

Brightfields: Sustainable Opportunities for Renewable Energy Projects on Environmentally Impaired Lands



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USEPA Region III

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RE-Powering America's Land Topics







- Introduction
- Overview: RE-Powering America's Land Initiative
- Siting Renewables on Potentially Contaminated Sites – A good fit for all stakeholders
- RE-Powering Tools & Resources
  - Feasibility Studies
  - Understanding & Addressing liability issues
- EPA & State Brownfield financial resources
- Success Stories

What is RE-Powering America's Land Initiative?

EPA's RE-Powering America's Land Initiative encourages renewable energy development on current and formerly contaminated land and mine sites when aligned with the community's vision for the site.











Renewable Energy on Contaminated Lands: Consistent with Policy Goals/Objectives

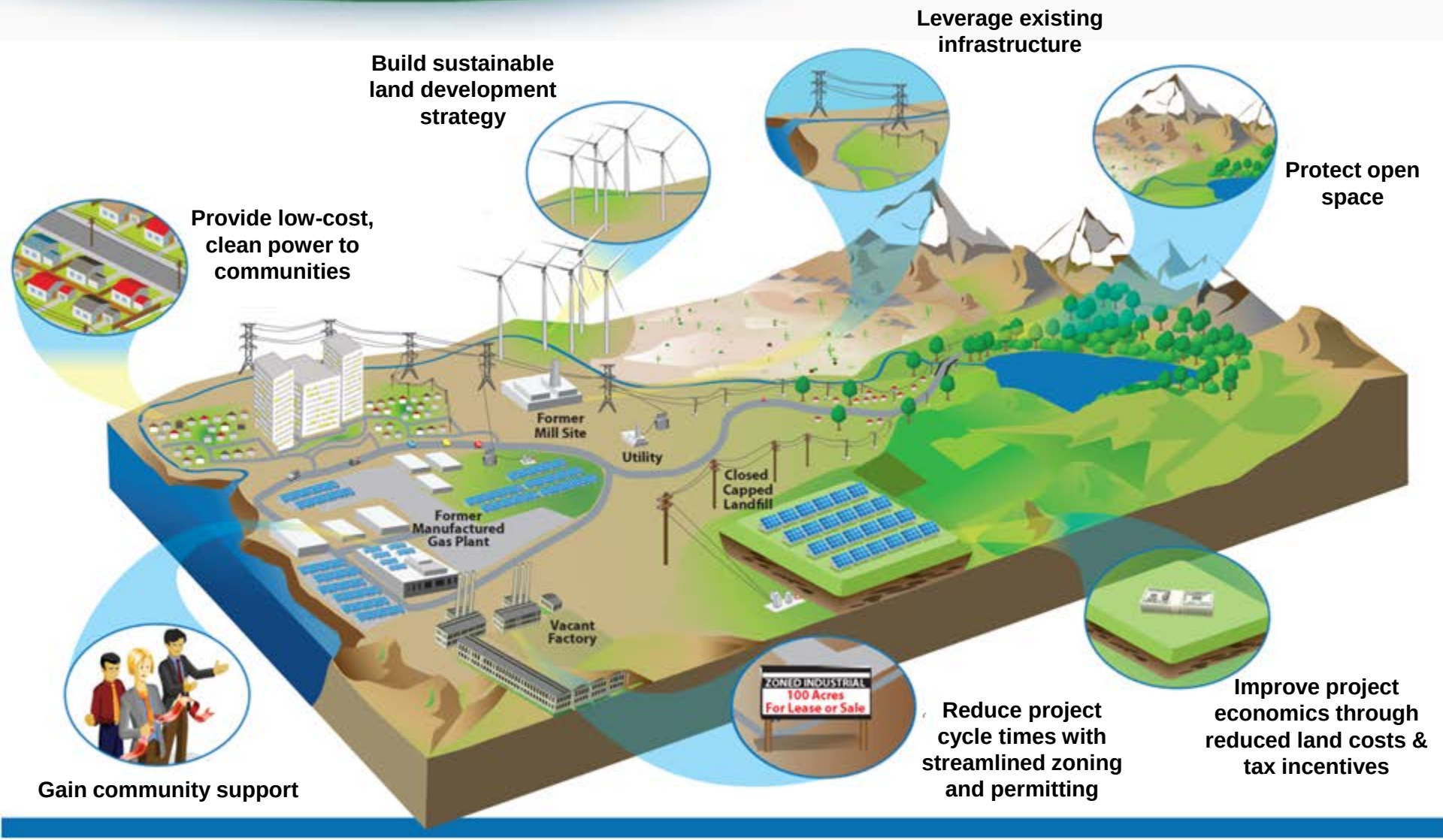
EPA Administrator's Key Themes

- Addressing climate change and improving air quality
- Making a visible difference in communities across the country
- Working toward a sustainable future

Federal Clean Energy/Sustainability Plans and Efforts

- Executive Order 13423—Strengthening Federal Environmental, Energy, and Transportation Management (Jan. 24, 2007) ("Sustainability Order I").
- Executive Order 13514—Federal Leadership in Environmental, Energy, and Economic Performance (Oct. 8, 2009) ("Sustainability Order II")
- President's Climate Action Plan (June 2013)
- Presidential Memorandum—Federal Leadership on Energy Management (December 5, 2013)

