



RE-Powering America's Land: Siting Renewable Energy on Potentially Contaminated Land, Landfills and Mine Sites

**Metropolitan Washington Council of Governments
November 14, 2016**

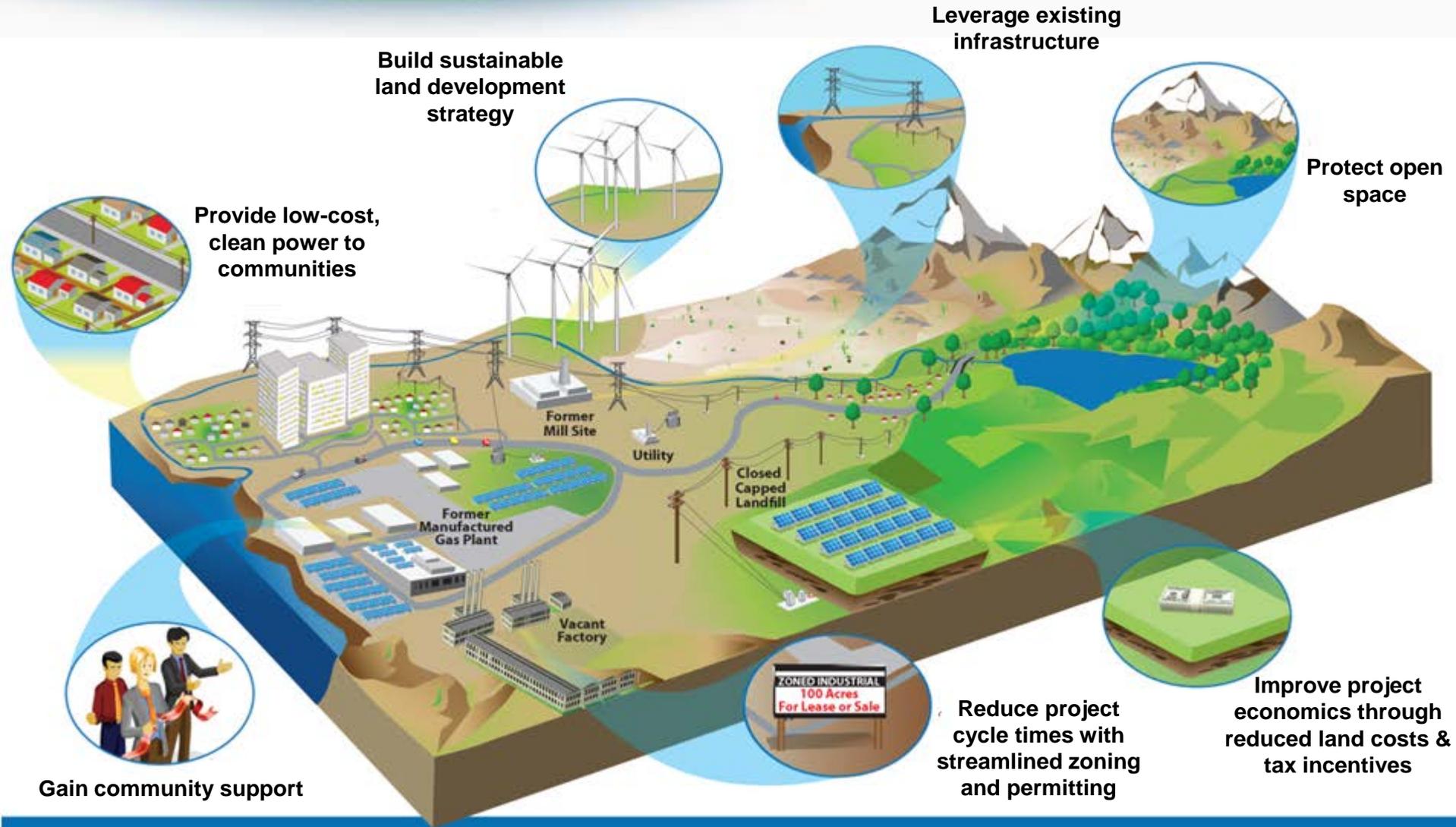


RE-Powering America's Land

Encourages renewable energy development on current and formerly contaminated lands, landfills and mine sites when such development is aligned with the community's vision for the site.



