
# Welcome to the CLU-IN Internet Seminar

Decision Trees for Screening Potentially Contaminated or Underutilized Sites for Solar and Wind Potential

Sponsored by: U.S. Environmental Protection Agency/Center for Program Analysis

Delivered: February 7, 2012, 1:00 PM - 2:30 PM, EST (18:00-19:30 GMT)

*Instructors:*
*Gail Mosey, National Renewable Energy Laboratory (NREL) (Gail.Mosey@nrel.gov)*
*Katie Brown, AAAS Fellow, U.S. Environmental Protection Agency (brown.katie@epa.gov)*
*Karen Irwin, U.S. Environmental Protection Agency Region 9 (irwin.karen@epa.gov)*
*Lars Lisell, National Renewable Energy Laboratory (NREL) (lars.lisell@nrel.gov)*
*Moderator:*
*Shea Jones, Program Analyst, U.S. Environmental Protection Agency (jones.shea@epa.gov)*

*Visit the Clean Up Information Network online at www.cluin.org*

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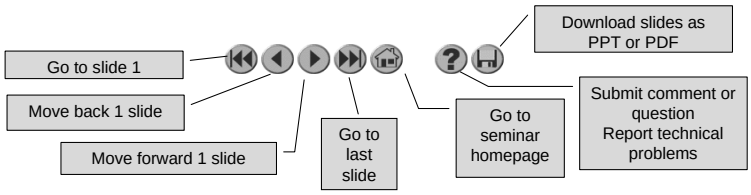
# Housekeeping

- Please mute your phone lines, Do NOT put this call on hold
  - **press #6 to unmute for questions, *6 to re-mute your line**
- Q&A
- Turn off any pop-up blockers
- Move through slides using # links on left or buttons




- This event is being recorded
- Archives accessed for free **http://cluin.org/live/archive/**

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Although I'm sure that some of you have these rules memorized from previous CLU-IN events, let's run through them quickly for our new participants.

Please mute your phone lines during the seminar to minimize disruption and background noise. If you do not have a mute button, press *6 to mute #6 to unmute your lines at anytime. Also, please do NOT put this call on hold as this may bring delightful, but unwanted background music over the lines and interupt the seminar.

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With that, please move to slide 3.

# Screening Sites for Renewable Energy Potential

**Introducing new tools to evaluate potentially contaminated or underutilized sites for solar or wind energy redevelopment**

**RE-Powering America's Land Initiative**

**Office of Solid Waste & Emergency Response**

**Center for Program Analysis**

February 7, 2012

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# Agenda

- RE-Powering America's Land Initiative
  - Overview
  - EPA/NREL Collaboration
- Decision Tree Development
  - Goal & Approach
  - Stakeholders & Targeted Sites
  - Needs & Objectives
  - Site Screening Options
- Process Overview
- Tool Demonstration
  - Site characteristics, redevelopment considerations, considerations related to potential contamination, load assessment, and financial screening
- Key Features
- Acknowledgements

Decision Trees are DRAFT. Please provide feedback via email to Shea Jones of the RE-Powering America's Land team at *jones.shea@epa.gov.*

Feedback is requested by February 16, 2012.

***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.***

# RE-Powering Objective

Empower communities to build successful projects that return potentially contaminated sites to beneficial use or increase productivity of already developed, but underutilized sites

Solar panels installed on mine tailings

*New Mexico*

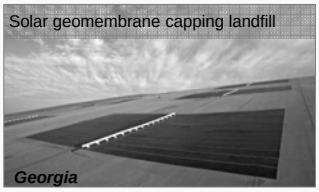
Wind turbines installed during remediation at abandoned steel mill

*New York*

Solar array installed at former gas works

*Massachusetts*

Solar geomembrane capping landfill



*Georgia*

Solar array providing covered parking and power

*Texas*

# RE-Powering America's Land Initiative

- EPA has authority to investigate, assess, and clean up contaminated sites
- RE-Powering promotes redevelopment opportunities for these EPA tracked sites:
  - Brownfields
  - Superfund
  - Abandoned Mine Lands
  - Resource Conservation Recovery Act (RCRA)
  - Landfills

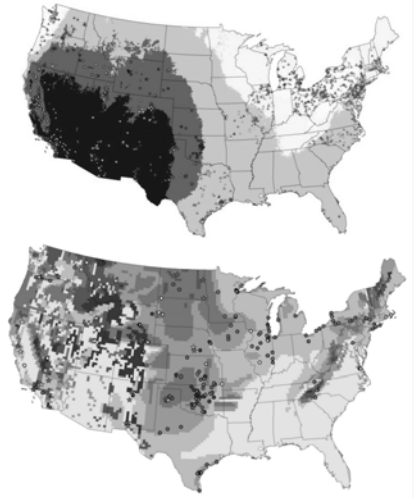
## Benefits of Redeveloping Potentially Contaminated or Underutilized Sites

