



# **RE-Powering America's Land: Renewable Energy on Potentially Contaminated Land and Mining Sites**

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***Local Governments Cultivating Green Energy on Brownfields***

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# What Will be Covered Today



- What is RE-Powering America's Land?
- Why Focus on Renewable Energy Generation on Contaminated Sites?
- Existing RE-Powering Tools
- Feasibility Studies
- Success Stories



# RE-Powering America's Land: Renewable Energy on Contaminated Land & Mining Sites



- EPA launched *RE-Powering America's Land* in 2008
- EPA has authority to investigate, assess, and clean up contaminated sites
- Recognized the potential redevelopment opportunities of these EPA tracked sites:

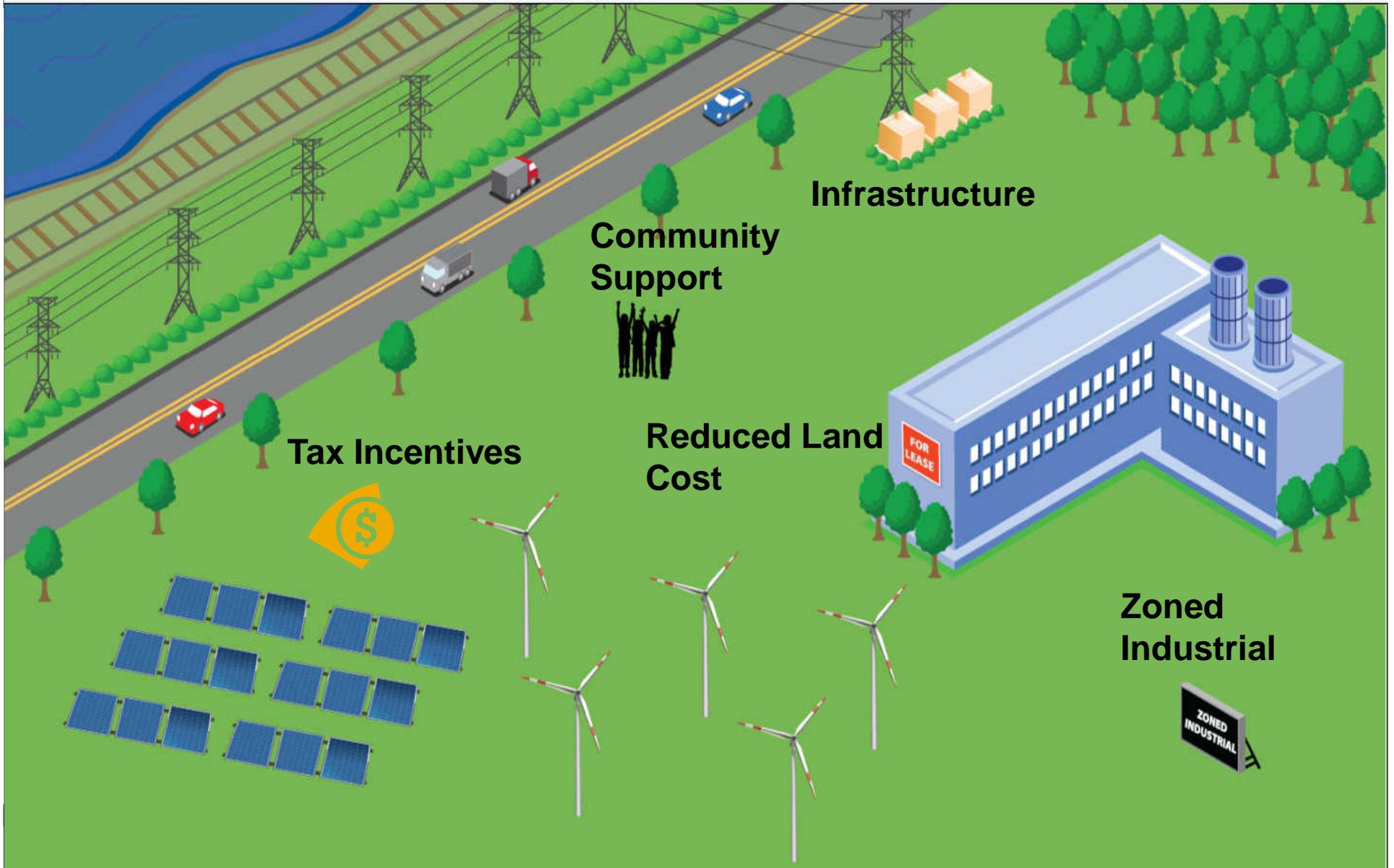
- Brownfields
- Superfund
- Abandoned Mine Lands
- RCRA – corrective action
- Landfills



