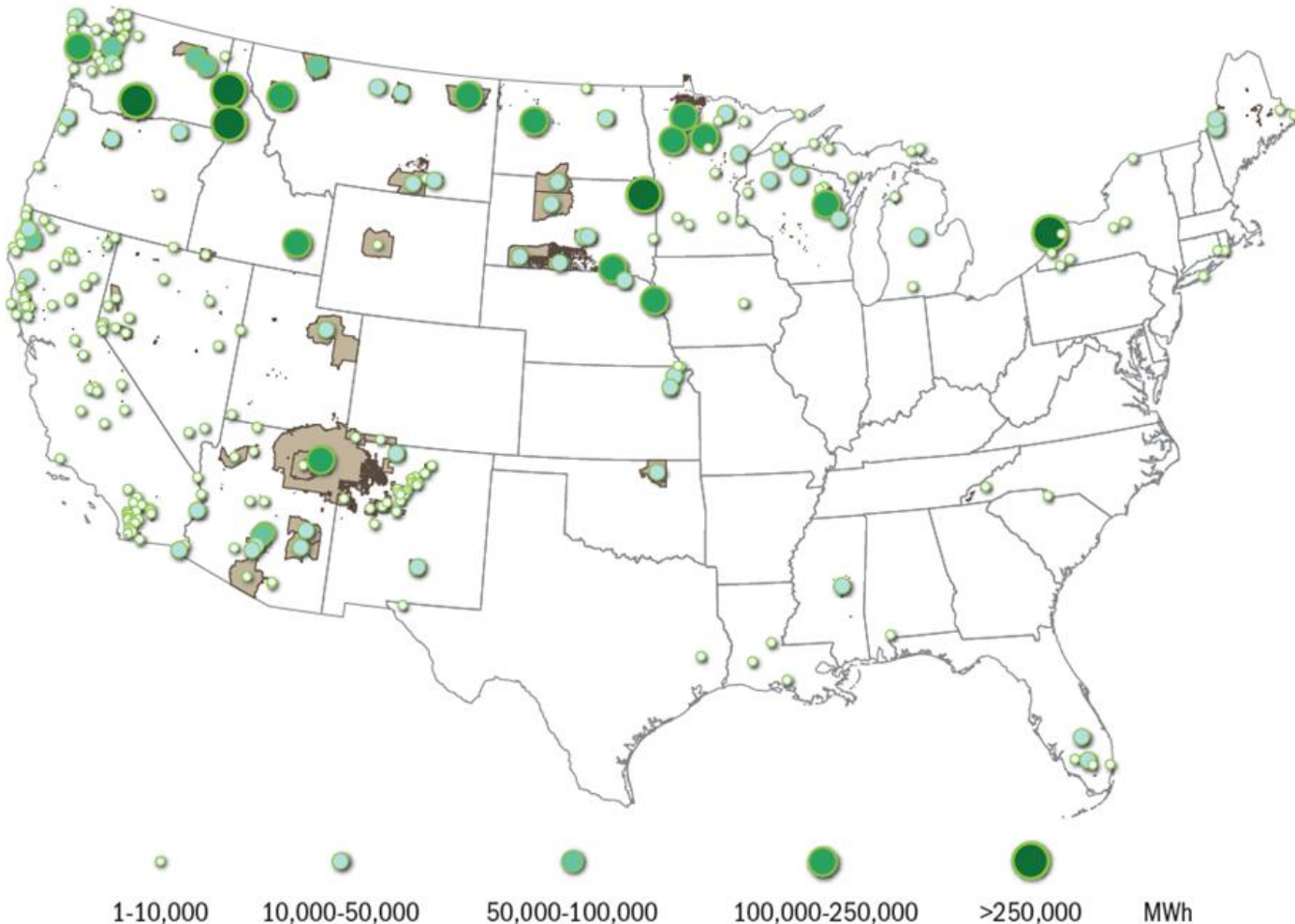
Geothermal Generation Potential



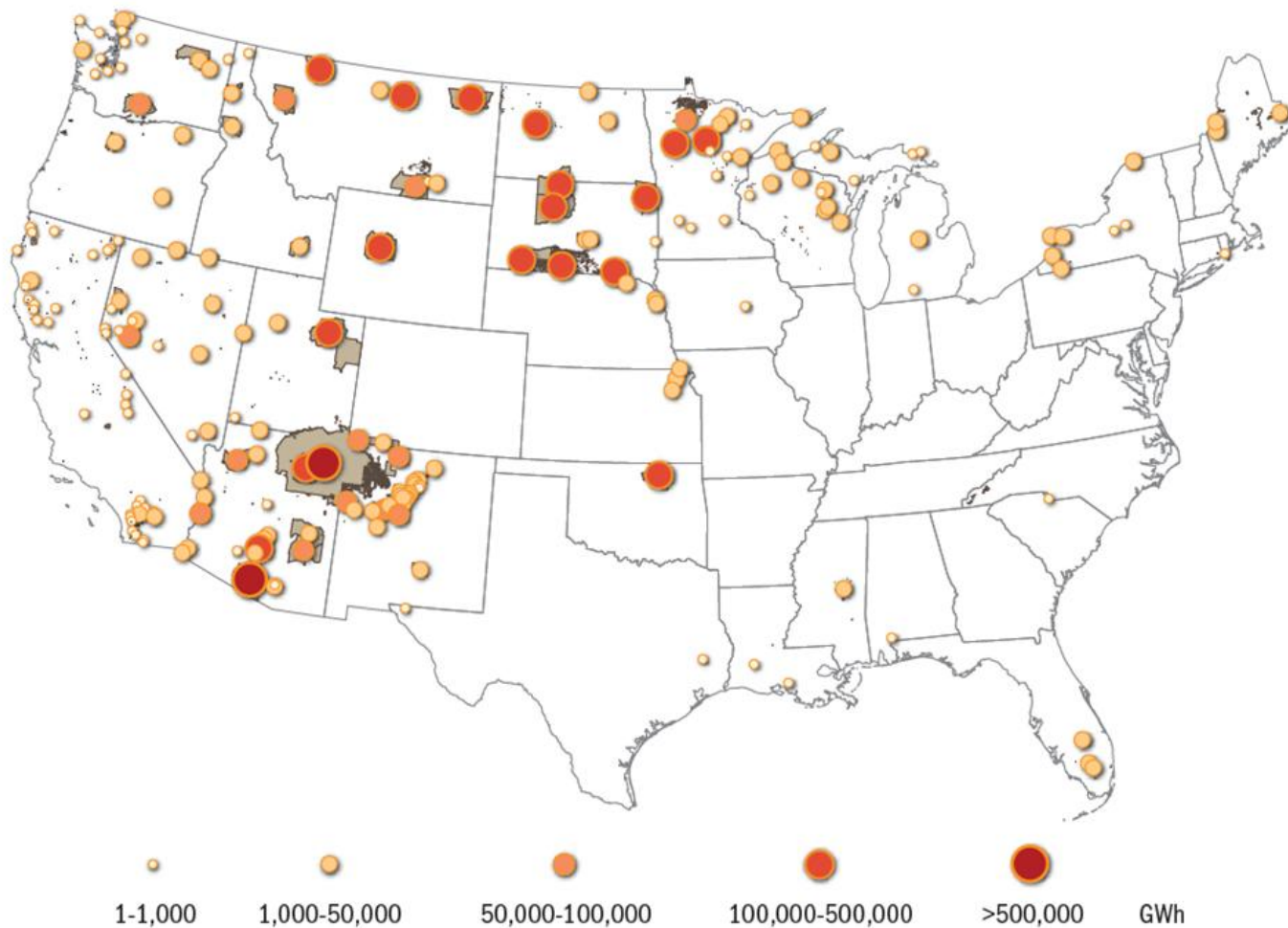
Hydropower Generation Potential



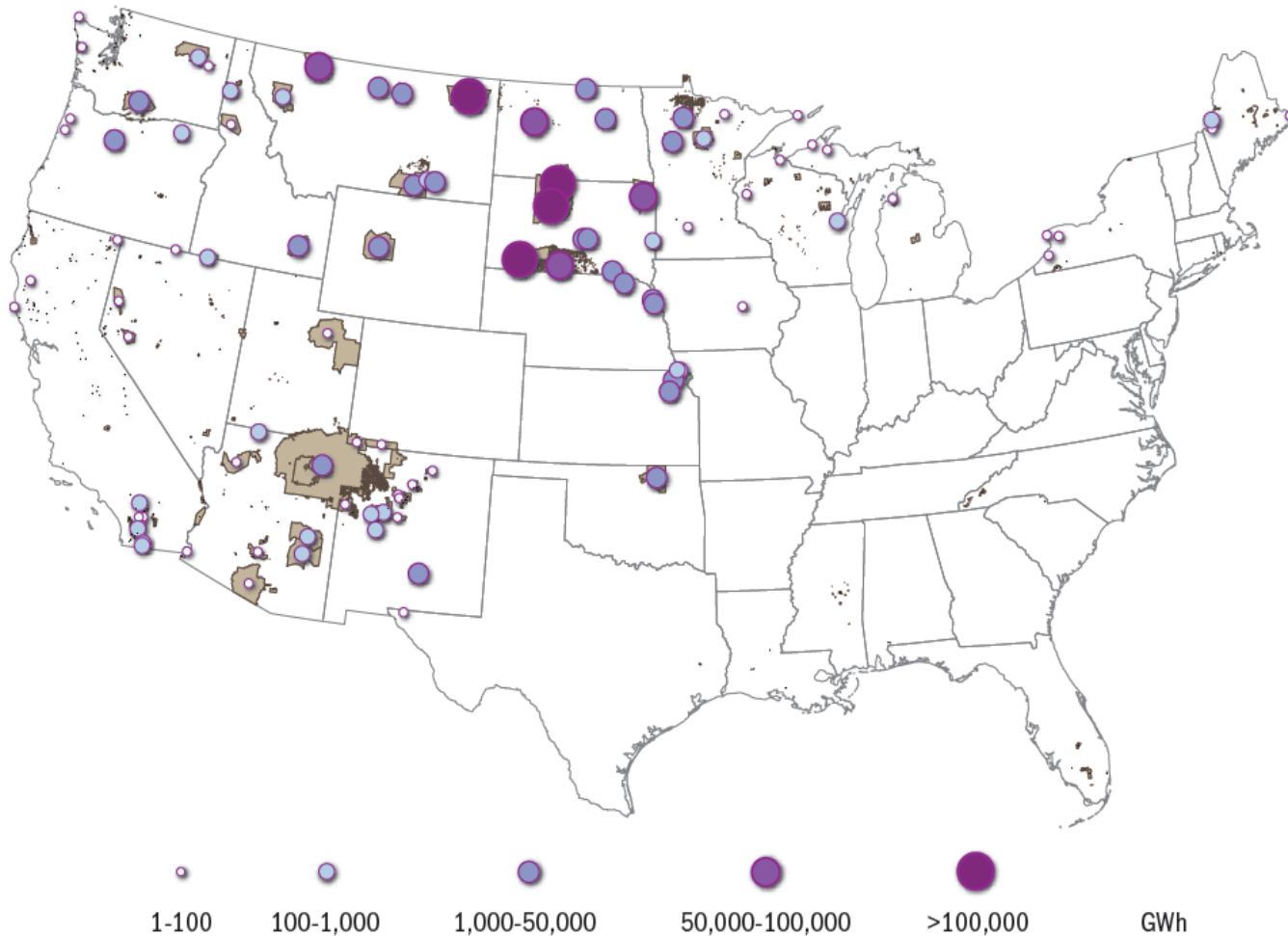
Biomass Generation Potential



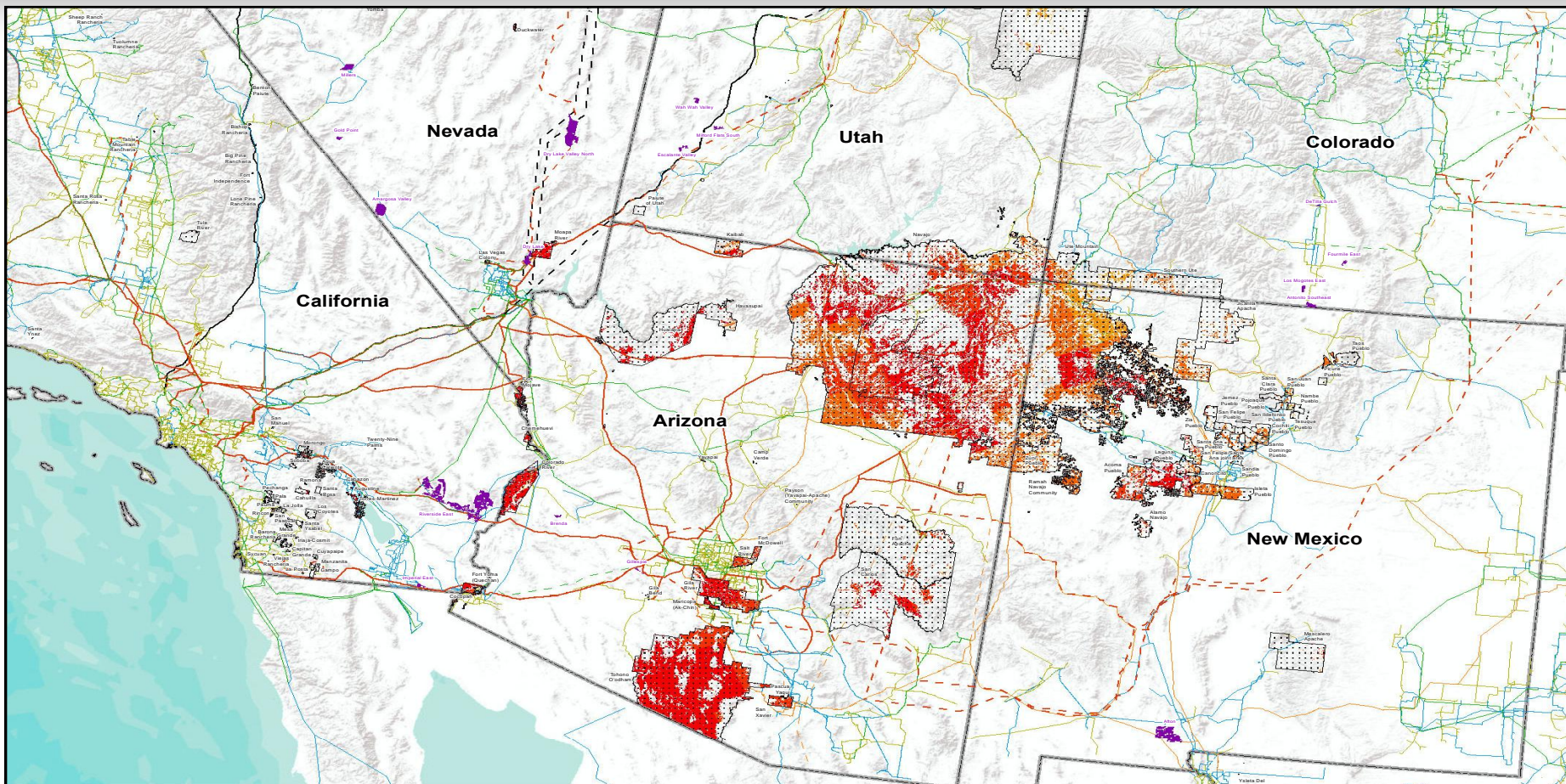
Solar PV (Utility-Scale, Rural) Generation Potential



Wind Generation Potential



BLM Solar Energy Zones



Photovoltaic Solar Resource on Tribal Lands of the United States