- Many of these sites offer:
  - Existing infrastructure: Transmission lines, roads and railway
  - Potentially lower transaction costs
  - Improved public support and faster permitting/zoning
- Siting renewable energy on these sites may:
  - Increase economic value for the property
  - Further environmental sustainability by maximizing land use
  - Reduce the stress on greenfields
  - Provide clean energy for use on-site, locally, and/or to utility grid
  - Create local jobs
- Over 15 million acres of potentially contaminated sites have been mapped to show renewable energy potential
  - http://epa.gov/renewableenergyland/

# EPA/National Renewable Energy Laboratory (NREL) Collaboration

- About NREL
  - Federally funded research and development center
  - Focus on renewable energy and energy efficiency
  - One of 11 national labs
  - Located in Golden, Colorado
- EPA and NREL have been collaborating on RE-Powering since its launch
- Prior to the start of RE-Powering, NREL and EPA collaborated on RET potential on EPA tracked sites and developed preliminary screening criteria and a report showing a GIS process for identifying high potential sites for renewable energy

**Solar & Wind Potential at EPA-Tracked Sites**



# EPA/National Renewable Energy Laboratory (NREL) Collaboration

- NREL's primary role with RE-Powering is to evaluate the feasibility of siting renewable energy on specific sites
- Between the first and second round of EPA RE-Powering projects, NREL will conduct over 36 site-specific analyses and one alternative fueling station analysis
- The analyses include:
  - ✓ determining the best renewable energy technology for the site,
  - ✓ the optimal location for placement of the renewable energy technology,
  - ✓ potential energy generating capacity, and
  - ✓ the economic feasibility of the renewable energy projects.
- Expected Outcome: A feasibility analysis to use when seeking out developers for the site
- As part of this effort, EPA partnered with NREL to develop the solar decision tree

# DECISION TREE DEVELOPMENT

# EPA/NREL Screening Tools

***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

***Comments*** Please provide feedback on the tool via email to Shea Jones of the RE-Powering America's Land team at *jones.shea@epa.gov*

# 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

# Needs & 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

# Site Screening Options

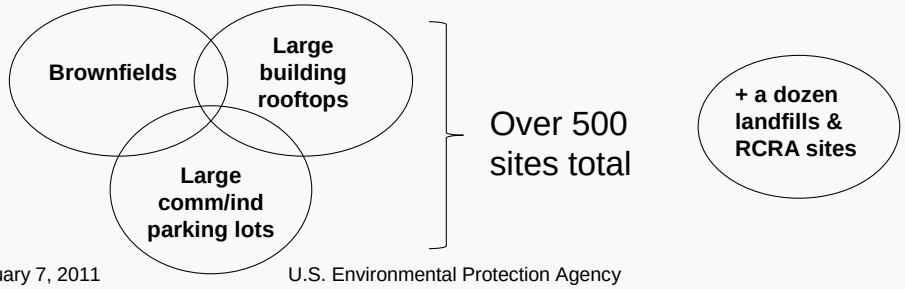
**Decision trees can be utilized for either:**