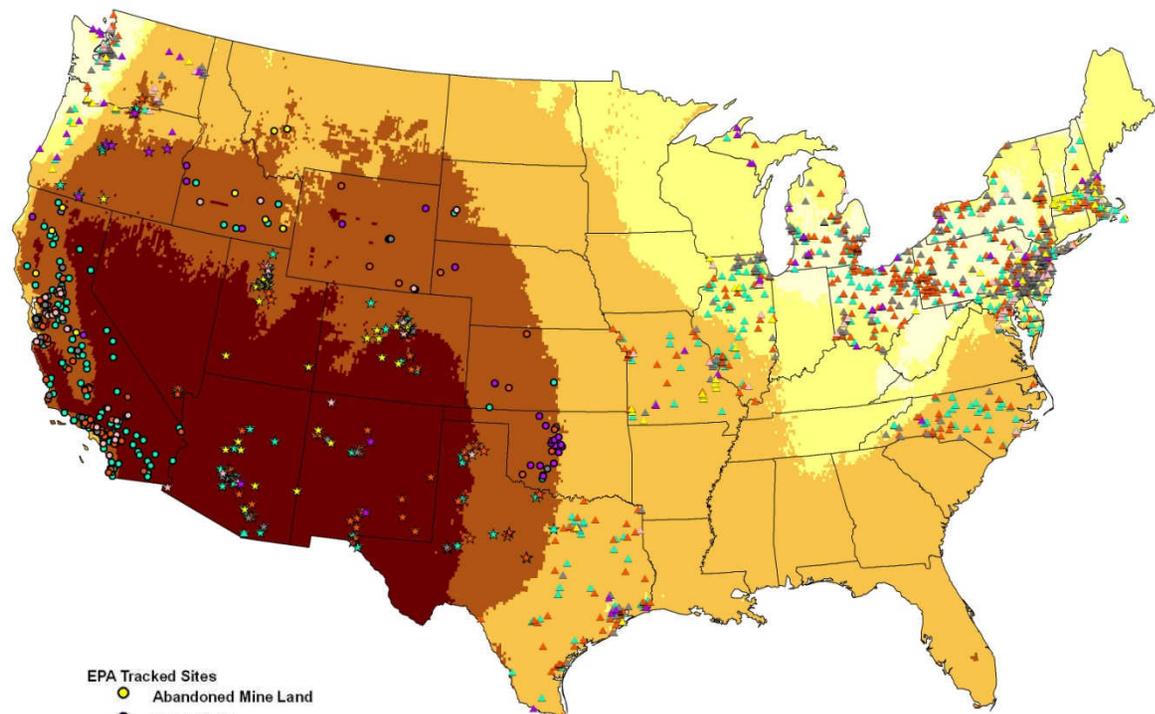
- To date, have mapped over 15 million acres, overlaid with RE potential



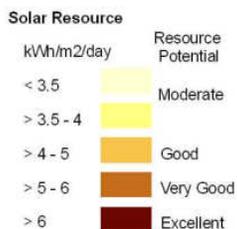
# Why Focus on Renewable Energy on Contaminated Sites?