Benefits -- Why Renewables on Potentially Contaminated Lands



Build sustainable land development strategy

Leverage existing infrastructure

Protect open space

Provide low-cost, clean power to communities

Gain community support

Reduce project cycle times with streamlined zoning and permitting

Improve project economics through reduced land costs & tax incentives

Encouraging Renewable Energy on Contaminated Lands

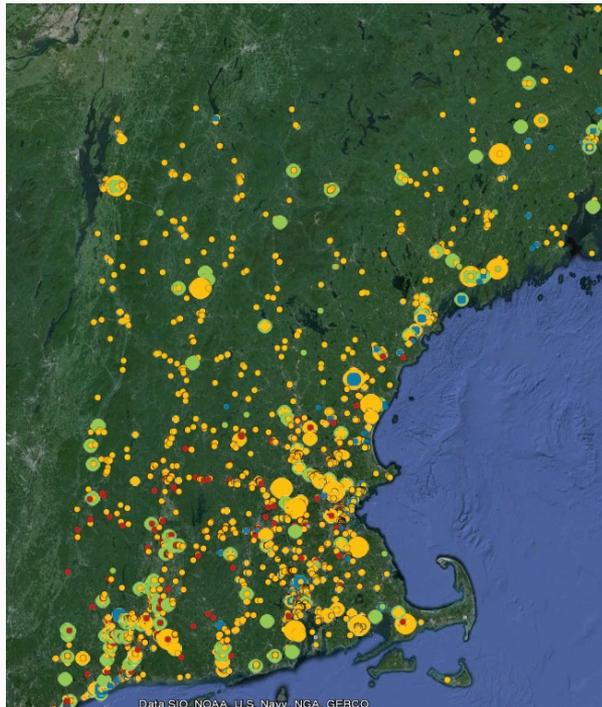


- Raising awareness, creating connections and developing partnerships
- Identifying and addressing barriers
- Identifying and screening contaminated properties
- Disseminating success stories and best practices
- Articulating benefits – environmental, economic, community
- Clarifying cleanup related issues, status and liability
- Disseminating financing strategies and information on incentives
- Highlighting favorable policies

Identifying and Screening



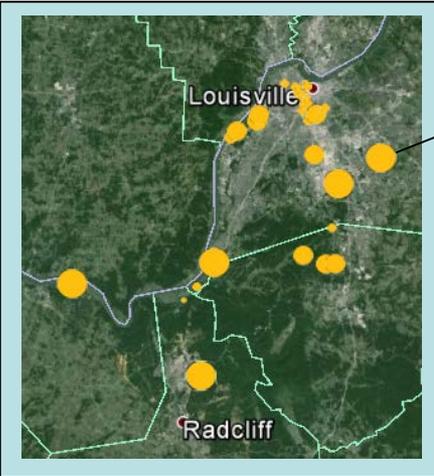
Google Earth Mapper



Electronic Decision Tree



RE-Powering's Mapper



GE APPLIANCES AND LIGHTING - APPLIANCE PARK

City, ST: LOUISVILLE, KY
 Acreage: 925.00
 Program: RCRA (EPA)
 EPA Region: 04
 Site ID: KYD006287021
 Current Environmental Status of Site: [Program Information](#)

Policies and Incentives <ul style="list-style-type: none"> Enabling State Policies: see State Incentives & Policies Renewable Energy Zone: N/A 	Proximities to Infrastructure & Electricity Demand Distance to... (miles) <ul style="list-style-type: none"> Transmission: 0.00 Substation: 0.00 Roads: 0.00 Urban Center: 0.00
Solar Resource <ul style="list-style-type: none"> Solar resource (kWh/m2/day): 4.01 	Positive Screening Results for Solar PV & CSP <ul style="list-style-type: none"> PV: Large Scale PV: Off-grid
Wind Resource <ul style="list-style-type: none"> Wind speed at: <ul style="list-style-type: none"> 80m (m/s): 5.29 50m (m/s): 4.66 	Positive Screening Results for Wind <ul style="list-style-type: none"> None
Biomass Resource <ul style="list-style-type: none"> Feedstock in million metric tons/year: <ul style="list-style-type: none"> Biopower (woody waste): 967,996 Biorefinery (woody waste or crops): 967,996 	Positive Screening Results for Biomass <ul style="list-style-type: none"> Biopower Biorefinery
Geothermal Resource <ul style="list-style-type: none"> Distance to known hydrothermal site (miles): N/A Favorability rating: N/A Temperature at depth of 4.5 km (C): 106 Near surface temperature (C): 14 	Positive Screening Results for Geothermal <ul style="list-style-type: none"> Heat Pump

For additional information, go to [EPA's RE-Powering America's Land Initiative](#), or email cleanenerg@epa.gov

Cleanup >> Cleanup in My Community

NCA Corrective Action Site Progress Profile

APPLIANCE PARK (CERCLA/RCRA)
 The profile is meant to provide you with basic information on EPA's cleanup progress at this RCRA facility. Please use the links in the "More Content" box for additional information.
[Download Legal Notices](#)

More Content

- Facility Information (as the Registry System)
- Facility Process Report
- Facility Site-specific Report
- Process Characterization
- Other Sources for this Site
- Programs That This Facility is Regulated Under

Use the tabs below to view information on this site's cleanup progress.