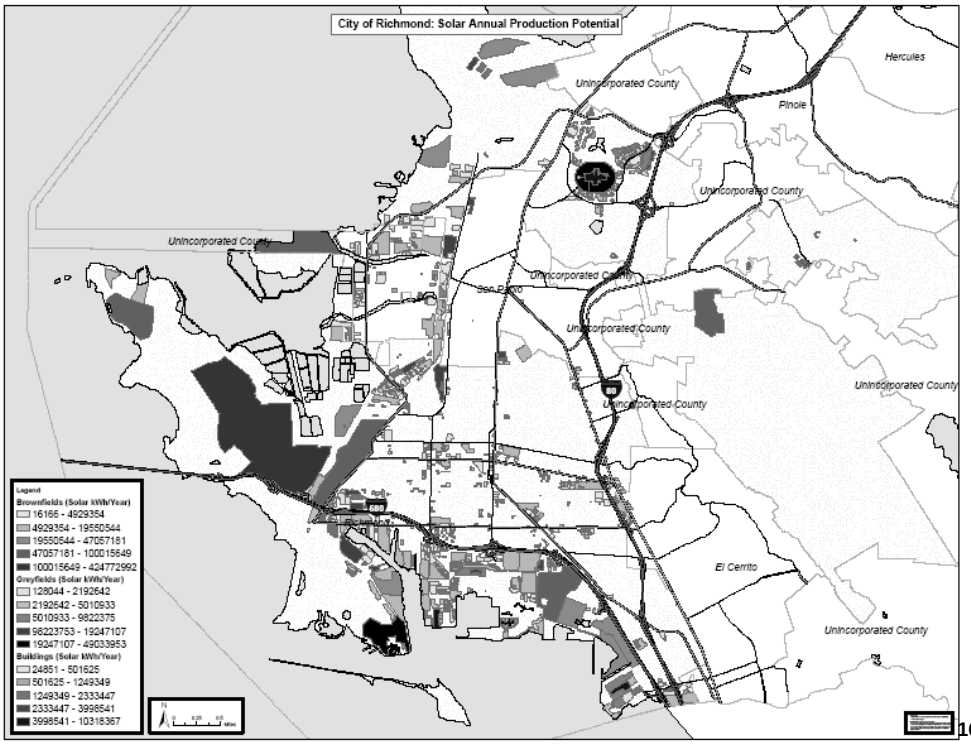
- Evaluating individual sites

  OR

- Community-scale evaluation

*Example: Site Inventory for Solar Potential - City of Richmond, CA*




City of Richmond: Solar Annual Production Potential
Hercules
Pinole
Unincorporated County
San Pablo
El Cerrito
Legend
Brownfields (Solar kWh/Year)
16166 - 4929354
4929354 - 19550544
19550544 - 47057181
47057181 - 100015649
100015649 - 424772992
Greyfields (Solar kWh/Year)
128044 - 2192642
2192642 - 5010933
5010933 - 9822375
98223753 - 19247107
19247107 - 49033953
Buildings (Solar kWh/Year)
24851 - 501625
501625 - 1249349
1249349 - 2333447
2333447 - 3998541
3998541 - 10318367

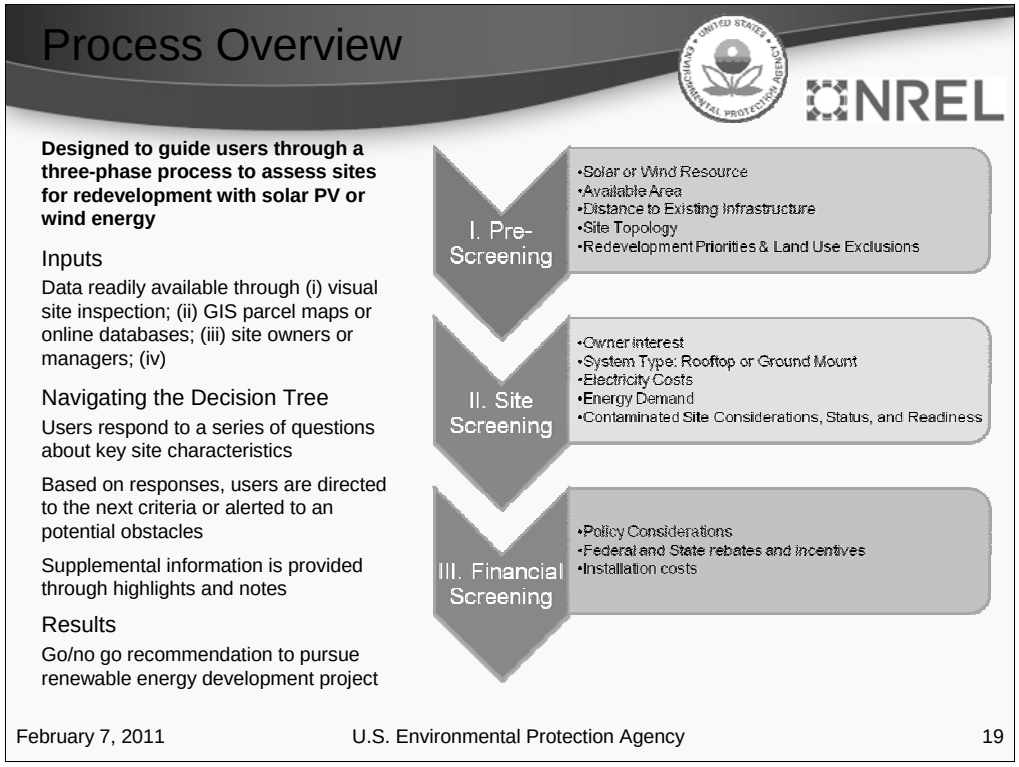
# City of Richmond

Large Building Rooftops

February 7, 2011

Tool Demonstration through Candidate Site in Ulster, NY

# PROCESS OVERVIEW




**High-Level Phases**

## Pre-Screening

Addresses data readily available through GIS parcel maps and online databases, as well as information that can be easily obtained through visual inspection