Why Renewables on Potentially Contaminated Lands



RE-Powering America's Land

Projects installed nationwide

Wind turbines installed during remediation at abandoned steel mill



New York

Concentrators installed on remediated mine tailings



New Mexico

Wind turbines at former industrial site



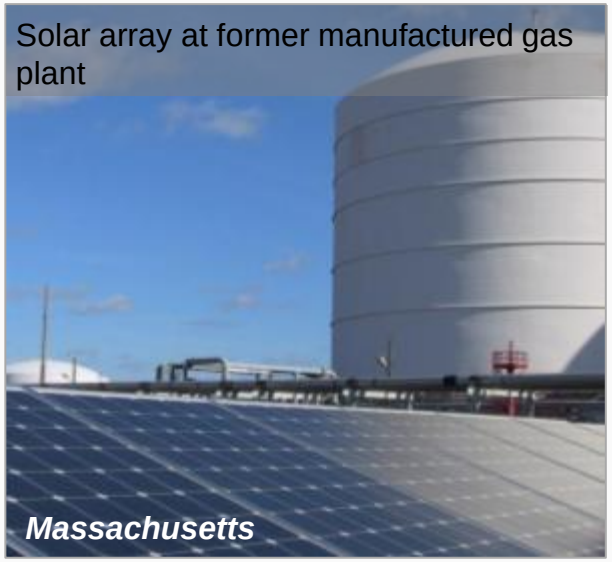
Wyoming

Solar array installed on landfill cap



Colorado

Solar array at former manufactured gas plant



Massachusetts

Solar array at former foundry



Illinois

Solar geomembrane capping landfill



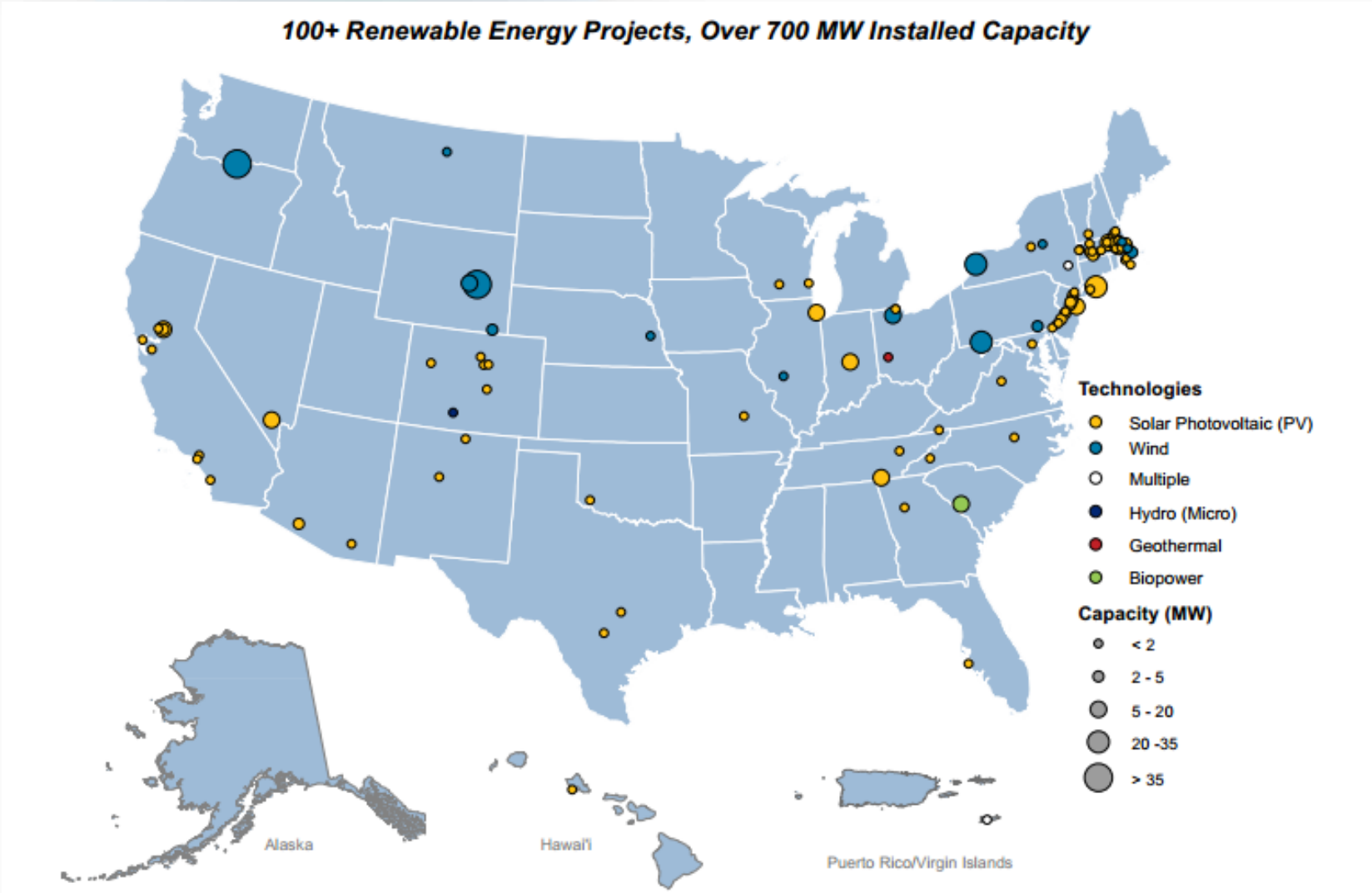
Georgia

Solar array at Superfund site

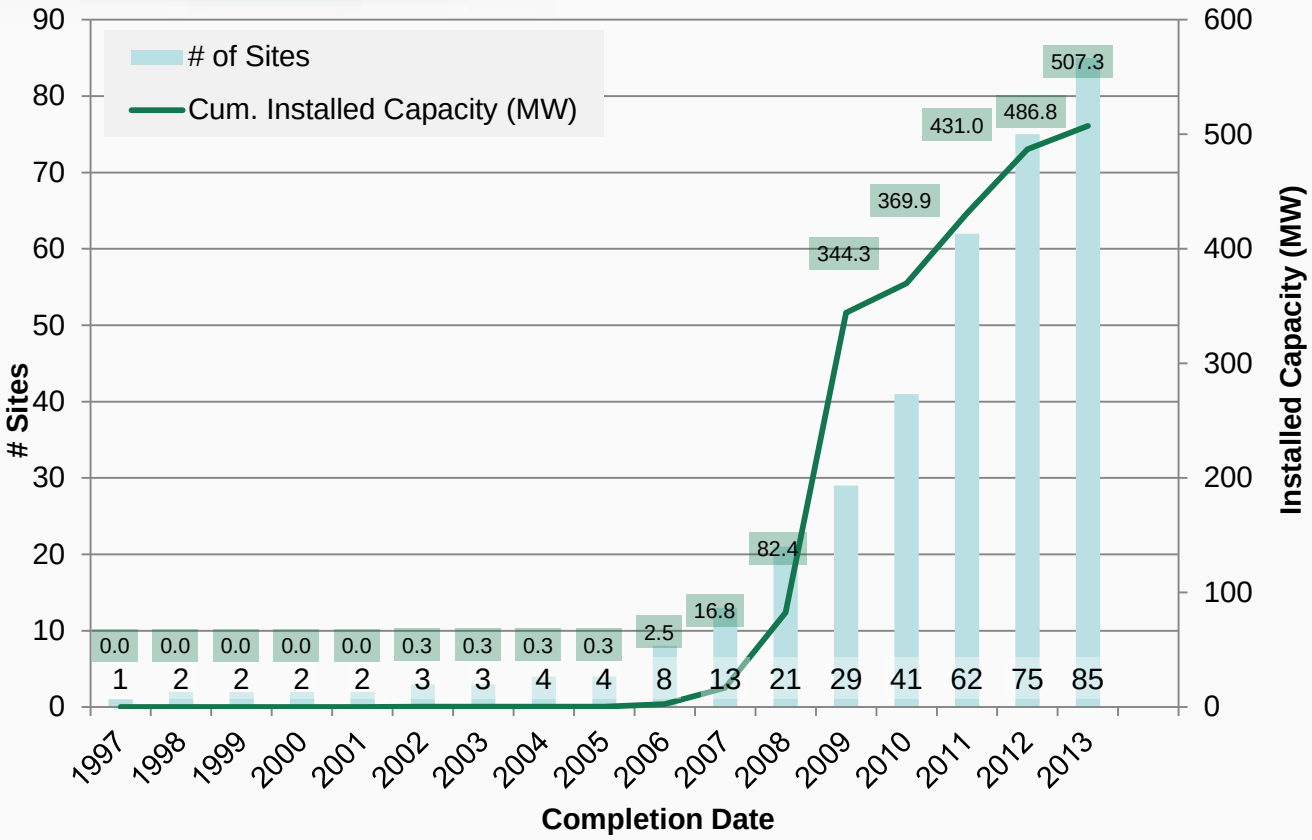


California

100+ Projects Identified To Date

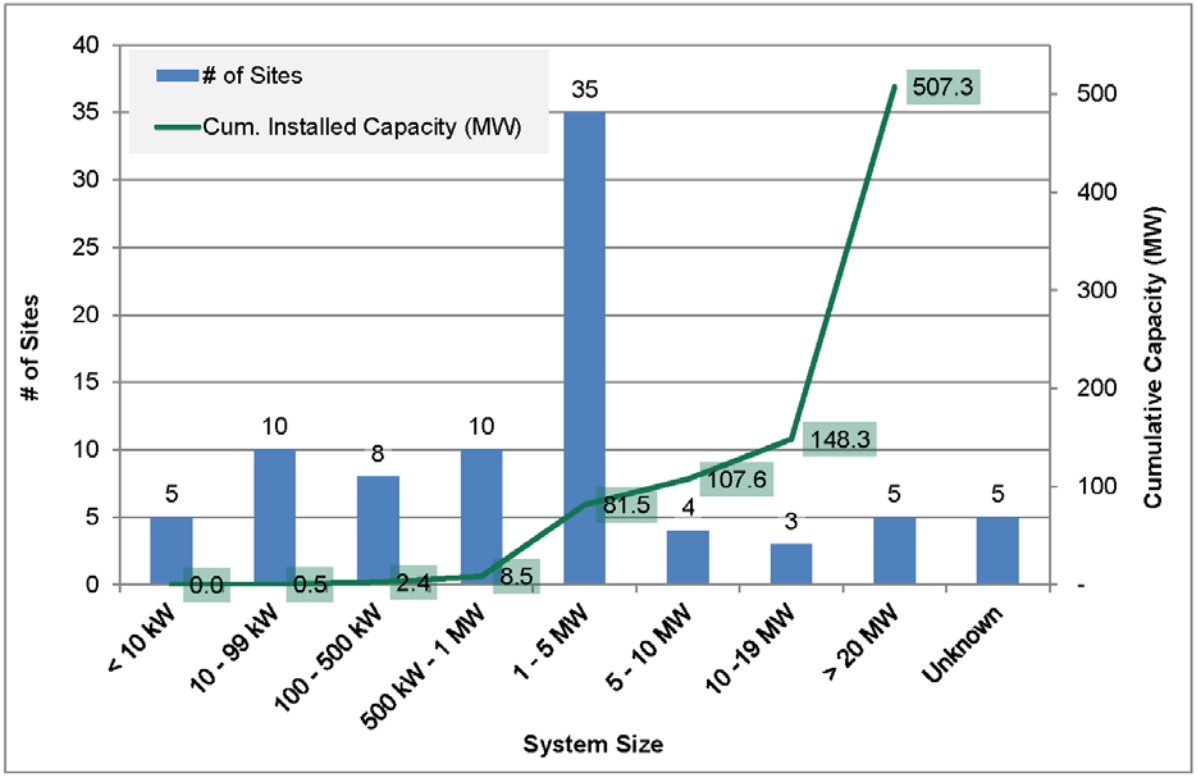


Projects Identified to Date



500+ MW Installed Capacity

85 Projects Identified To Date



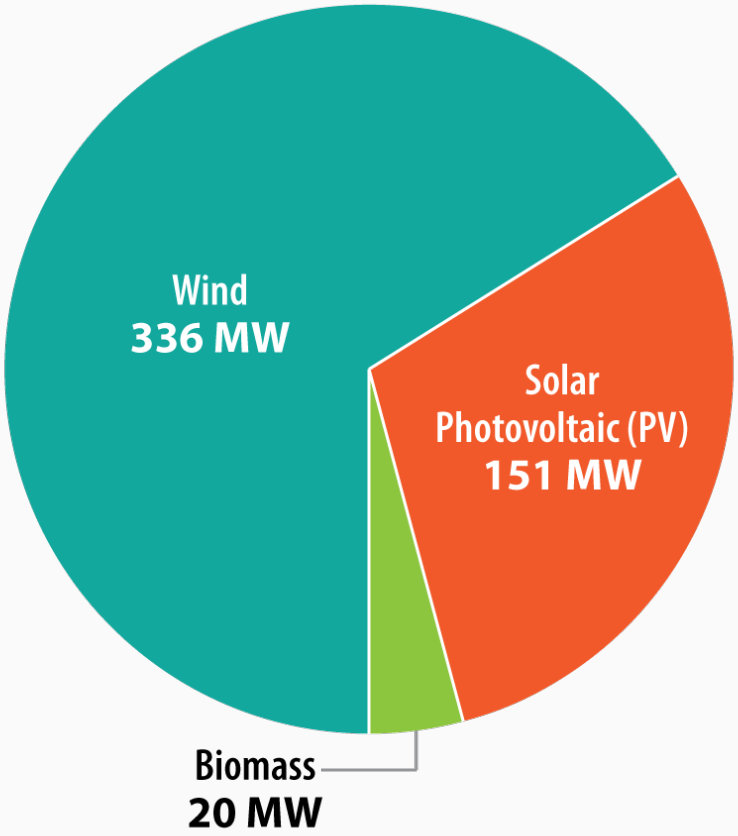
Installations by State

State	Count of Type of Site	Installed Capacity (MW)
MA	22	36.8
NJ	10	22.7
CA	8	12.1
NY	6	67.2
CO	5	5.9
TN	3	9.9
WY	3	256.8
PA	2	38.0