Site Location | **Cleanup Progress Summary** | **Environmental Impact Summary**

Site Location

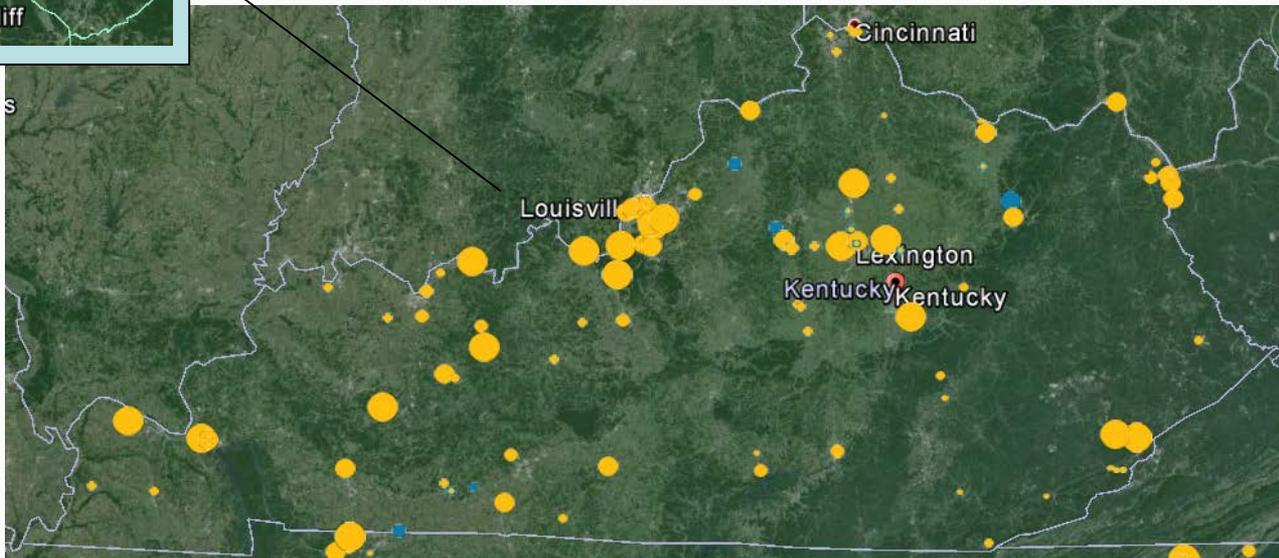
Cleanup Progress Summary
 Remedial actions are managed under the Resource Conservation and Recovery Act. When these actions are complete for this site, you will see a green checkmark in the status column.

Environmental Impact Summary
 If this corrective action site has been observed to determine if human exposures to contaminants are under control and the migration of contaminants is under control, that information is provided below.

Human Exposure Control
 At this site, human exposures are under control.

Cleanup Progress Profile

Attributes in Mapper



Google Earth Mapper

Sites Screened by Program and State



Program	# of Sites
Abandoned Mine Land	466
Brownfield Program Sites	26,030
Superfund	2,009
Landfills - Landfill Methane Outreach Program	2,062
RCRA Corrective Action Sites	3,759
Sites Associated with Federal Programs	34,326
State Identified Sites	# of Sites
California (7,622), Hawaii (1,180), Illinois (5,541), Massachusetts (1,495), New Jersey (10,362), New York (2,180), Oregon (4,743), Pennsylvania (5,543), Texas (1,150), Virginia (5,422), West Virginia (2,103)	47,341
Federal and State Sites Screened	81,667

Met Wash COG Sites By Program



	BF	SF	Landfill	RCRA	State Data*	Total
DC	69	4		2		75
Frederick County (Frederick)		1	2 (1)			3
Montgomery County (Gaithersburg, Rockville)	1	2 (1,0)	2 (0,1)			5
Prince George's County (Bowie)		3	2 (1)			5
Charles County		1	2			3
Fairfax County (Fairfax)			2(1)		12 (1)	14
Loudoun County		1	1		27	29
Prince William County		2	1		11	14
Total	70	14	12	2	50	148

* VA Non-Coal Orphaned Mineral Mines data

RE-Powering's Electronic Decision Tree



Redevelopment Plans

Redevelopment plans can take the form of a site-specific redevelopment plan or a comprehensive land use planning and zoning document that applies to, or is under development for, a defined geographic district in which many individual sites are located (commonly referred to as a "Redevelopment Area Plan" or "Specific Area Plan"). Where a Specific Area Plan applies, proposed redevelopment projects at sites within the geographic scope of the plan will be evaluated by the municipality for consistency with the plan's land use objectives for the district. Implementing the plan involves a number of steps including identifying financing, securing development approvals, finalizing the real estate transaction, cleanup, and construction.

Objectives for a redevelopment plan include identifying and inventorying existing assets and identifying the municipal strategy for eliminating environmental liabilities.

When municipalities approve a redevelopment plan for a property, they are more likely to approve a solar installation on that property.