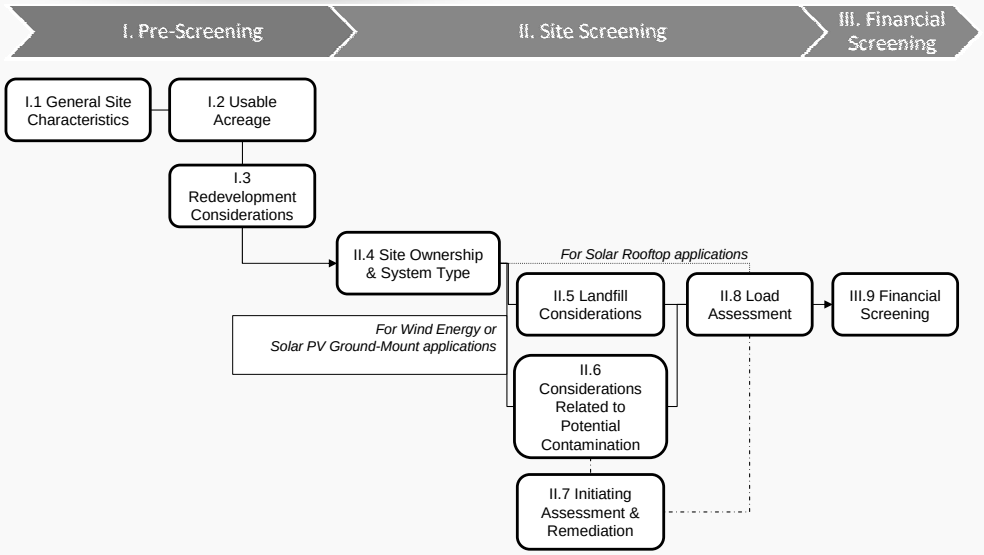
## Site Screening

Addresses data that generally requires collecting information from property owners or site managers. May also require site-level investigation, potentially using specialized tools or equipment.

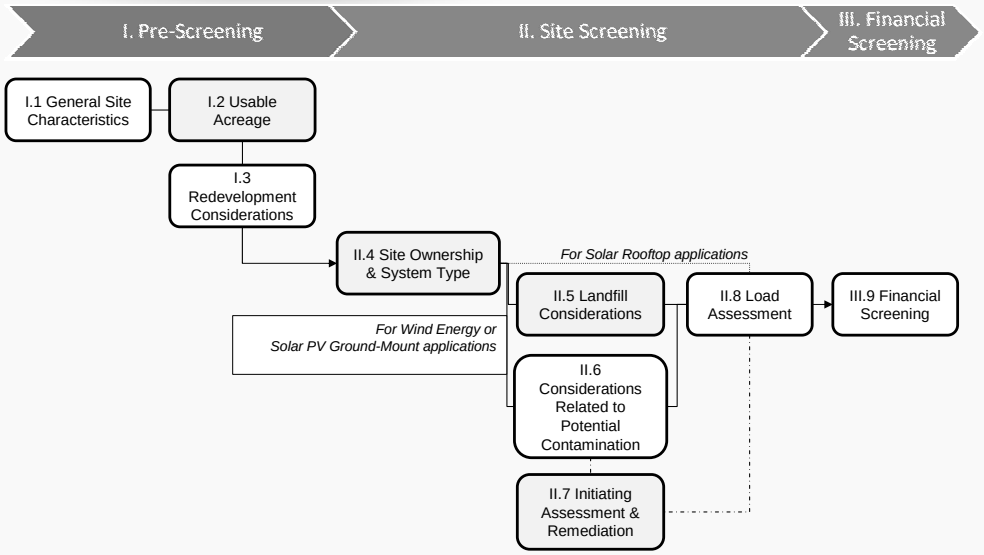
## Financial Screening

Addresses economic, policy, and incentive factors that further influence payback.

# Process Steps



# Process Demonstration



# Process Navigation

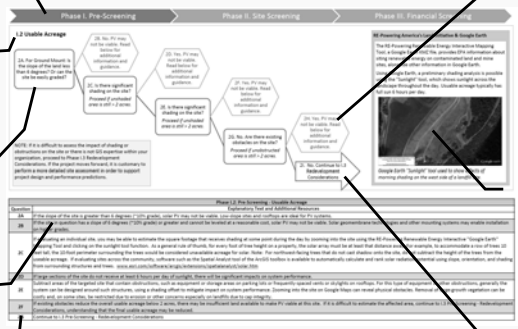
***Process flow chart***
Indicates active phase in the site screening process

***Process Step title***
Indicates process step number and title to aid navigation in decision tree

***Evaluation box***
Poses a question to guide the user through screening criteria

***Notes***
Provides information on the criteria, potential impact of "Flag" responses, and additional considerations that aid site screening.

***Note labels***
Link explanatory notes to each of the "Evaluation" boxes, "Flags," or "Arrows."






***Flag***
Indicates potential obstacle for redevelopment with solar PV based on user response. Points user to "Notes" for additional guidance and information.