# Potential for Solar



- EPA Tracked Sites**
- Abandoned Mine Land
  - Brownfield
  - RCRA
  - Federal Superfund
  - Non-Federal Superfund
  - Landfill
- PV Type**
- Utility Scale PV Only
  - ▲ PV Policy Driven Only
  - ★ PV Policy Driven and Utility Scale PV



**Utility PV 470 sites**

**Policy Driven PV 1,397 sites**

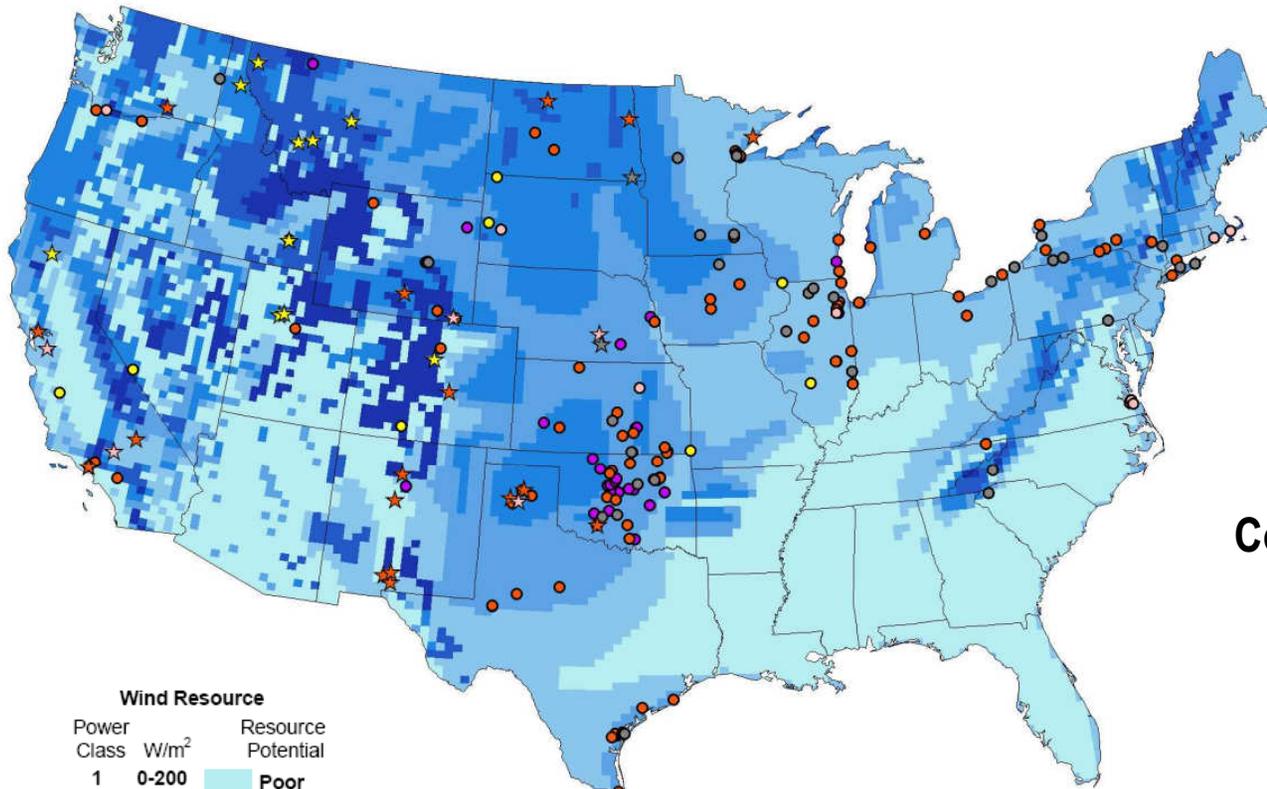
**Non-grid PV 11,384 sites**

**Utility CSP (Stirling) 85 sites**

**Utility CSP (Trough) 60 sites**



# Potential for Wind



**Utility Wind 37 sites**

**Community Wind 169 sites**

**Non-Grid Wind 1,304 sites**

Power Class	W/m <sup>2</sup>	Resource Potential
1	0-200	Poor
2	200-300	Marginal
3	300-400	Fair
4	400-500	Good
5	500-600	Excellent
6	600-800	Outstanding
7	>800	Superb