Community Vision

Site reuse should be determined based on the site's assets. It is important that the community's long-term vision for the site is considered. Many end uses should be considered for the site.

If evaluating sites across the district, a Redevelopment Plan map can be used to identify potential sites.

If a RCRA or Superfund site is identified, it is important to discuss existing redevelopment plans and how they may affect the redevelopment plans.

Decision Tree Tool

Home | Site Characteristics and Redevelopment | Redevelopment Considerations | Contamination and Landfill Issues | Load Assessment and Financial | Summary and Results

Site: Landfill ABC Type: Landfill Technology: Solar Installation: Ground

Question	Explanation
Is the usable acreage for a ground mounted system greater than 2 acres? <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Skip Enter usable acreage (optional): Enter comment (optional):	Usable acreage • is typically characterized as "flat to gently sloping" • has southern exposure free from obstructions • gets full sun for 6+ hours a day (at least 4 hours in winter months) Usable Acreage = [Total Acreage - (Area with Obstacles) - (Shaded Area) - (Area with > 10% grade)] Please use the comment area to discuss any obstacle, shading or grade issues. If powering remediation, skip and continue.

More Info about estimating usable acreage
Strategies to consider "site bundling"

Back Next Save Exit

Decision Tree Summary



- **Explores solar (ground mount and/or rooftop) or wind (ground mount)**
- **Can be used for small to large sites to assess potential for distributed, large-scale or utility-scale systems**
- **Walks users through a series of Yes / No / Skip Questions**
- **Supplements questions with additional information, tips and links to relevant resources**
- **Generates reports of the screening results and user comments that can be printed or imported into other documents**
 - **Summary Site Screening Report**
 - **Data Entry Report**
 - **Site Comparison Report**



RE-Powering Resources

Success Stories

RE-Powering America's Land: Siting Renewable Energy on Potentially Contaminated Land and Mine Sites
An Old New England Town Lights the Way with Solar
 April 2014

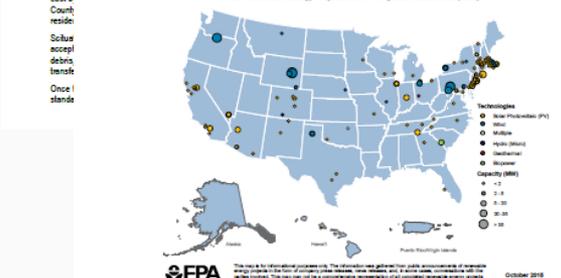
The U.S. Environmental Protection Agency (EPA) recognizes the overall benefit of siting renewable energy projects on contaminated properties. Through the RE-Powering America's Land Initiative, EPA is encouraging renewable energy development on current and formerly contaminated lands, landfills, and mine sites. This case study, closed were a Findi in 201 to find consid town c the m cost c After i multig selecti Welles Nation ensure obje with i Landfil that, i Sctue renew Prop Turm Sctue Sctue rest b Court reside Sctue sceal debris tensile Once i stands

RE-Powering America's Land Initiative: Project Tracking Matrix

October 2015

The U.S. Environmental Protection Agency (EPA) recognizes the overall environmental benefit of siting renewable energy projects on contaminated properties. Through the RE-Powering America's Land Initiative, EPA is encouraging renewable energy development on current and formerly contaminated lands, landfills, and mine sites when such development is aligned with the community's vision for the site. Using publicly available information, RE-Powering maintains a list of completed renewable energy installations on contaminated sites and landfills. To date, the RE-Powering Initiative has identified 158 renewable energy installations on 150 contaminated lands, landfills, and mine sites, with a cumulative installed capacity of almost 1,070 megawatts (MW) and consistent growth in total installations since the inception of the RE-Powering Initiative. Approximately 66% of these installations are large-scale systems with a project capacity of 1 MW or more, either exporting energy onto the utility grid or offsetting onsite energy demands. This document provides summary statistics of known installations and discusses emerging trends. In addition to the completed sites listed here, EPA is tracking more than 40 renewable energy projects on contaminated or disturbed properties in various stages of planning, approval, or construction. These include a 15-MW solar on landfill project under construction in Mount Holly, NJ; a nearly 1-MW community solar garden on a landfill underway in Milton, NH; and a 2.75-MW solar installation beginning construction on a state brownfield in Clean, NV. In addition, more than 15 other communities have promoted renewable energy projects on contaminated sites, primarily landfills, at town council or public meetings.

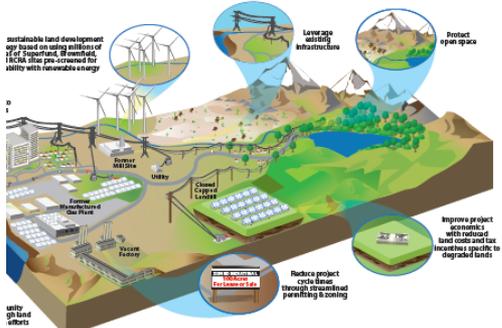
158 Renewable Energy Projects, Over 1 Gigawatt Installed Capacity



¹ In this document, installation and project refer to a single renewable energy technology installation, while site and location refer to a single contaminated property. A site or location may have more than one installation or project. For example, the former Dow Johnson Mine (one site) has three separate wind installations. Multiple installation details can be seen in the tracking spreadsheet at the end of this document.