***Highlight***
Provides supplemental information on topic pertinent to screening step

***Arrow***
Directs user to proceed to next step in screening process

# Sample Site

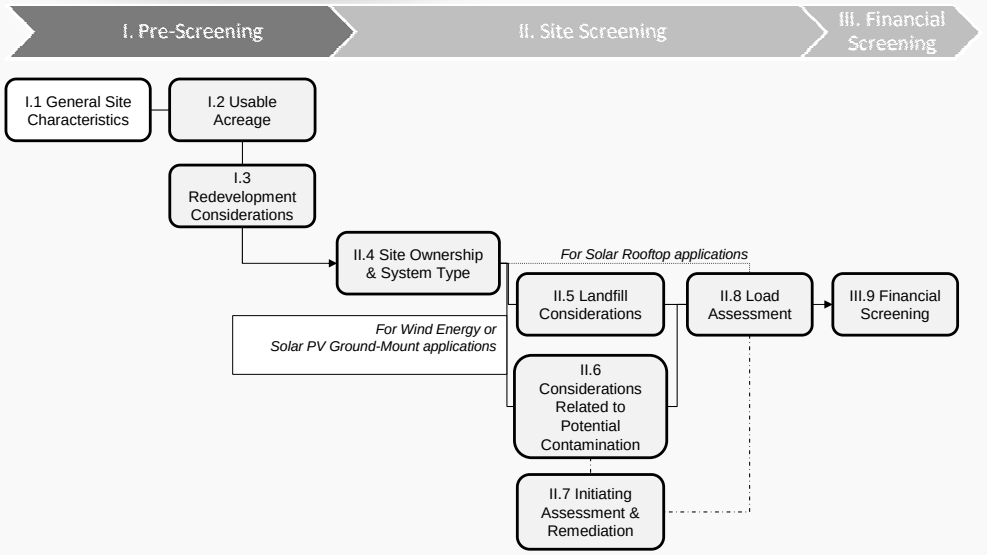
Location: Ulster, NY
Historical Use: Industrial / manufacturing
Contamination: Groundwater plume

Technologies of interest:
- Solar
- Wind

Application:
- Ground-mount: Solar PV or Wind
- Rooftop: Solar PV

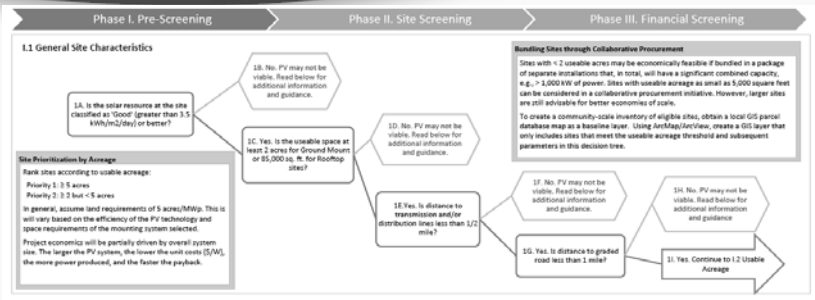
Current Status:
- Pump & Treat in place
- Existing buildings partially in use

# Process Demonstration



# I.1Site Characteristics

*Solar*



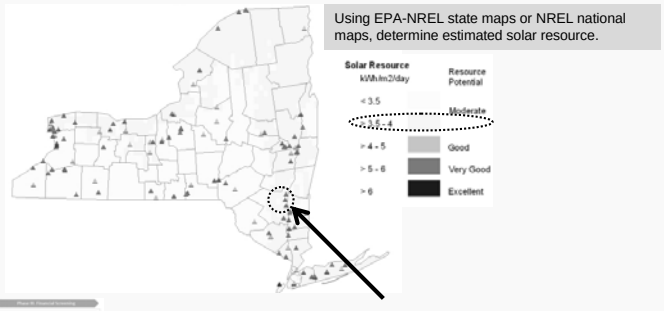

| Phase I.1: Pre-Screening - General Site Characteristics | |
|---|---|
| Question | Explanatory Text and Additional Resources |
| 1A | The solar resource potential is measured in kWh/m2/day. The majority of the US meets the 3.5 kWh/m2/day threshold. NREL's Renewable Energy Resource maps (www.nrel.gov/renewable_resources) provide information at the regional level. For a specific site, use one of the following mapping tools: (1) EPA Renewable Energy "Google Earth" Interactive Mapping Tool (www.epa.gov/renewableenergyland/mapping_tool.htm) and (2) In My Backyard (IMBY) (www.nrel.gov/eis/imby). Solar resource potential is not likely to vary significantly among sites in the same geographic vicinity and elevation. |
| 1B | If the solar resource for this particular site is classified as less than "Good" (having less than 3.5 kWh/m2/day), a solar PV system may not be ideal for redevelopment at this site, unless the state also has strong incentives. We recommend exploring other renewable energy redevelopment options or infill redevelopment options. Note: infill indicates redevelopment within an urban setting. |
| 1C | Eligible space for PV includes under-utilized or unoccupied land, vacant lots, and/or unused paved area, e.g. a parking lot or industrial site space, as well as existing building rooftops. Usable acreage is typically characterized as "flat to gently sloping", southern exposures that are free from obstructions and get full sun for at least a 6-hour period each day. For an individual site to be viable for redevelopment with solar PV, the usable acreage should be at least 2 acres in order to install a system of at least 50 kW or greater in order to make the site economically feasible. |
| 1D | If the usable acreage does not meet the size threshold, consider bundling rooftop and ground-mount systems at the same site or bundling multiple sites. If the useable area still does not meet the threshold, solar PV may not be viable at this site. |
| 1E | In dense to moderately dense urban settings, assume that most properties meet this criterion. Depending on overall system size and economic factors, it may be feasible to build the necessary infrastructure to reach the grid tie-in location. If you are considering an off-grid (non-grid connected) system, distance to transmission is not a limiting factor, continue to Question 1G. |
| 1F | If the system will be grid-connected and the distance to transmission is more than 1/2 mile, solar PV may not be viable due to the additional cost associated with connecting the system to the nearest grid tie-in. If the system will not be grid-connected (off-grid), move forward in the decision tree to Question 1G. |
| 1G | In dense to moderately dense urban settings, assume that most properties meet this criterion. If you are considering an off-grid (non-grid connected) system, the distance to graded roads is not a limiting factor, continue forward in the decision tree to Question 1I. The distance to graded roads may only become a factor during the installation phase of development for an off-grid system as contractor vehicles may find it difficult to access the site. There may be additional requirements associated with emergency-vehicle access. |
| 1H | If the system will be grid-connected and the distance to graded roads is greater than 1/2 mile, the additional cost associated with developing access roads may make solar PV development cost-prohibitive. If the site in question has access points/non-graded roads that you believe will not prohibit contractor vehicles from accessing the site during installation, operation and maintenance phases, you should answer "Yes" and continue forward in the decision tree to Question 1K. |
| 1I | Continue to Phase I.2 Pre-Screening - Usable Acreage |