- EPA Tracked Sites**
- Abandoned Mine Land
  - Brownfield
  - RCRA
  - Federal Superfund
  - Non-Federal Superfund



# RE-Powering Tools

- **Google Earth Mapping**
  - Joint EPA-NREL venture produced interactive maps
- **Technical Assistance**
- **Success Stories and Case Studies**
  - Identifying and sharing successes
- **Decision Trees for Potentially Contaminated Sites**
  - EPA and NREL have developed decision trees to screen potentially contaminated and underutilized sites for solar and wind potential.
- **Coming Soon**
  - Solar on Landfills Best Practice Document

Website: [www.epa.gov/renewableenergyland](http://www.epa.gov/renewableenergyland)



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# Google Earth Mapping Tool



- **Mapped EPA inventory of EPA tracked sites**
  - Abandoned Mine Lands
  - Brownfields – sites that received a Brownfields grant
  - RCRA
  - Superfund
  - Landfills
- **National Renewable Energy Laboratory (NREL) Data**
  - Wind, Solar, Biomass, and Geothermal Resources
- **Infrastructure Data**
  - U.S. Highways
  - U.S. National Transportation Atlas Railroads
  - Transmission Lines



Fly To

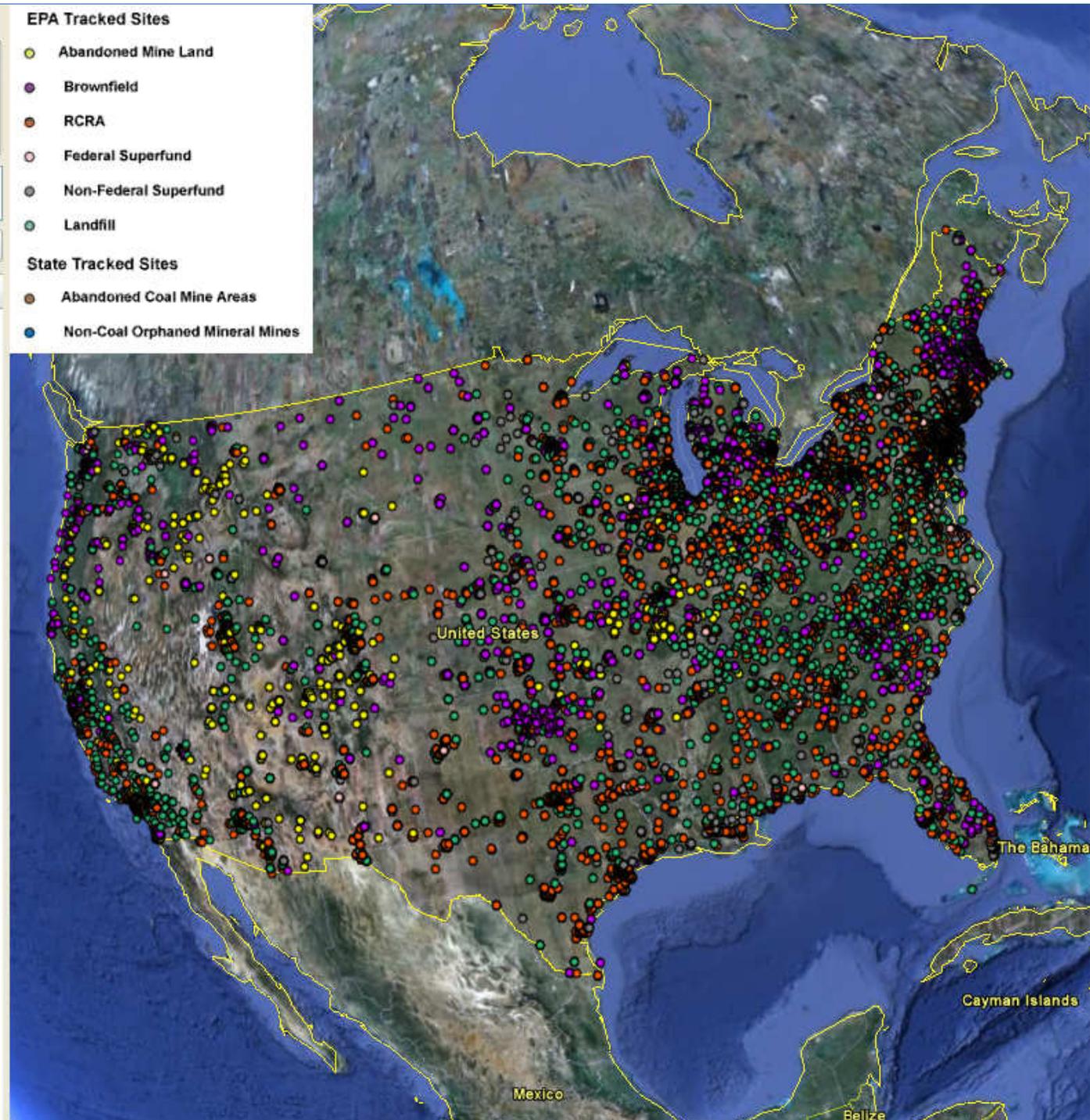
Fly to e.g., Reservoir Rd. Clayville, NY