Advantages

RE-Powering America's Land Potential Advantages of Reusing Potentially Contaminated Land for Renewable Energy



LAND INITIATIVE
 and initiative, the EPA encourages renewable energy development on potentially contaminated land, landfills, and mine sites when aligned with the community's vision for the land, RE-Powering maintains a list of completed renewable energy installations on contaminated sites and landfills, and compiles this information in its [Project Tracking Matrix](#). Land with completed sites identified and reported by parties directly involved with their respective projects (e.g., information from the associated city, town, or county site manager) or from other EPA resources. Common benefits reported include revenues from land leases and taxes, electricity cost savings associated with the reduced need for transmission, reduced greenhouse gas emissions, et al. This resource is for informational purposes only. Please note that the benefits listed here are not a comprehensive list of all potential advantages of this development approach.

Best Practices

Best Practices for Siting Solar Photovoltaics on Municipal Solid Waste Landfills



RE-Powering America's Land Initiative: May 2016

and initiative, the EPA encourages renewable energy development on potentially contaminated land, landfills, and mine sites when aligned with the community's vision for the land, RE-Powering maintains a list of completed renewable energy installations on contaminated sites and landfills, and compiles this information in its [Project Tracking Matrix](#). Land with completed sites identified and reported by parties directly involved with their respective projects (e.g., information from the associated city, town, or county site manager) or from other EPA resources. Common benefits reported include revenues from land leases and taxes, electricity cost savings associated with the reduced need for transmission, reduced greenhouse gas emissions, et al. This resource is for informational purposes only. Please note that the benefits listed here are not a comprehensive list of all potential advantages of this development approach.

State	City	Type of Site	Site Community Type	RE Type	Project Capacity (MW)	Project Type	Completion Date	Summary of Benefits Identified in Publicly Available Sources
AZ	Apache	Mine Lands	Private	Solar	5	Municipal Electricity	2011	Half of the approximately 60 construction sites used to local residents. The electricity generated will be sold to Tucson Public Service (TPS), which offers a 20-year power purchase agreement.
AZ	Benson	Superfund	Private	Solar	0.0016	On-site / Green Buildings	1987	The use of solar and wind energy to power cleanup reduces the 20-year greenhouse gas emissions by 100,000 lbs annually (equivalent to 100,000 lbs of greenhouse gas emissions). The solar panels are expected to last 20 years and will be replaced by solar panels that cost 10% less than power lines and power plants at the end of their life.
AZ	Flagstaff	Mine Lands	Private	Solar	16	Municipal Electricity	2011	Power generated by the solar is sold to Tucson Public Service at a rate that is 10% below the rate of 20-year power purchase agreement. Capacity 100 megawatts of electricity, enough to power about 1,000 homes.
AZ	Buckeye	Landfill	Municipal	Solar	93	Municipal Electricity	2015	Estimated 115,000 lbs. CO ₂ emissions from the project. More than 100 acres of solar panels.
CA	Sacramento	Superfund	Private	Solar	4	Municipal Electricity	2010	The project is anticipated to cover more than 170,000 sq ft of site area. The project is expected to generate 1.5 million kWh of electricity annually, which is expected to reduce the power cost of electricity by 10%.
CA	Camp Pendleton	Camp Pendleton	Superfund	Federal	1.5	Municipal Electricity	2011	The Naval Facilities Engineering Command anticipates the system will provide 100,000 kWh of electricity annually to the base. The system will provide 100,000 kWh of electricity annually.
CA	Chico State	Landfill	NA	Solar	1.8	Municipal Electricity	2014	The Chico State project is designed to generate over 2 million kilowatt hours of energy annually. Development of more than 1,000,000 pounds of CO ₂ .
CA	Flasher Properties, Depot Park	Superfund	Private	Solar	2	Municipal Electricity	2010	The project will generate over 400,000 kWh of electricity for the park, lighting and heat. That is equivalent to 100,000 lbs of CO ₂ emissions.
CA	Flasher Properties, Depot Park	Superfund	Private	Solar	0.0003	On-site / Green Buildings	2011	The system will save up to 1% of the site's annual electricity costs for power and heat system operations, saving energy costs of approximately 1,100 per year.
CA	Livermore (Deere National Laboratory)	Superfund	Federal	Solar	0.004	On-site / Green Buildings	2008	The self-powered solar treatment cells allow groundwater to be treated at a rate that is 100 times faster than the conventional groundwater treatment process.
CA	MSL at Population Laboratory (PL)	Superfund	Federal	Solar	0.04	On-site / Green Buildings	2011	Under a 20-year power purchase agreement, the PV system is expected to annually generate 60,120 kWh of energy (approximately 20% of the treatment system's electricity consumption), at an expected power cost of 10¢ to 15¢ (energy Pasadena times).