# I.1Site Characteristics

*Solar*

1A. Is the solar resource at the site classified as 'Good' (greater than 3.5 kWh/m2/day) or better?

Using EPA-NREL state maps or NREL national maps, determine estimated solar resource.




# I.1Site Characteristics

*Solar*

1A. Is the solar resource at the site classified as 'Good' (greater than 3.5 kWh/m2/day) or better?

1B. No. PV may not be viable.

1C. Yes. Is the useable space at least 2 acres for Ground Mount or 85,000 sq. ft. for Rooftop sites?

Eligible space for PV includes under-utilized or unoccupied land, vacant lots, and/or unused paved area, e.g. a parking lot or industrial site space, as well as existing building rooftops. Sites > 5 acres are high priority.

For this site, site owner has identified:
- 90 acres of open space + parking lots
- 10 acres of available rooftop

Based on site prioritization recommendation, this site should be treated as high priority based on acreage.

# I.1Site Characteristics

*Solar*

1A. Is the solar resource at the site classified as 'Good' (greater than 3.5 kWh/m2/day) or better?

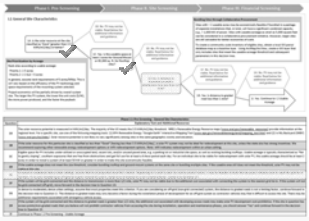
1B. No. PV may not be viable.

1C. Yes. Is the useable space at least 2 acres for Ground Mount or 85,000 sq. ft. for Rooftop sites?

1D. No. PV may not be viable.

1E.Yes. Is distance to transmission and/or distribution lines less than 1/2 mile?

As an office park and former manufacturing facility, distribution lines already service this site.



# I.1Site Characteristics

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1A. Is the solar resource at the site classified as 'Good' (greater than 3.5 kWh/m2/day) or better?

1B. No. PV may not be viable.

1C. Yes. Is the useable space at least 2 acres for Ground Mount or 85,000 sq. ft. for Rooftop sites?

1D. No. PV may not be viable.

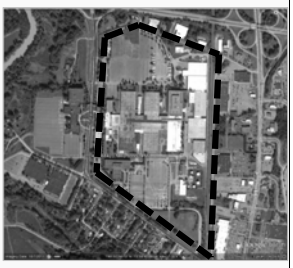
1E.Yes. Is distance to transmission and/or distribution lines less than 1/2 mile?

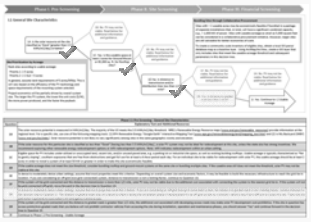
1F. No. PV may not be viable.

1G. Yes. Is distance to graded road less than 1 mile?

Using Google Earth or other map, ascertaining distance to roads is fairly straight forward.

Here, roads are adjacent to site.