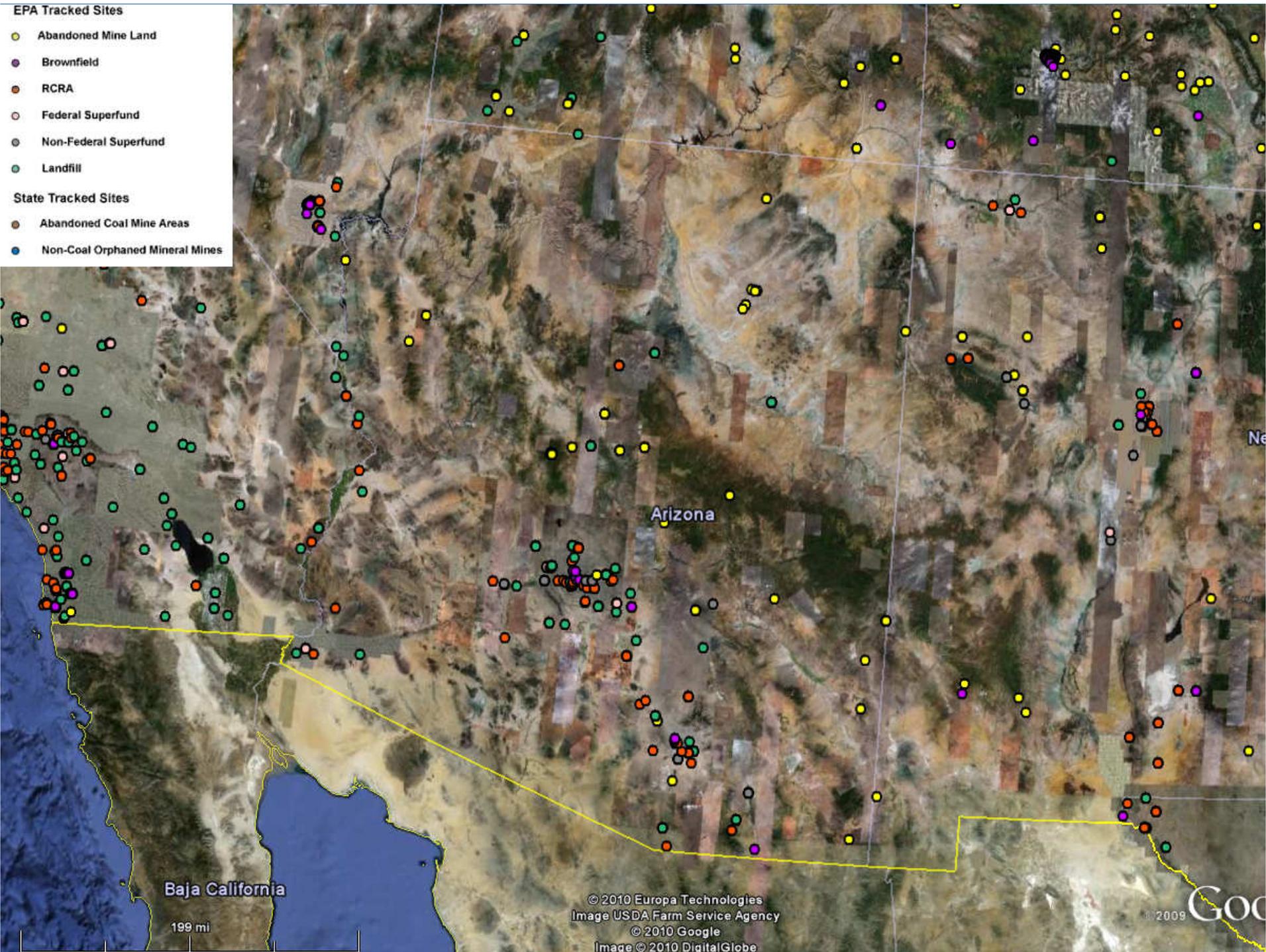
▼ Places

- My Places
- Temporary Places
- EPA Renewable Energy Sites
  - EPA Site Type Legend
  - [Google Earth Instructions](#)
  - Utility Wind
  - Community Wind
  - Non-Grid Wind
  - CSP Utility Solar
  - PV Utility Solar
  - PV Policy Driven Solar
  - Non-Grid PV Solar
  - Biopower Facility
  - Biorefinery Facility
  - Geothermal Flash Power Plant
  - Geothermal Binary Power Plant
  - Geothermal Heat Pump
  - Landfill Gas Energy Project
  - [Data Guidelines](#)

- EPA Tracked Sites**
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- State Tracked Sites**
- Abandoned Coal Mine Areas
  - Non-Coal Orphaned Mineral Mines