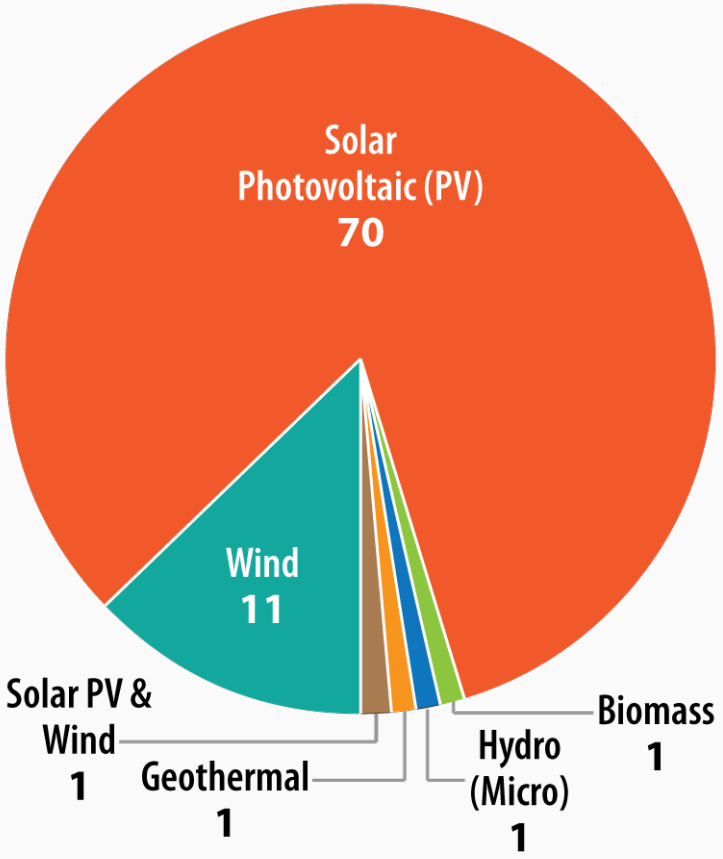
Projects Identified To Date

More Wind Capacity; More Solar Sites

Capacity



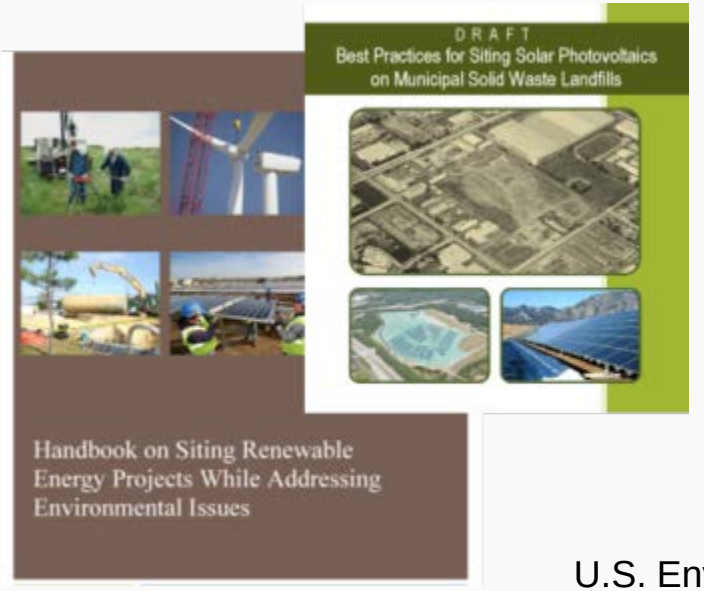
Number of Sites



RE-POWERING TOOLS & RESOURCES

RE-Powering Tools & Resources





Screened Sites

- Google Earth interactive map
- Searchable database

Factsheets & Handbooks

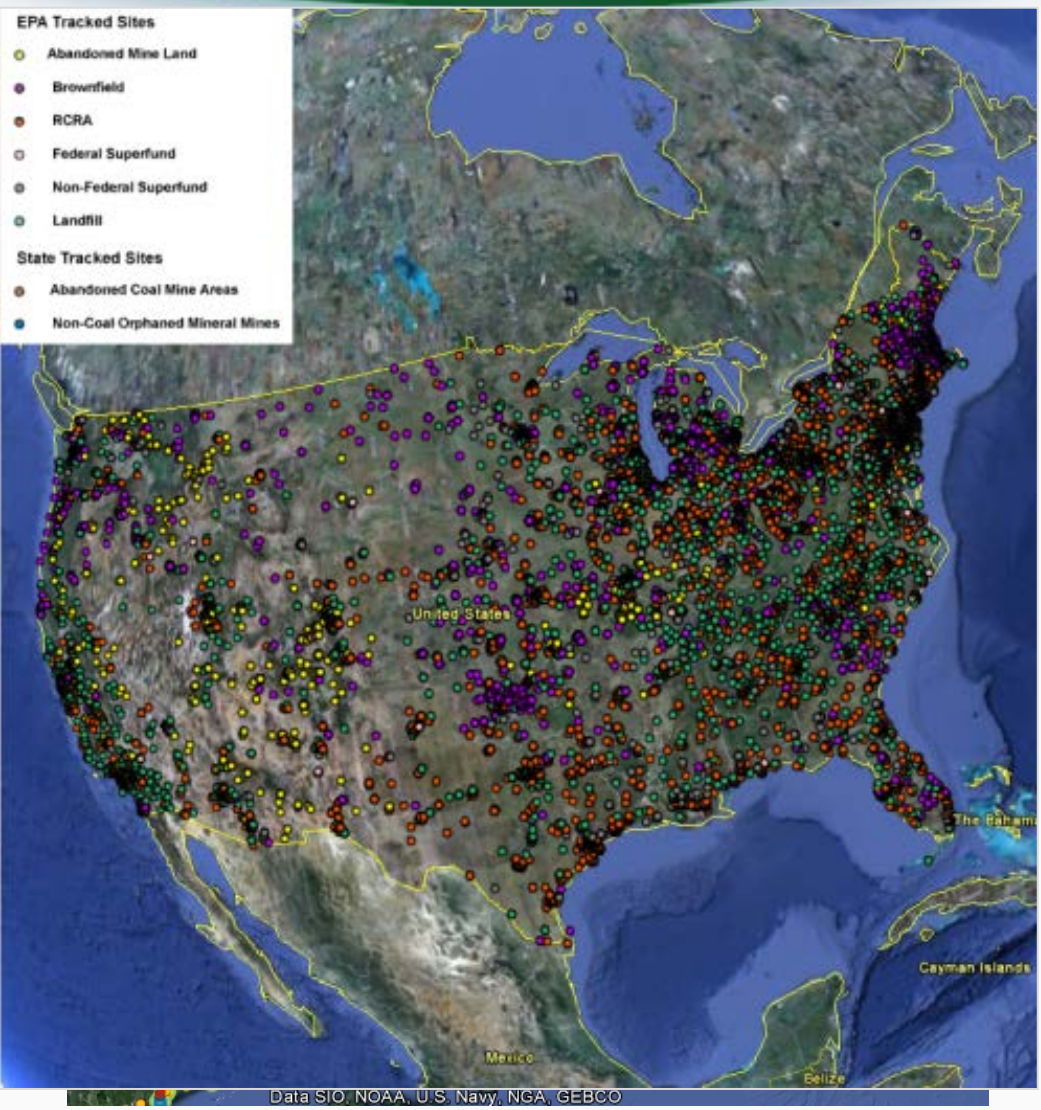
- Potential Advantages of Reusing Potentially Contaminated Land for Renewable Energy Fact Sheet
- Handbook on Siting Renewable Energy Projects While Addressing Environmental Issues
- Best Practices for Siting Solar PV on Landfills
- Solar and Wind Decision Trees
- Liability tools

Other tools & resources

- EPA-NREL feasibility studies
- Success stories & case studies
- Quarterly webinars & newsletters
- Stakeholder-focused workshops

RE-Powering Mapper

Google Earth Overlay

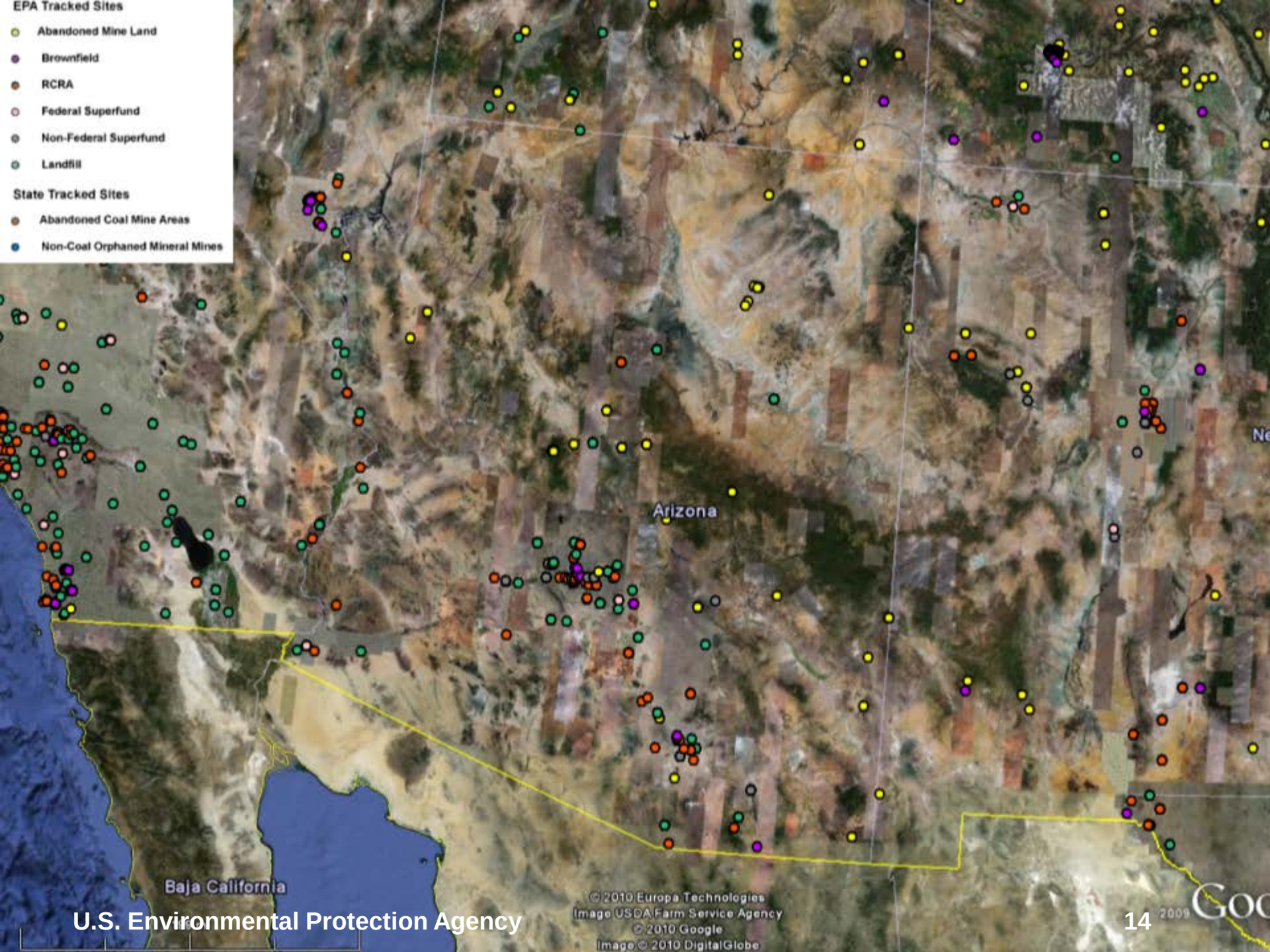


Mapped inventory of 66,000+ EPA and select state tracked sites (over 35 million acres of land) for renewable energy potential. Screening Criteria included:

- Resource Availability
- Acreage
- Distance to Infrastructure

Incorporates data from:

- EPA Cleanup and Landfill Programs
- National Renewable Energy Lab
  - Wind, Solar, and Biomass Resources
- Southern Methodist University and USGS
  - Geothermal
- Department of Homeland Security
  - U.S. Highways
  - Railroads
  - Transmission Lines
  - Substations
- State Agencies from CA, HI, NJ, NY, OR, PA, VA, and WV


EPA Tracked Sites
Abandoned Mine Land
Brownfield
RCRA
Federal Superfund
Non-Federal Superfund
Landfill
State Tracked Sites
Abandoned Coal Mine Areas
Non-Coal Orphaned Mineral Mines
Arizona
Baja California
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WILLIAMS AIR FORCE BASE

City: CHANDLER
State: AZ
Mapped Acreage: 4,043.0
Program: EPA Tracked Federal Superfund
EPA Region: 9
EPA ID/Brownfields ACRES Property ID: AZ7570028582
Current Environmental Status of Site: Cleanup program information

Renewable Energy Potential (Based on Screening Criteria): CSP Stirling Engine Solar; CSP Trough and Power Tower Solar; PV Utility Solar; PV Policy Driven Solar; Non-Grid PV Solar; Biopwer Facility; Biorefinery Facility; 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): 0
Wind Power Class: 1
Wind Power Density (W/m^2), at 50 Meters: 0-200
Wind Resource Potential: Poor
Utility Solar Power Resource (kWh/m^2/day): 7.03
Utility Solar Potential: Excellent
Non-Grid Connected Photovoltaic Solar Resource (kWh/m^2/day): 6.46
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): 104.08
Geothermal Flash Power Plant Resource - Temp at Depth of 4.5 km (°C): 143.6
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
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.

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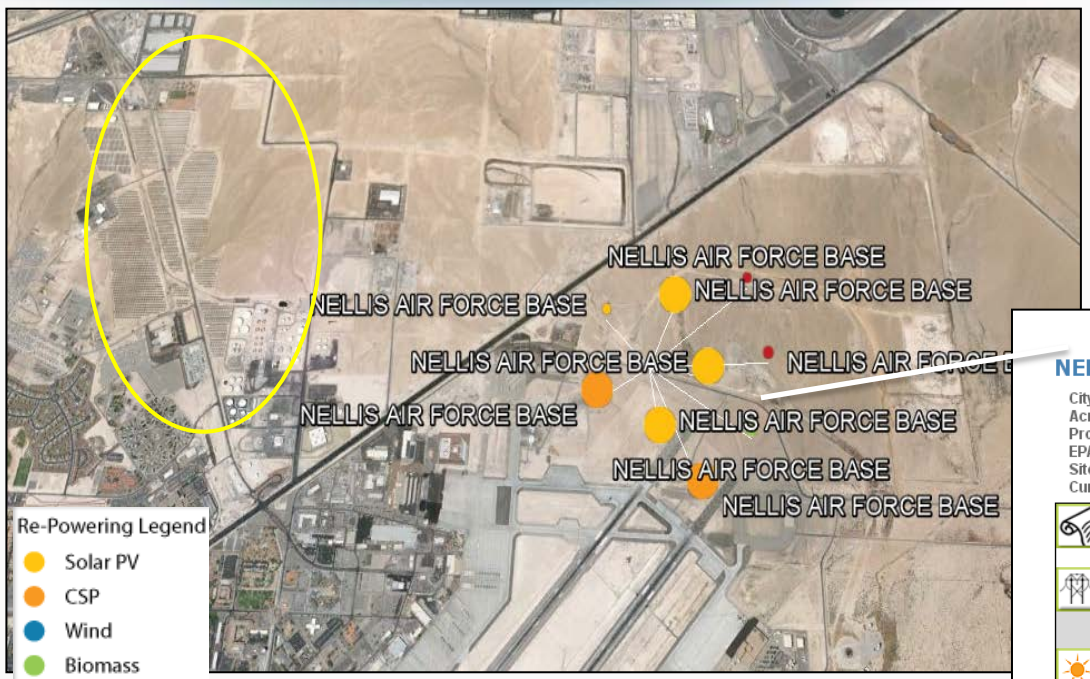
RE-Powering Mapper

Google Earth Overlay



One Site, Nine Opportunities

NELLIS AIR FORCE BASE

City, ST: NELLIS AFB, NV
Acreage: 11,791.00
Program: RCRA (EPA)
EPA Region: 09
Site ID: NV7570024110
Current Environmental Status of Site: Program Information

Policies and Incentives
- Enabling State Policies: RPS, Solar Set-Aside, Solar Multiplier; State Incentives & Policies
- Renewable Energy Zone: n/a

Proximities to Infrastructure & Electricity Demand
Distance to…(miles)
- Transmission: 0.00
- Substation: 0.00
- Roads: 0.00
- Urban Center: 0.84

Solar Resource
- Solar resource (kWh/m^2/day): 7.13

Positive Screening Results for Solar PV & CSP
- PV: Utility Scale
- PV: Policy Driven
- PV: Large Scale
- PV: Off-grid
- CSP: Stirling Engine
- CSP: Trough & Power Tower

Wind Resource
- Wind speed at:
  - Height of 80 m (m/s): 5.00
  - Height of 50 m (m/s): 5.00

Positive Screening Results for Wind
- None

Biomass Resource
- Feedstock in million metric tons/year:
  - Biopower (woody waste): 408,041
  - Biorefinery (woody waste/crops): 408,041

Positive Screening Results for Biomass
- Biopower

Geothermal Resource
- Distance to known hydrothermal site (miles): n/a
- Favorability rating: 3 - 4
- Temperature at depth of 4.5 km (C): 166
- Near surface temperature (C): 22

Positive Screening Results for Geothermal
- Enhanced Geothermal System
- Heat Pump

For additional information, go to EPA's RE-Powering America's Land Initiative or email cleanenergy@epa.gov

EPA United States Environmental Protection Agency

RE-Powering Screening Dataset

Contains detailed site information for all 66,000+ sites RE-Powering tracks

ST	Program	Site Name	City	Acres	Solar PV: Large scale	Estimated Solar PV Capacity Potential (MW)
CO	RCRA	AUTOLIV ASP INC	AURORA	640.00	X	106.66
CO	Landfill Methane Outreach Program	DENVER ARAPAHOE DISPOSAL SITE (DADS)	AURORA	1,363.00	X	227.16
CO	RCRA	DENVER-ARAPAHOE CHEM WASTE PROCESS FAC	AURORA	36.00	X	6.00
CO	Brownfield	FITZSIMONS PROMENADE	AURORA	4.50	X	0.75
CO	Brownfield	IDALIA COURT	AURORA	5.80	X	0.96
CO	Superfund	LOWRY LANDFILL	AURORA	508.00	X	84.66
CO	RCRA	MAGELLAN PIPELINE COMPANY LP	AURORA	42.00	X	7.00
CO	Brownfield	SAND CREEK LANDFILL	AURORA	3.20	X	0.53

Example: Sites in Aurora, Colorado with Large Scale Solar PV Potential (over 300 kW capacity)