Tracking Matrix

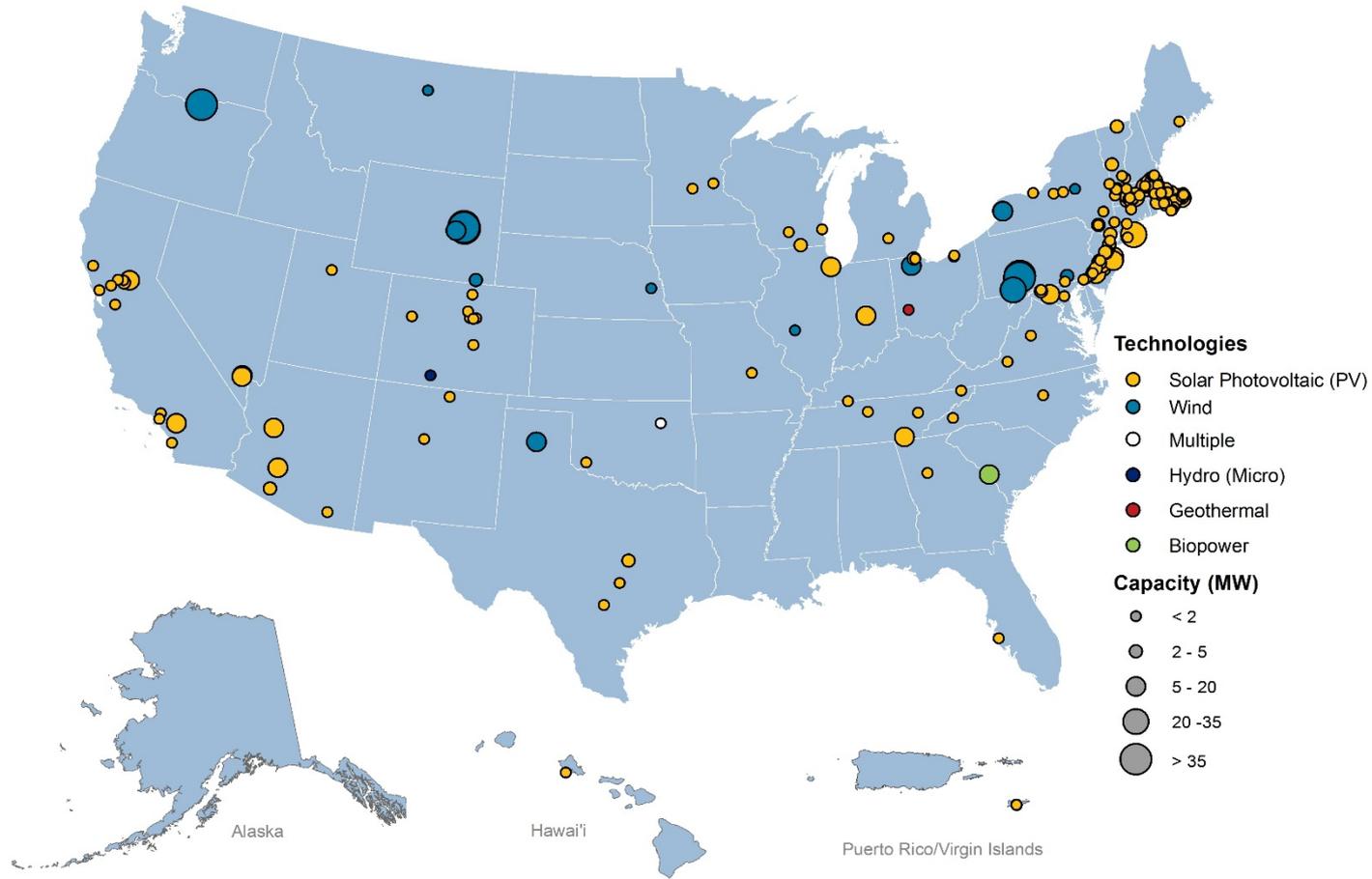
Benefits Matrix

Tracking Matrix

-- Projects Identified To Date



190 Renewable Energy Projects, Over 1.1 Gigawatt Installed Capacity



This map is for informational purposes only. The information was gathered from public announcements of renewable energy projects in the form of company press releases, news releases, and, in some cases, conversations with the parties involved. This map may not be a comprehensive representation of all completed renewable energy projects on contaminated lands. To provide information on additional projects, please email cleanenergy@epa.gov.