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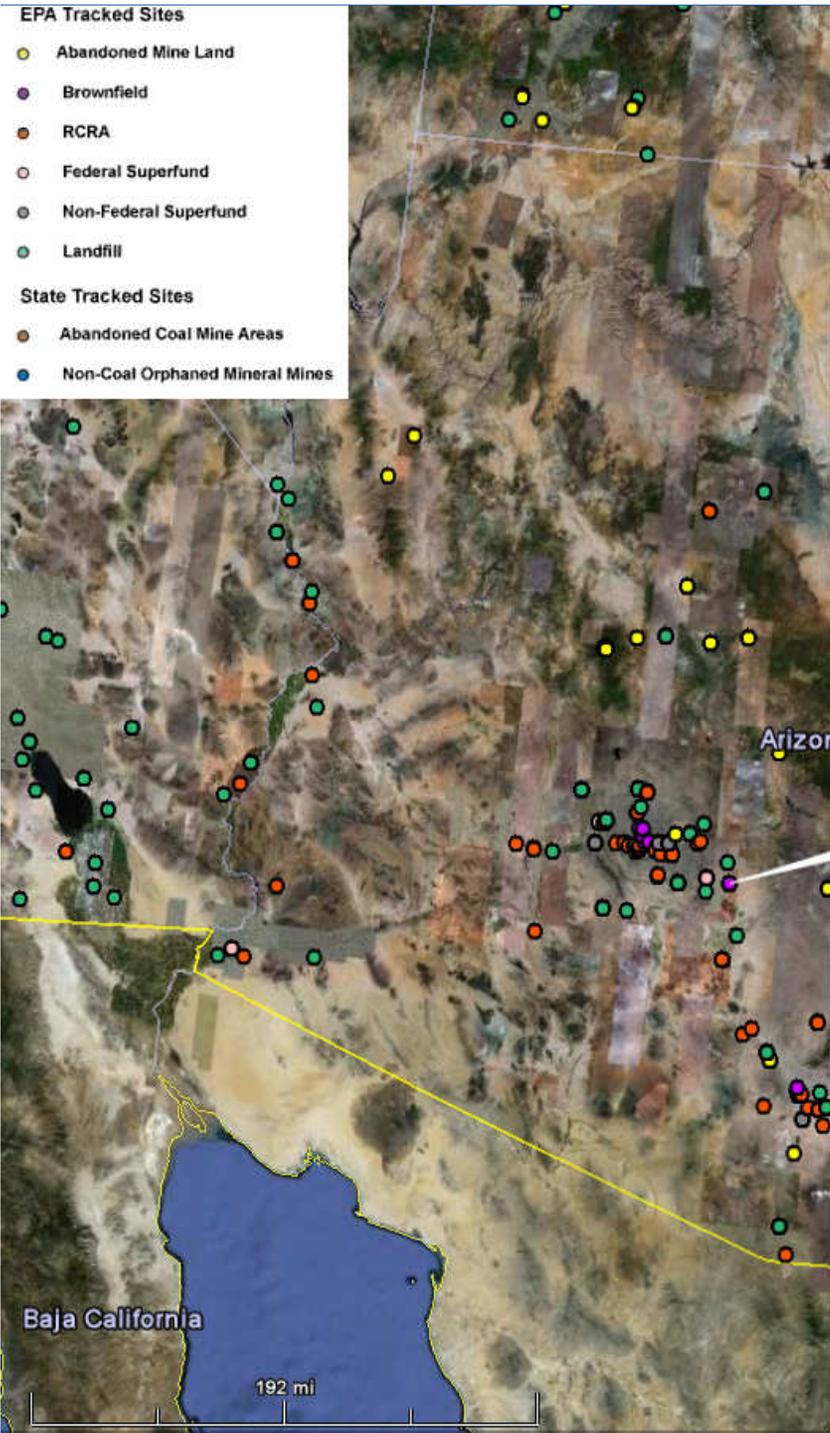


#### EPA Tracked Sites

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#### State Tracked Sites

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## Former Tri-City Landfill

City: Scottsdale

State: AZ

Mapped Acreage: 140.0

Program: EPA Tracked Brownfield

EPA Region: 9

EPA ID/Brownfields ACRES Property ID: 16622

Current Environmental Status of Site: [Cleanup program information](#)

**Renewable Energy Potential (Based on Screening Criteria):** CSP Stirling Engine Solar; PV Utility Solar; PV Policy Driven Solar; Non-Grid PV Solar; Biopwer Facility; Biorefinery Facility; Geothermal Flash Power Plant; Geothermal Binary Power Plant; Geothermal Heat Pump

**State Renewable Portfolio Standard (RPS):** RPS, Solar Multiplier, Distributed Generation Provision, [State Incentives and Policies](#)