Annual average solar resource data are shown for a tilt-latitude collector. The data are a 10km satellite modeled dataset (SUNY/NREL, 2007) representing data from 1998-2005. Resource has been filtered to exclude slopes greater than three percent and major water bodies.

Transmission Lines created by the Homeland Security - Infrastructure Program (HSIP Gold 2012)

The DOI Solar Energy Zones approximate areas available for utility-grade solar energy development under the Solar Energy Zone Alternative of the Solar Energy Development Programmatic Environmental Impact Statement (PEIS). Refer to the Solar Energy Development PEIS for more details. This data was developed for the Department of Interior, Bureau of Land Management by Argonne National Laboratory.

Transmission Lines

Volt Class, Proposed

— DC Line, In Service

- - DC Line, Proposed

— 735 and Above, In Service

- - 735 and Above, Proposed

— 500, In Service

- - 500, Proposed

— 345, In Service

- - 345, Proposed

— 230-287, In Service

- - 230-287, Proposed

— 100-161, In Service

- - 100-161, Proposed

— Under 100, In Service

- - Under 100, Proposed

— Step-Up, In Service

- - Step-Up, Proposed

▨ Tribal Land

■ BLM Solar Energy Zones

PV Resource

kWh/m2/day

4.66 - 5.25

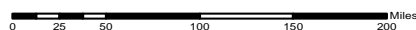
5.26 - 5.50

5.51 - 5.75

5.76 - 6.00

6.01 - 6.25

6.26 - 6.51



This map was produced by the National Renewable Energy Laboratory for the US Department of Energy, 15 October 2012