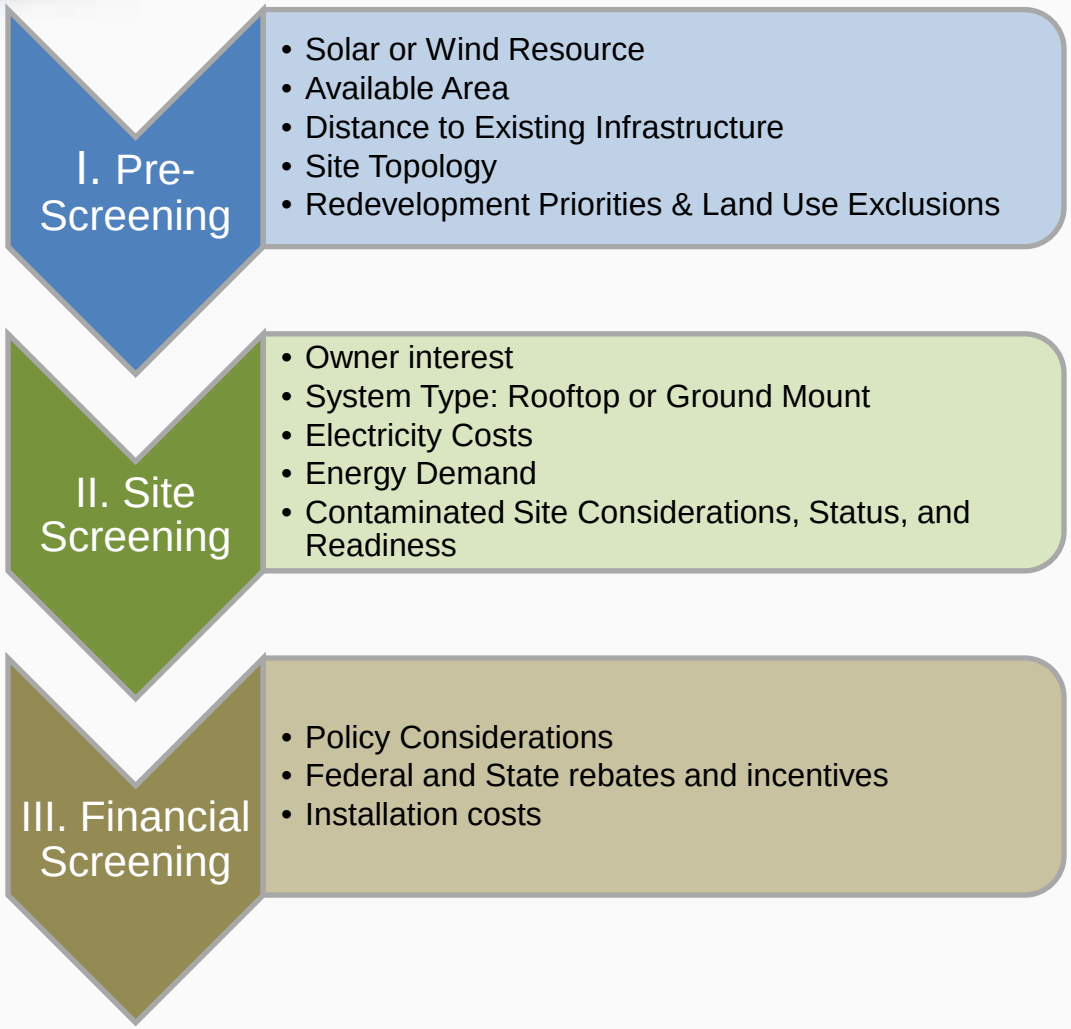
Solar and Wind Decision Trees

Goal

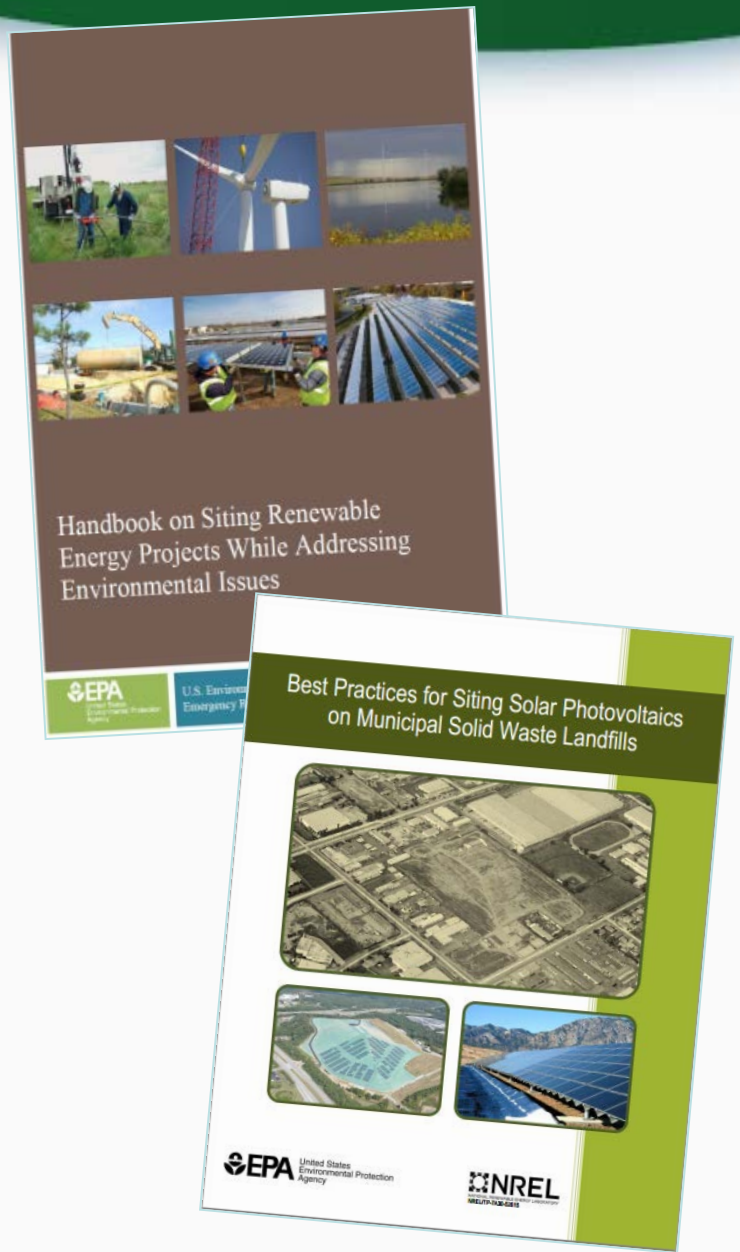
To guide stakeholders through the process of screening sites for solar or wind potential

Key Stakeholders

- State & Local Governments
- Renewable Energy Developers
- Cleanup Project Managers



RE-Powering Tools & Resources



Handbook on Siting Renewable Energy Projects While Addressing Environmental Issues

- Opportunities for siting renewable energy projects while addressing environmental site issues during all phases of cleanup

Best Practices for Siting Solar Photovoltaics on Municipal Solid Waste Landfills

- Provides unique considerations, challenges, and best practices for siting solar PV on MSW landfills
- Provides information on power generation and deal structures
- Provides examples of solar PV on landfill projects
- Provides tools and resources to help facilitate solar PV on landfills

Desire

- www.dsireusa.org

EPA/NREL FEASIBILITY STUDIES

EPA-NREL Feasibility Studies

Technical Assistance

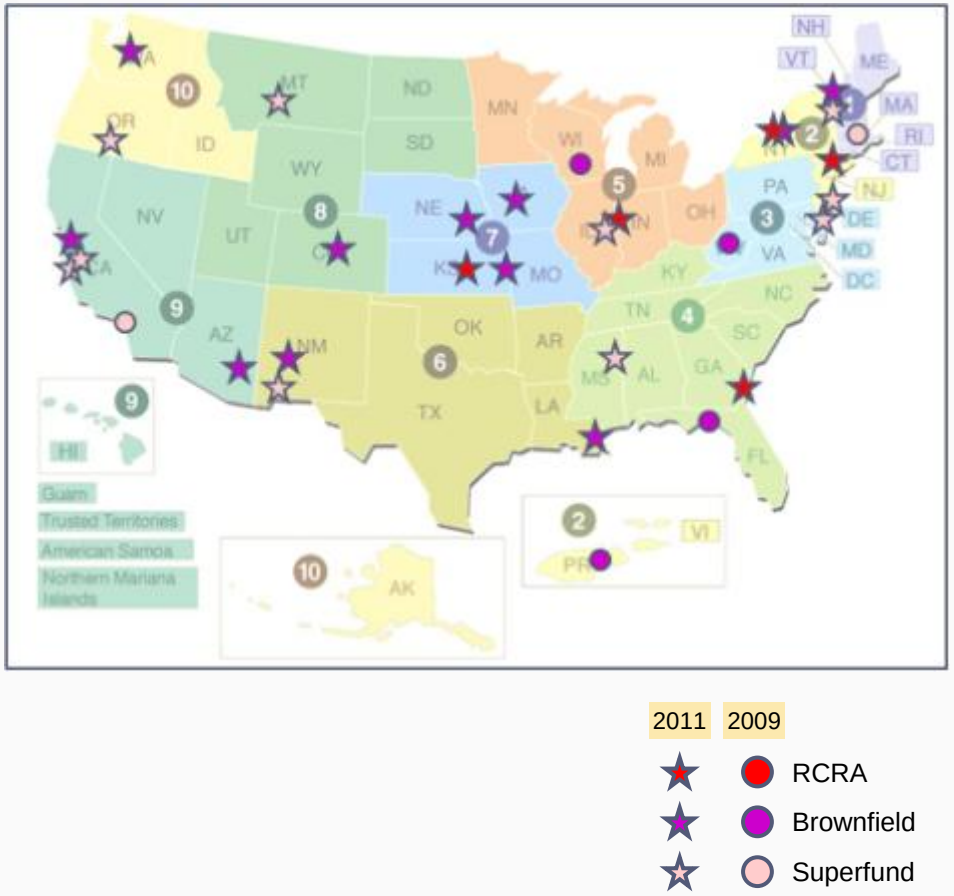
Goal

Pair EPA's expertise on contaminated sites with the renewable energy expertise of NREL to facilitate siting renewable energy on contaminated lands

Tools

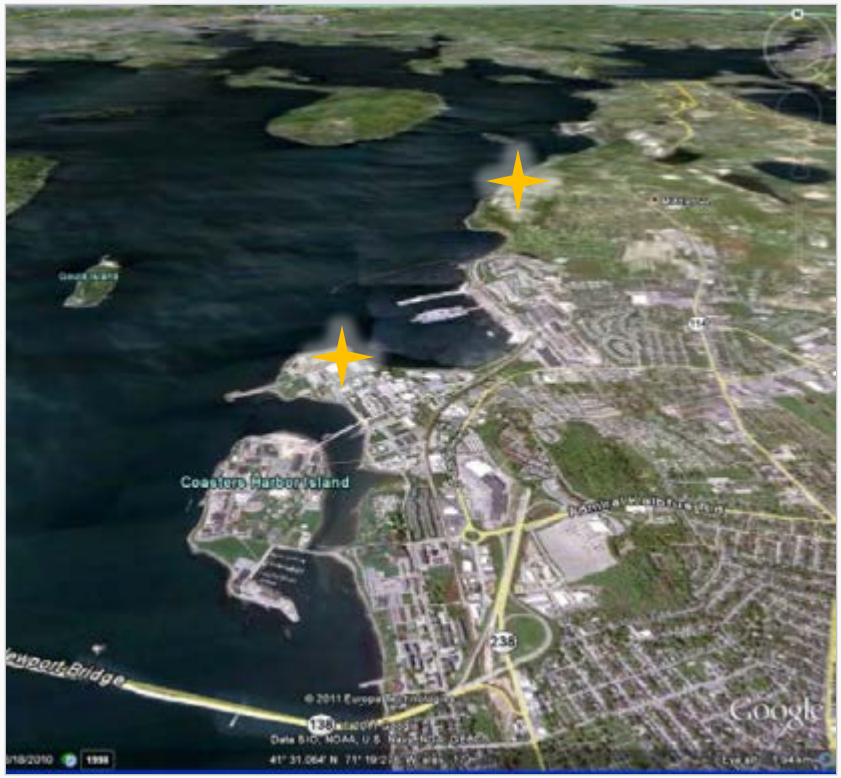
EPA/NREL Feasibility Studies

- 2009: 13 projects initiated
- 2011: 26 projects initiated



Naval Station Newport

Wind Resource Feasibility Study – Superfund Site



Historical uses

- Tank farms

Wind Energy Feasibility

- System size: 9 MW
  - 1.5 MW turbines
- Est. energy production: 23-30 GWh/yr
  - 22-29% of base energy requirements