**Renewable Energy Zone:** N/A

**Distance in Miles to Transmission Lines (1990 Data):** 1.71

**Wind Power Class:** 1

**Wind Power Density (W/m<sup>2</sup>), at 50 Meters:** 0-200

**Wind Resource Potential:** Poor

**Utility Solar Power Resource (kWh/m<sup>2</sup>/day):** 7.04

**Utility Solar Potential:** Excellent

**Non-Grid Connected Photovoltaic Solar Resource (kWh/m<sup>2</sup>/day):** 6.45

**Non-Grid Connected Photovoltaic Solar Potential:** Excellent

**Resources for Biopower (metric tons/year):** 702,615

**Biopower Resource Potential:** Outstanding

**Resources for Biorefinery (metric tons/year):** 585,010

**Biorefinery Resource Potential:** Outstanding

**Geothermal Heat Pump Resource - Near Surface Temp (°C):** 21

**Geothermal Binary Plant Resource - Temp at Depth of 3 km (°C):** 109.66

**Geothermal Flash Power Plant Resource - Temp at Depth of 4.5 km (°C):** 150.07

**Landfill Gas Energy Project Potential:** N/A

**Site-Specific Renewable Energy Data:** [Renewable Energy Excel spreadsheet](#)

**Data and Methodology Description:** [Data Guidelines document](#)

**Additional Information:** [EPA's RE-Powering America's Land Initiative](#)

**Contact:** [cleanenergy@epa.gov](mailto:cleanenergy@epa.gov)

**Disclaimer:** This map and its associated data are intended to provide a general understanding of the renewable energy potential of EPA and state tracked sites. They will be updated periodically. More detailed site-specific analysis is necessary to identify or prioritize the best sites for developing renewable energy facilities based on technical and economic potential. See the Data Guidelines document for specific information on methodology and data considerations.



Directions: [To here](#) - [From here](#)

# Solar and Wind Decision Trees



**Goal** Enable state and local governments to evaluate potentially contaminated or underutilized sites for renewable energy potential

**Approach** Collaborate between EPA and NREL to create new tools to guide stakeholders through the process of screening sites for their suitability for future redevelopment with solar photovoltaic (PV) or wind energy

## **Needs and Objectives**

- Fills a knowledge gap
- Encourages a leadership role for local governments
  - To address opportunities in the community for both privately-owned & publicly-owned sites
- Provides a straightforward, step-by-step screening process short of a detailed site-specific assessment
  - Aim is to narrow the field to good candidate sites for renewable energy based on technical and economic feasibility criteria



# Stakeholders & Targeted Sites



## Key Stakeholders

### State & Local Governments

To help states and municipalities screen and prioritize existing sites for their suitability for solar PV installation

### Renewable Energy Developers

To introduce considerations unique to redevelopment of potentially contaminated sites and provide common framework for interactions with state and local governments during project development phase

### Clean-up Project Managers

To aid clean-up PMs to screen their potentially contaminated sites for PV development potential

## Targeted Sites: Potentially Contaminated or Underutilized Sites

Brownfields, Superfund or RCRA sites



Landfills



Underutilized rooftops



Parking lots



Abandoned parcels



# NREL Partnership: Site Specific Analysis



- EPA Partnered with NREL to evaluate the feasibility of siting renewable energy on specific sites
- In 2010, conducted 12 feasibility studies and one alternative gas station project
- In 2011-2012, selected 26 additional sites for feasibility studies through public RFP
- The analysis will include:
  - determining the best renewable energy technology for the site,
  - the optimal location for placement of the renewable energy technology,
  - potential energy generating capacity,
  - the return on the investment, and
  - the economic feasibility of the renewable energy projects.
- Expected Outcome: A tool for the community to use when seeking developers for the site

# Next Steps for RE-Powering



- Expand the toolbox of resources for use by EPA staff, states, and stakeholders
  - ◆ Solar on landfill guidance
  - ◆ Case studies tied to barriers
- Host Webinar Series
- Clarify Liability Protections
- Add state-tracked sites to Google Earth



# Examples of Success: Brockton Brightfields



## Brockton Brightfields, MA

- Brockton is 97% developed
- 460 kW
- City-owned
- Jobs for local installers and MA renewable energy businesses
- South facing, 42 degree angle to maximize total electricity generation



# Thank You



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- » [www.epa.gov/renewableenergyland](http://www.epa.gov/renewableenergyland)



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