October 2016

Tracking Matrix - Excerpts



Maryland

1. Site Description									2. Renewable Energy Information				3. Project Implementation	
Site/Project Name	EPA Region	State	City	Type of Site	Site Owner	Site Ownership Type	Property Acreage	Former Use Description	RE Type	Project Capacity (MW)	Project Acreage	Primary RE Developer Name	Completion Date	Project Type
Fort Detrick	3	MD	Frederick	Superfund	U.S. Army	Federal	1,200	Army Medical Command installation	Solar PV	18.60	67.0	Ameresco Inc.	2016	Onsite Use - General
Forty West Landfill	3	MD	Hagerstown	Landfill	Washington County	Municipal	-	MSW Landfill	Solar PV	2.00	10.0	EPG Solar	2015	Wholesale Electricity
Washington County Rubble Landfill	3	MD	Williamsport	Landfill	Washington County	Municipal	-	Building materials and construction debris landfill	Solar PV	2.50	-	EPG Solar	2015	Wholesale Electricity
Former Ellicott City Landfill	3	MD	Ellicott City	Landfill	Howard County	Municipal	83	MSW Landfill	Solar PV	-	2.0	Unknown	2011	Onsite Use - General

Virginia

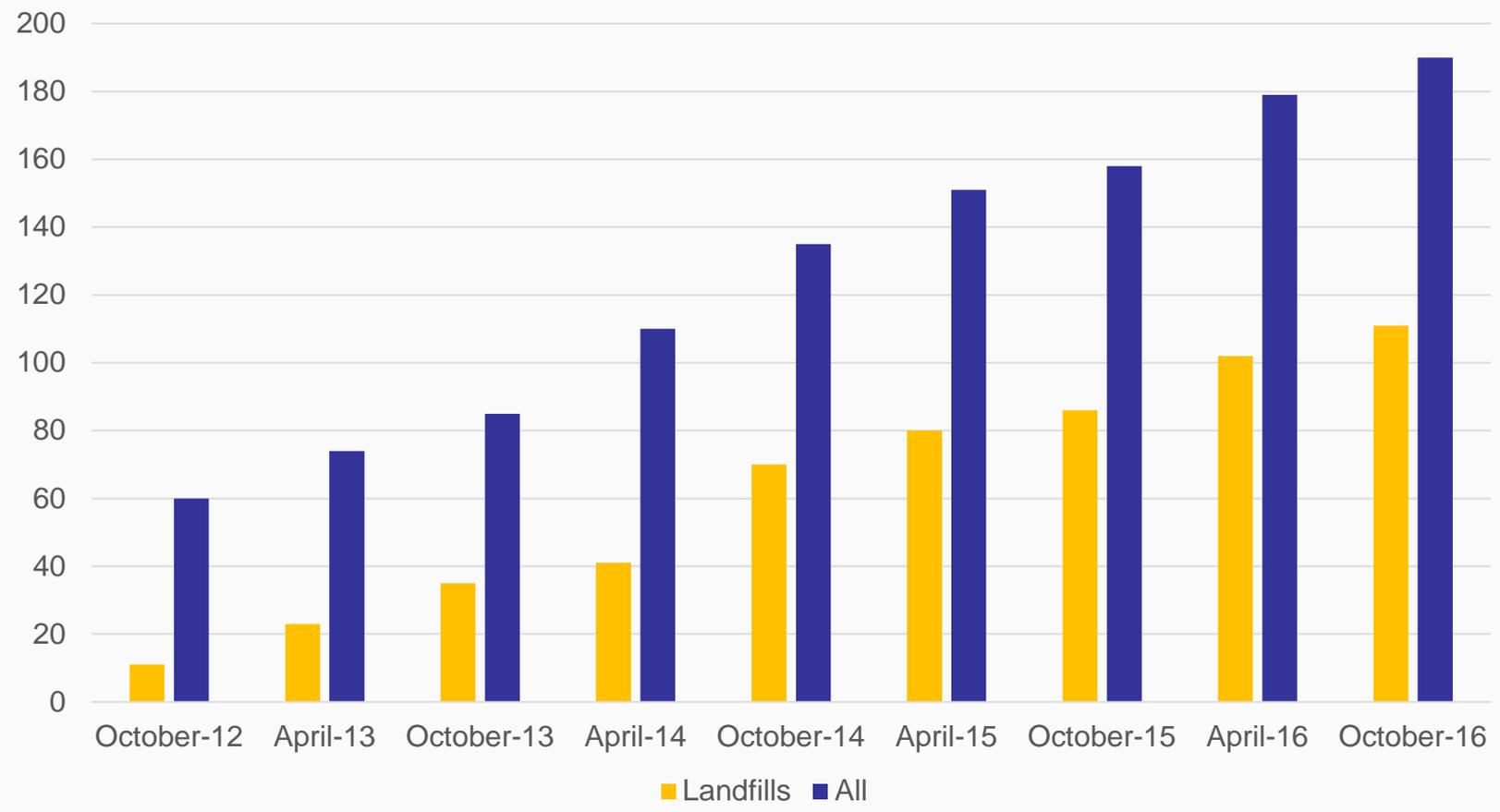
1. Site Description									2. Renewable Energy Information				3. Project Implementation	
Site/Project Name	EPA Region	State	City	Type of Site	Site Owner	Site Ownership Type	Property Acreage	Former Use Description	RE Type	Project Capacity (MW)	Project Acreage	Primary RE Developer Name	Completion Date	Project Type
Crozet Orchard	3	VA	Crozet	Superfund Removal	Unknown	Private	-	Apple Orchard	Solar PV	-	-	Unknown	2007	Onsite Use - Green Remediation
Salem VA Medical Center Solar	3	VA	Salem	Landfill	U.S. Department of Veterans Affairs	Federal	6	Landfill	Solar PV	1.60	6.0	REC Solar	2013	Onsite Use - General