Key Market Drivers

- RPS: 16% by 2019
- Favorable interconnection and net metering policies in place

Use of Renewable Energy Optimizer Tool

- Proposes solutions combine wind turbines, solar PV, solar water heating, and daylighting

Massachusetts Military Reservation

Wind Installation & Solar PV Feasibility Study





Wind Farm Description

- Powering remediation
- Three 1.5 MW-turbines installed in two phases
- Offsetting 100% electricity costs and air emissions of clean-up project

PV Feasibility Site Assessment: Historical uses

- 3 capped landfills & borrow pit

Solar PV Feasibility

- System size: 7.7 MW
- Est. energy production: 8,755 MWh
- Payback: 9 years
- Job creation: 420 during construction

Key Market Drivers

- Retail electricity pricing (15.9¢/kWh)
- MA SRECs

ADDRESSING LIABILITY ISSUES

Types of Contaminated Sites

- Superfund Sites
- RCRA Corrective Action Sites
- Federal Facilities
- Mining Sites
- Leaking Underground Storage Tank Sites
- State Voluntary Cleanup,other Sites
- MSW and Industrial Landfills
- Brownfields Sites



Types of Contaminated Sites

- **Superfund Sites**
- **RCRA Corrective Action Sites**
- **Federal Facilities**
- **Mining Sites**
- **Leaking Underground Storage Tank Sites**
- **State oversight sites**
  - **Voluntary Cleanup Program**
  - **Other authorities**
- **MSW and Industrial Landfills**
- **Brownfields Sites**

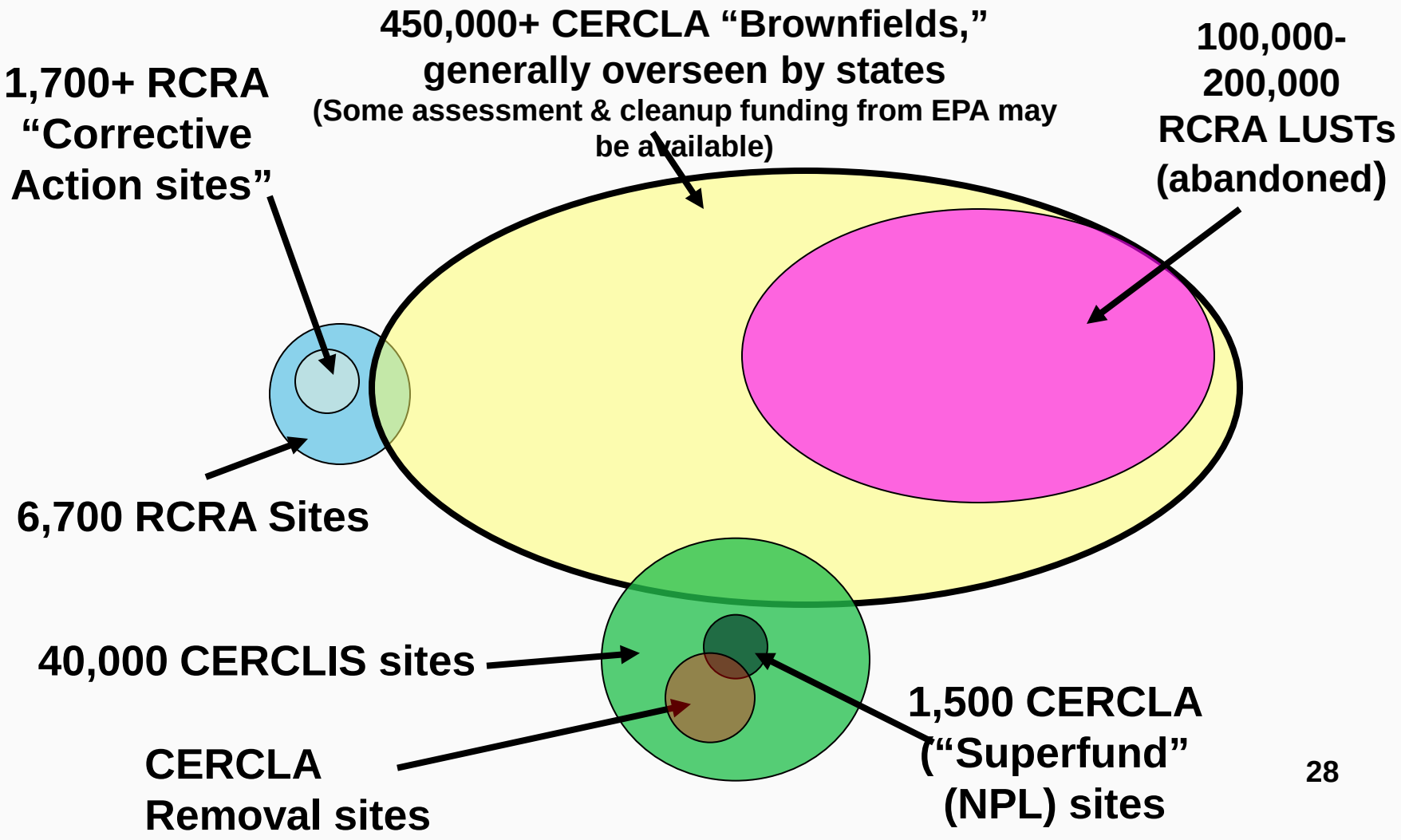




Liability issues: Overview

- The issues
  - EPA, states must balance land cleanup statutes' enforcement provisions ('polluter pays'), revitalization of impaired lands, and promotion of cleaner power sources
  - Practicalities for the RE developer
- 3/11 Renewable Energy & Liability Fact Sheet
  - Distinguish EPA, state issues
  - Statutory liability 'safe harbors;' provisos
  - Enforcement Discretion Guidance
  - Site-specific documents
- 12/12 Tenant liability guidance and RE-specific comfort letters
- Other tools

Universe of site cleanups overseen by: EPA (CERCLA or RCRA); by authorized states under RCRA; or by states under VCPs etc.



Distinguish federal and state liability laws; Relationship of developer to site

- Federal law – CERCLA, or ’Superfund’ - holds liable:
  - current “owner” or “operator” of a facility
  - former “owner” or “operator” of a facility “at the time of disposal”
  - one who “arranges for disposal” at, or “transports for disposal” to, a facility
- Standard of liability
  - Strict liability
  - Joint and several liability
- RCRA
  - Potentially imposes liability for investigation & cleanup on owners, operators and generators of solid/hazardous waste; one who “causes or contributes” to contamination.

Distinguish federal and state liability laws; Relationship of developer to site

- Generally, only properties with significant actual or potential public health and/or environmental impacts are likely to warrant **federal** cleanup/enforcement under CERCLA or RCRA
  - sites on the Superfund National Priorities List (NPL);
  - sites where EPA has completed or is undertaking CERCLA cleanup activities;
  - facilities subject to RCRA corrective action or post-closure care;
  - contaminated sites, including underground storage tanks (USTs), in Indian country; and
  - federally-owned sites undergoing CERCLA or RCRA cleanups.
- Many states have similar liability laws, and Voluntary Cleanup Programs (VCPs)
  - Are being used at a much bigger universe of sites
  - Generally sites of “federal interest” not eligible for VCPs

Distinguish federal and state liability laws; Relationship of developer to site

- Courts, not EPA or state agencies, ultimately determine scope of liability, unless a site-specific agreement with a government or private party plaintiff is reached
  - Whether particular activities at a site trigger liability is a site-specific issue
  - Caselaw construing liability still somewhat unsettled, can vary by jurisdiction
  - Agencies have limited resources, focus their attention on worst sites
- Some qualified statutory ‘safe harbors’ added in recent years, at federal and state level
  - Statutes, Guidance
- Relationship of developer to the site – purchase vs. lease – can make a difference to analysis of potential liability
- BTW, don’t assume other large swaths of land are any easier to develop
  - Some communities are barring RE projects on agricultural lands, protecting open space
- So, unfortunately,
  - Consult a lawyer