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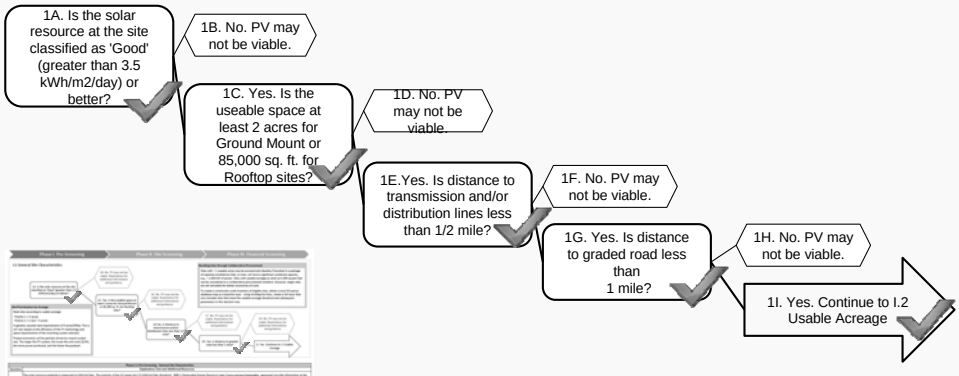
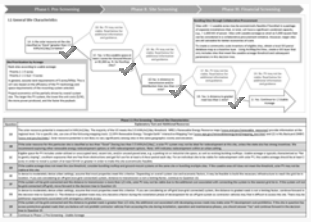
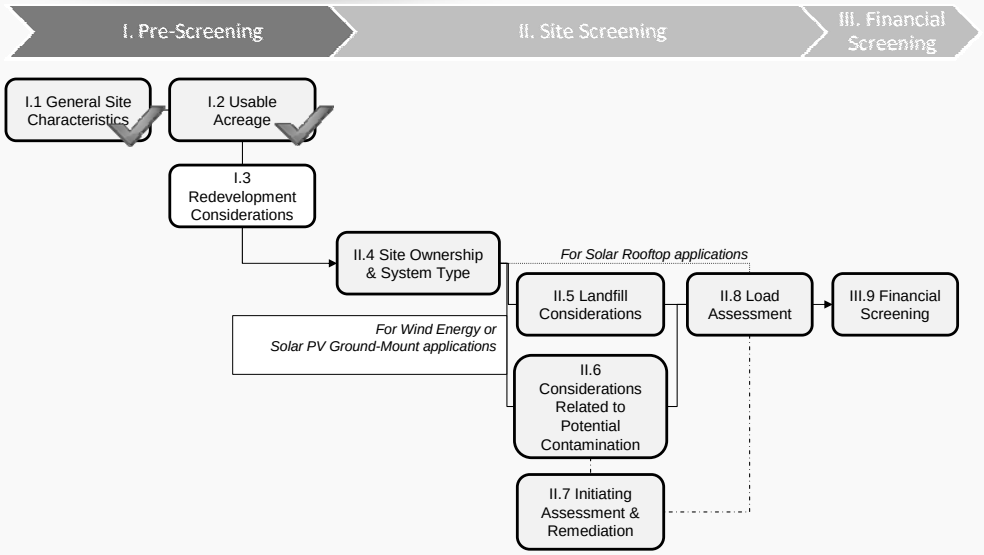
*Solar*



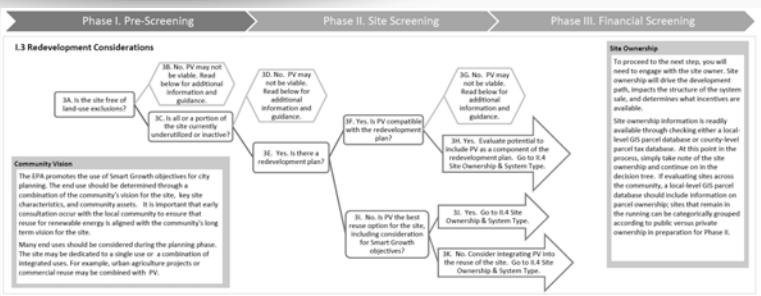



# Process Demonstration



# I.3 Redevelopment Considerations

*Solar*




| Phase I.3: Pre-Screening - Redevelopment Considerations | |
|---|---|
| **Question** | **Explanatory Text and Additional Resources** |
| 3A | Certain sites will be excluded from consideration for renewable energy development, such as environmentally sensitive or preservation areas, for example wetlands and wilderness preservation areas. If not readily known, this information can be obtained from the city land use planning department. Some land-use exclusions or restrictions include:<br>- Exclusion of water, wetlands, wild and scenic rivers, and wilderness study area<br>- Restrictions may be applicable for areas surrounding airports<br>- Restrictions may also be associated for federal lands with special designation such as national parks, national preserves, national monuments, national conservation areas, and wilderness areas. |
| 3B | If the site has land-use exclusions associated with it, the incremental cost associated with developing renewables on that site may make the site cost-prohibitive. |
| 3C | Conduct a site visit to gauge whether a potentially contaminated site is currently underutilized or inactive. Check applicable EPA federal or state online databases for site listings and Project Manager contact information. Local redevelopment agencies or land-use planning departments may have additional information on the site and/or whether an inventory of brownfields has been completed in the community. The EPA maintains mapping tools to search for contaminated sites by region or by community (e.g. address, zip code, etc.) at www.epa.gov/cleanup. For state-managed sites, search databases through the applicable state Department of Environmental Protection. |
| 3D | If the site is actively used (e.g. leased office space), surrounding land may be eligible for a ground-mounted PV system, if the site owner and/or user is interested. |
| 3E | Check if the land area or rooftop being evaluated for solar potential is located on a parcel that the city has already targeted for redevelopment in the context of a land use planning process, e.g., a Redevelopment Plan or a Specific Area Plan. If evaluating sites across the community, seek input from the municipal land use planning department to compare the most current Redevelopment Plan map with sites targeted for solar. If a RCRA or Superfund site, check with Potentially Responsible Party (PRP) or property owner to inquire about existing redevelopment plans. Based on community vision for the site, consider the potential to incorporate PV into the redevelopment plans and continue to II.4 Site Ownership & System Type. |
| 3F | PV could be evaluated as a potential component of a future redevelopment plan. |
| 3G | Evaluate the potential to add PV as a component of the redevelopment plan for either residential or commercial end uses. |
| 3H | Solar PV could be evaluated as a potential component of a future site re-use plan. If appropriate, continue to Phase II.4 Site Screening - Site Ownership & System Type. |
| 3I | Important considerations for determining potential reuse options for a site include community vision for the site, market realities, existing infrastructure, and realities of existing contamination. Smart Growth objectives include guiding development to already-developed areas to foster walkable neighborhoods with a variety of services and transportation choices. See Appendix A for guidelines in evaluating whether the site may be a priority for future redevelopment based on Smart Growth objectives. |
| 3J | Continue to Phase II.4 Site Screening - Site Ownership & System Type. |
| 3K | Solar PV could be evaluated as a potential component of a future reuse plan. If appropriate, continue to Phase II.4 Site Screening - Site Ownership & System Type. |