Tracking Matrix

-- Landfills Project Trends



RE-Powering Installations



Success Stories

Case Study: Solar on Landfill



SCITUATE SOLAR LANDFILL AT-A-GLANCE

- Scituate, MA (www.scituatema.gov)
- Former 29-acre municipal landfill
- Capped and covered with soil layer
- 3 MW solar PV installation on 12.5 acres (panels cover 6.1 acres)
- 10,560 polysilicon panels
- Expected \$200,000 annual savings for town from net metering; T&D plus energy value
- Project will produce 3.825 million kilowatt-hours per year
- Land lease to developer: \$1/year
- PPA price: 8.4 cents/kWh plus escalators; developer retained the SRECs
- All project labor was local



Success Stories

Case Study: Solar on Superfund Site



MAYWOOD SOLAR FARM

- Case Study (<http://www.epa.gov/superfund/programs/recycle/pdf/reilly-chem-2014.pdf>)
- Old industrial property (distilled coal tar and treated wood) – 120 acres
- Treatment, containment and cover of contaminated areas; on-going groundwater management and monitoring
- Innovative soil management plan to minimize disturbance of impaired soil
- EPA “comfort letter” to clarify liability issues
- 10.8 MW solar PV installation on 43 acres; Over 36,000 panels
- Project developer sub-leases site property and sells power to local utility under 15 year PPA
- Qualified for utility sponsored renewable energy program (voluntary “feed in tariff” type program)
- Utility retains ownership of project renewable energy credits





- EPA

- Liability Reference Guide for Siting Renewable Energy on Contaminated Property (2014)
- Revitalization Handbook -- Revitalizing Contaminated Lands: Addressing Liability Concerns (Updated 2014)

(See http://www.epa.gov/renewableenergyland/rd_tools.htm)

- CERCLA Liability and Local Government Acquisitions and Other Activities (<http://www2.epa.gov/enforcement/fact-sheet-cercla-liability-and-local-government-acquisitions-and-other-activities>)

- State Liability

- District of Columbia
 - Certificate of Completion
- Maryland: Voluntary Cleanup Program
 - No Further Requirements Determination
 - Certificate of Completion
- Virginia: Voluntary Remediation Program
 - Certificate of Satisfactory Completion of Remediation



- Tools for remediation and redevelopment that could also be used for renewable energy (Federal, State, Local)
 - EPA and State Brownfield Programs
 - Tax Abatement Programs
 - Tax Increment Financing
 - HUD Community Development Block Grants
 - Community Reinvestment Act
- Renewable energy financing tools
 - USDA Rural Energy for America Program
 - State Green Banks
 - Green Bonds
- Federal Tax Incentives



Policies that Encourage Consideration / Create Preferences

- MA -- SREC II program includes specific incentives for renewable energy on landfills and brownfields
- MD – Community Solar Pilot program in which certain segment created for small systems and systems built on brownfields, parking lots or industrial areas.
- NJ -- 2012 Solar Act explicitly identifies solar-electric systems on brownfields, areas of historic fill and closed landfills as eligible to generate SERC's;
- VT -- Act 99 offers specific considerations to facilitate solar installations on landfills.
- US BLM, Instructional Memo 11-1 (Review of solar and wind right-of-way and prioritization of “low conflict areas” such as previously disturbed sites)

Highlighting Supportive Policies – Community Solar



RE-Powering (RE on CLs)

- Usually needs customers / off-taker (Limited on-site load)
- 190 installations to date / 1.1 GW
- Large number of CLs in US
- Such lands are in and among communities

Community Solar

- Customers needing sites
- 108 installations to date / 110 MW
- Increasing trend and projects in 26 states to date

Low and Moderate Income / EJ Communities

- CLs often located in LMI and EJ communities
- Higher proportion of LMI individuals and families live in rental and multifamily housing
- Community solar provides access to renewable energy

RE-Powering America's Land

www2.epa.gov/re-powering/



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