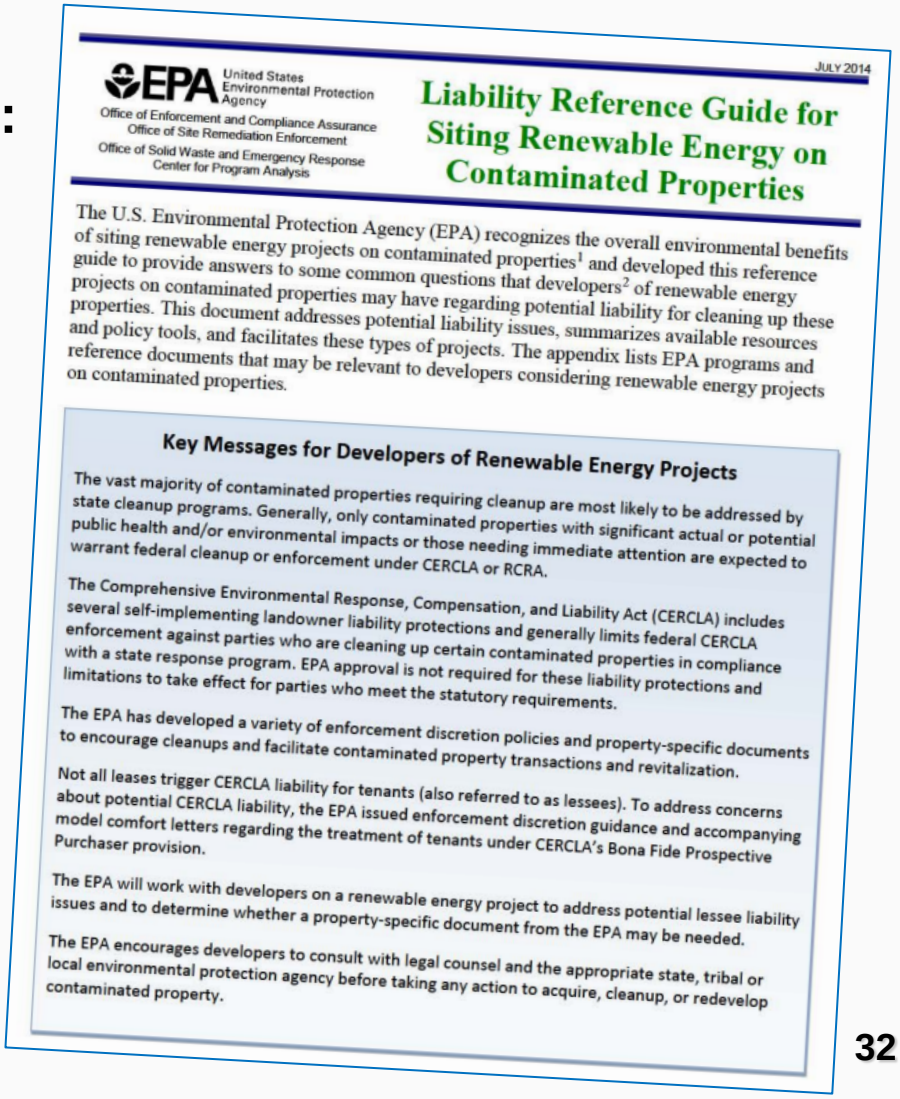


7/14 EPA Fact Sheet –

Addresses liability concerns at renewable energy projects on contaminated sites

101 level, Q&A format addressing:

- **Benefits of renewable energy on contaminated sites and brownfields**
- **General cleanup liability provisions, federal and state**
- **Liability protections for purchasers and lessees**
- **Guidance and tools to assist renewable energy developers**
- **Does not set forth new policy, only explanation of existing**



EPA United States Environmental Protection Agency
Office of Enforcement and Compliance Assurance
Office of Site Remediation Enforcement
Office of Solid Waste and Emergency Response
Center for Program Analysis

JULY 2014

Liability Reference Guide for Siting Renewable Energy on Contaminated Properties

The U.S. Environmental Protection Agency (EPA) recognizes the overall environmental benefits of siting renewable energy projects on contaminated properties[1] and developed this reference guide to provide answers to some common questions that developers[2] of renewable energy projects on contaminated properties may have regarding potential liability for cleaning up these properties. This document addresses potential liability issues, summarizes available resources and policy tools, and facilitates these types of projects. The appendix lists EPA programs and reference documents that may be relevant to developers considering renewable energy projects on contaminated properties.

Key Messages for Developers of Renewable Energy Projects

The vast majority of contaminated properties requiring cleanup are most likely to be addressed by state cleanup programs. Generally, only contaminated properties with significant actual or potential public health and/or environmental impacts or those needing immediate attention are expected to warrant federal cleanup or enforcement under CERCLA or RCRA.

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) includes several self-implementing landowner liability protections and generally limits federal CERCLA enforcement against parties who are cleaning up certain contaminated properties in compliance with a state response program. EPA approval is not required for these liability protections and limitations to take effect for parties who meet the statutory requirements.

The EPA has developed a variety of enforcement discretion policies and property-specific documents to encourage cleanups and facilitate contaminated property transactions and revitalization.

Not all leases trigger CERCLA liability for tenants (also referred to as lessees). To address concerns about potential CERCLA liability, the EPA issued enforcement discretion guidance and accompanying model comfort letters regarding the treatment of tenants under CERCLA's Bona Fide Prospective Purchaser provision.

The EPA will work with developers on a renewable energy project to address potential lessee liability issues and to determine whether a property-specific document from the EPA may be needed.

The EPA encourages developers to consult with legal counsel and the appropriate state, tribal or local environmental protection agency before taking any action to acquire, cleanup, or redevelop contaminated property.

2002 CERCLA Brownfield Amendments; EPA implementation

- Established self-implementing liability protections for certain parties seeking to redevelop contaminated properties.
  - Protections apply to all contaminated properties regardless of purpose/type of redevelopment
  - EPA involvement is not necessary or warranted in the majority of transactions
- Parties cleaning up certain lower risk properties - “eligible response sites” - in compliance with state response programs that specifically govern cleanups are generally not subject to CERCLA enforcement (“Section 128 enforcement bar”)
  - Certain exceptions exist
- Many states have negotiated a memorandum of agreement (MOA) with EPA regarding the appropriate use of their VCPs.
  - MOAs do not alter legal rights or responsibilities
  - Do often include general enforcement assurances from EPA that it does not intend to initiate enforcement actions at properties assessed and cleaned up under VCPs and in accordance with the terms of the MOA.
- EPA enforcement discretion guidance further address liability uncertainties and clarify potential liability for redevelopers of contaminated properties.
- EPA has developed site-specific enforcement tools to facilitate contaminated property transactions and revitalization when perceived liability remains an obstacle and EPA involvement is necessary.

CERCLA **Statutory** Liability Protection is available to to:

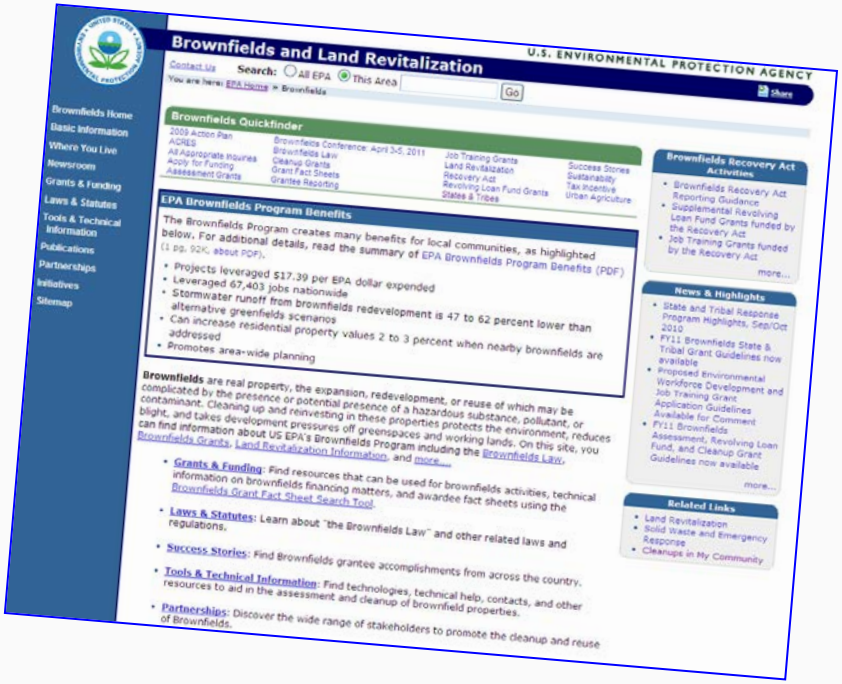
- Contiguous Property Owners
  - Protects property owners whose property is contaminated as a result of pollution migration from another's property
  - All Appropriate Inquiry (AAI) required, knowledge of contamination defeats protection
  - No date limit (i.e. 1/11/02 not relevant
- “Innocent Landowners” – 3 types
  - For specific categories (various “involuntary acquisitions” by governments; inheritance) knowledge of contamination OK
  - Otherwise AAI required, knowledge of contamination defeats protection
- Bona Fide Prospective Purchasers
  - AAI required, knowledge of contamination is good
  - Only for property acquired after 1/11/2002

CERCLA Statutory Liability Protection: Bona Fide Prospective Purchasers (BFPPs)

- Protects purchaser of property from CERCLA liability
- Allows acquisition of property with knowledge of contamination
- Threshold criteria for purchaser
  - Acquire ownership after 1/11/02
  - All “disposal” occurred before purchase
  - Conduct “all appropriate inquiries” (AAI)
  - Not a liable party and no “**affiliation**” with a liable party
    - excludes “relationship[s] … created by the instruments by which title to the facility is conveyed or financed”
- Continuing Obligations
  - Take reasonable steps with respect to the property
  - Provide cooperation, assistance, access to agencies,
  - Comply with info requests/subpoenas
  - Provide legally required notices
  - Comply with land use restrictions; not impede institutional controls

Key Guidance Documents re BFPPs

- PPA Policy Statement (2002)
  - PPAs the exception, post 2002 amendments
- "Common Elements" Guidance/Model Reasonable Steps Comfort Letter (2003)
- Windfall Lien Guidance (2003)
- BFPP Doing Removal Work Model (2006)
- Windfall Lien Administrative Procedures (2008)
- "Affiliation" Guidance (9/21/11)
  - Expands universe of "relationship[s] … created by the instruments by which title to the facility is conveyed or financed"
  - Contracts universe of relationships constituting "affiliation," i.e relationships removed in place or time
- Revised Tenant liability Guidance (12/12)
  - Lessees as "derivative" BFPPs
  - "Indicia of ownership" lessees
  - Lessees who complete AAI
  - In any event, leases do not necessarily trigger CERCLA liability



Site-Specific Tools

- Requests for EPA enforcement assistance with contaminated property transactions should be the exception.
  - 2002 BFPP provisions are self executing
  - EPA involvement at one property may create an expectation/perceived need in marketplace for EPA involvement at other properties, thus impeding redevelopment
- However, EPA does have site-specific enforcement tools that have been effective in facilitating transactions and revitalization when perceived liability remains an obstacle to redevelopment and EPA involvement is critical.
- Generally used only at sites of federal interest
- Tools include:
  - Comfort/Status Letters
  - BFPP Doing Work Agreements
  - Prospective purchaser & lessee agreements



Comfort / Status Letters

- Addresses EPA's intent re exercise of its response and enforcement authorities under RCRA or Superfund at a property, based upon the information presently known to EPA.
- Helps an interested party to better understand the potential for EPA involvement at a site.
- EPA may issue letter upon request if:
  - Facilitates cleanup and redevelopment
  - Realistic perception or probability of incurring CERCLA liability
  - No other mechanism is available to adequately address the party's concerns.



State Cleanup Programs

- Majority of properties requiring cleanup are likely to be addressed by state cleanup programs, such as state Superfund, brownfields, voluntary cleanup (VCP), or UST programs
- Since 2008, all states have programs or policies to provide some level of liability protection to new owners or lessees in specific situations. 24 states have EPA Region/state MOAs.
- While individual states are the best source of information about their laws and programs, EPA will work with parties on a renewable energy project to determine which agency has oversight responsibility for the property
- Per the 2002 Brownfield Amendments, EPA CERCLA enforcement defers to state cleanup programs in certain situations

Prospective purchaser & lessee agreements

- Site-specific agreement with EPA, which includes covenant not to sue
- Should be rarely needed
  - Resource intensive
  - Timeline may not fit in development schedule
- Could be available for sites where:
  - BFPPs want to resolve potential windfall lien issue
  - Site developer wants to do significant cleanup work as part of project
  - No other responsible party exists, no developer will undertake entire cleanup, and site likely to otherwise sit idle
  - A “significant public interest would be served” by the deal, and it won’t otherwise happen. (Could include renewable energy projects)
- See PPA Policy Statement (2002)

Overview: Liability Considerations

Support for RE on Contaminated Lands

- To facilitate this beneficial reuse, EPA will work to address potential liability issues and to determine whether a property-specific document from EPA may be needed

State vs. Federal Programs

- Majority of contaminated properties requiring cleanup are addressed by state cleanup programs
- Few sites require federal involvement

Existing Liability Protections

- CERCLA includes a number of liability protections and generally prohibits federal CERCLA enforcement against parties who are cleaning up lower risk properties in compliance with a state response program that specifically governs cleanups.

Leases & Responsibility

- Leases do not necessarily trigger CERCLA liability for tenants. In some cases, lessees can obtain BFPP status to secure protections.

- EPA issued guidance that discusses the potential applicability of the BFPP provision to tenants, as well as the intention to use enforcement discretion to treat certain tenants as BFPPs on potentially contaminated sites

Due Diligence

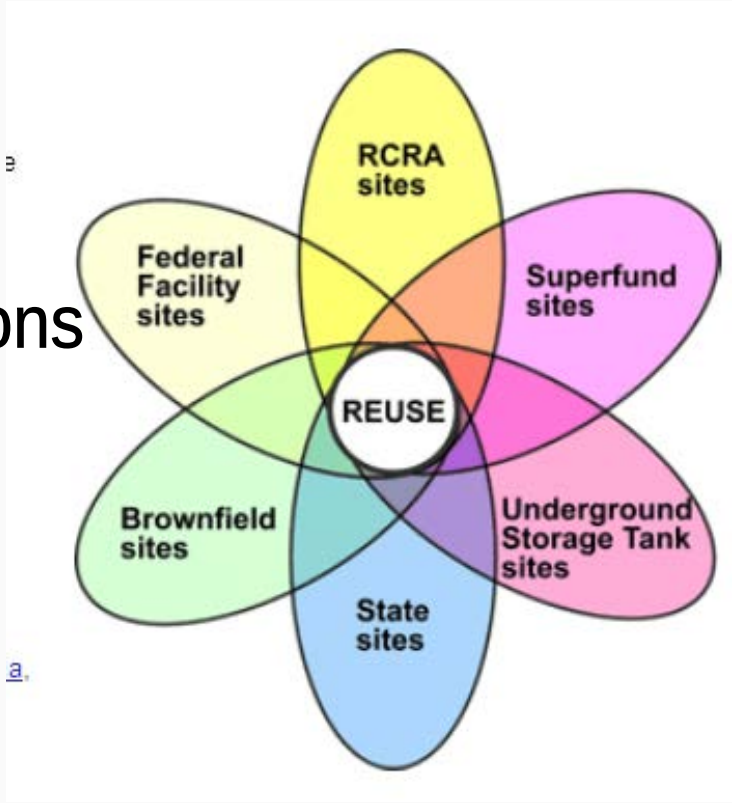
- Consult with legal counsel and the appropriate state, tribal or local environmental protection agency before taking any action to acquire, cleanup, or redevelop contaminated property

For more information, please review the "RE-Powering America's Land: Siting Renewable Energy on Potentially Contaminated Properties: Liability Considerations" fact sheet on the RE-Powering website.

EPA & State Brownfield financial resources

EPA Collaborates with

- state partners
- redevelopment authorities
- economic development agencies
- metropolitan planning organizations
- Indian Tribes
- municipalities
- counties
- school districts
- nonprofit organizations



EPA Brownfields Funding

Competitive Grants, overhead and other assistance

$116 million

States & Tribes

$50 million

- ASSESSMENT GRANTS
- CLEANUP REVOLVING LOAN FUND GRANTS
- DIRECT CLEANUP GRANTS
- JOB-TRAINING GRANTS
- TARGETED BROWNFIELDS ASSESSMENTS
- STATE & TRIBAL RESPONSE PROGRAM GRANTS

Grant Amounts Available

Assessment Grants (Hazardous)	$200,000. $350,000.	Community-Wide Site-Specific
Assessment Grants (Petroleum)	$200,000. $350,000.	Community-Wide Site-Specific
Cleanup Grants	$200,000 per site	20% Cost Share Limit 3 per year
Revolving Loan Fund Grants	$1,000,000 per eligible entity	20% Cost Share 40% can be used for subgrants of up to $200K per site
Job Training Grants	$200,000.	Limited to areas served by one of the other grants

EXAMPLE SUCCESS STORIES

Nellis AFB

Las Vegas, NV



This 14-MW solar facility is one of the largest solar installations on a U.S. military base.

Historical uses

- Military base infrastructure/housing
- Weapons testing
- Landfill (PVC/TCE contaminates)

PV System description

- 140 acres // 33 acres landfill
- 14 MW // 2 MW landfill (~2,350 homes)
- Single-axis, tilted tracking system
- 25% of base energy requirements
- ~$1M in annual energy savings

Deal structure

- Privately financed for tax-credit benefits
- 20-year power purchase agreement between utility and USAF
- Solar Renewable Energy Credits (SREC) go to utility to meet RPS

DuPont Newport

Newport, DE



"We are very proud to be involved with this powerful story - repurposing remediated land to host renewable power generation for the local Newport community. EPA Region 3's support letter and general advocacy for the project were instrumental in providing comfort to all financing parties involved."

- Joe Sacks, VP, Greenwood Energy

Historical use

- 120 acre former landfill for a DuPont pigment manufacturing plant
- Heavy metals and chlorinated solvents

PV System description

- 5 acre footprint
- 548 kW DuPont Apollo thin-film photovoltaic solar panels, fixed-tilt system, (equiv. demand from 60 homes)
- Fixed-tilt system

Deal structure

- Developer Greenwood Energy, worked with ultimate owner John Hancock Financial Services and Soltage, LLC
- Power being sold into the PJM day ahead market at LMP
- SRECs being be sold to Delmarva Power (via state Sustainable Energy Utility) per a 20 year contract to meet its RPS requirements.

Ft. Carson

Colorado Springs, CO



"Reducing Ft. Carson's reliance on fossil fuels helps us build a sustainable energy future that is good for our bottom line, the environment, and national security."

- Nate Searing, Utility Programs Mgr

Fort Carson, Directorate of Public Works

Historical use

- Decommissioned landfill

PV System description

- 15 acres
- 2 MW (equiv. 540 homes)
- Fixed-tilt system
- 2.3% of base energy requirements
- $500k in energy savings

Deal structure

- Municipal utility-owned and -operated system
- 20-year power purchase agreement between utility and Army
- Solar Renewable Energy Credits (SREC) sold by developer to private utility to meet RPS requirements

Aerojet Superfund Site

Sacramento, CA



"While our priority was making sure that the solar project would not impact the site's cleanup, we were also interested in supporting an innovative, green remediation project like this."

- Kevin Mayer, Superfund Project Manager
U.S. EPA

Historical use

- Rocket propulsion development and testing

PV System description

- 40 acres
- 6 MW (equiv. 15,000 homes)
- Single-axis tracking system

Deal structure

- Power Purchase Agreement between private developer & Aerojet
- Green remediation: offsets energy consumption for extensive groundwater remediation program onsite
- Three-tier incentive program negotiated with local utility

Bethlehem Steel Winds Project

Lackawanna and Hamburg, NY



By leveraging the existing transmission infrastructure, the Steel Winds project saved substantial costs associated with utility interconnection studies and extensive capital investments for typically required for interconnection upgrades.

Historical use

- Steel mill

Wind farm description

- 30 of 1,600-acre property
- 35 MW (equiv. 15,000 homes)
- Fourteen 2.5-MW wind turbines

Deal structure

- Private development in coordination with surrounding communities
- Renewable Energy Credits (RECs) sold to local utility to support RPS obligation
- $100k in annual payments plus ~$190k in annual tax revenues to local communities

Frontier Fertilizer

Green Remediation at EPA Fund-Lead Site – Davis, CA





Rep. Mike Thompson and EPA R9 Administrator Jared Blumenfeld tour Frontier Fertilizer, a 100% RE Powered Remedy in Davis, CA.

Historical use

– Pesticide and fertilizer distribution facility

PV System description

– Generates 109,125 kW annually
  - 8,000 kWh/yr on rooftop
  - 101,125 kWh/yr ground mounted

Environmental Remedy



– Powers 100% of energy needs for 80 gpm GAC pump-and-treat

Contact Information

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