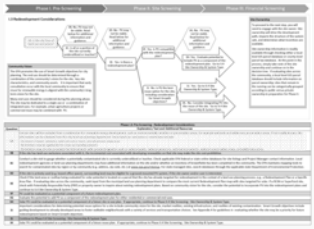
# I.3 Redevelopment Considerations

*Solar*

3A. Is the site free of land-use exclusions?

Some land-use exclusions or restrictions include:

- Exclusion of water, wetlands, wild and scenic rivers, and wilderness study area
- Restrictions may be applicable for areas surrounding airports
- Restrictions may also be associated for federal lands with special designation such as national parks, national preserves, national monuments, national conservation areas, and wilderness areas.



# I.3 Redevelopment Considerations

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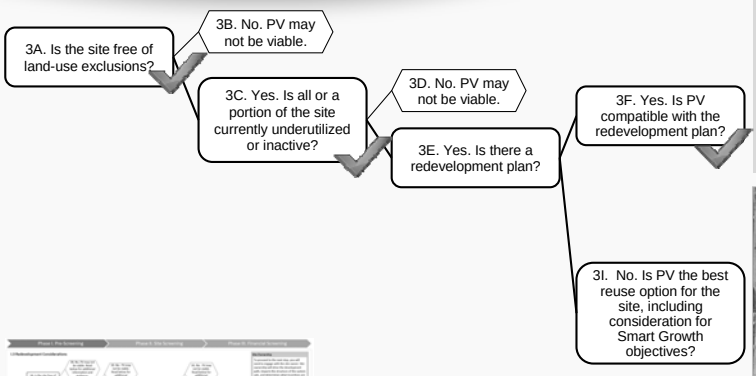
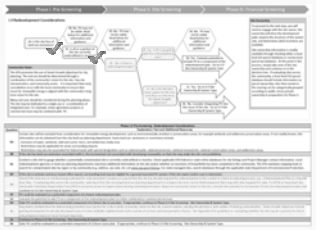



Determine if a Redevelopment Plan or a Specific Area Plan exists. If so, determine if PV is compatible with the plan.

In this case, Ulster has created a plan and has already incorporated solar PV as a key component.



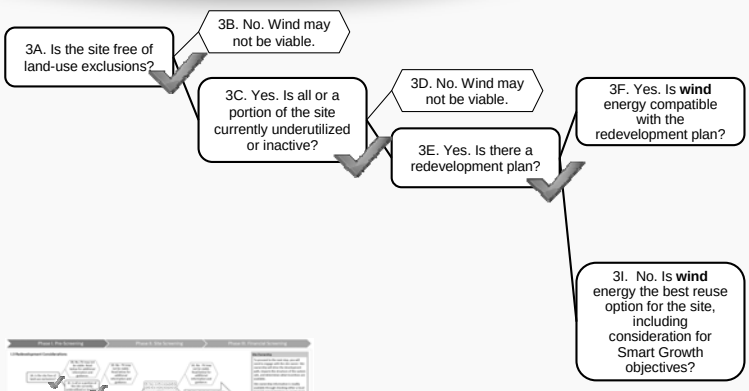
## Appendix A. Criteria for Smart Growth Objectives

| Criteria | "Yes" Rating |
|---|---|
| **I. Location adjacent to existing infrastructure including water & sewer lines** | |
| 1. Is site located < 1/2 mile from existing water & sewer infrastructure? | G |
| 2. Is site located < 1/4 mile from existing water & sewer infrastructure? | E |
| **II. Road network layout** | |
| 1. Is site located in an interconnected road system or on an existing street that is interconnected? | E/G |
| *Indicators of an interconnected road system include frequent street intersections per mile and a high percentage of 4-way intersections. In contrast, less well interconnected road systems have a predominance of cul-de-sacs and few parallel routes.* | |
| **III. Walkability (continuous sidewalk)** | |
| 1. Is there a continuous existing, walkable sidewalk within 1/8 mile radius of the site? | E |
| 2. Is there a walkable sidewalk within a 1/4 mile radius of the site (even if not immediately adjacent to the site)? | G |
| **IV. Walkability (block size)** | |
| 1. Is the block size (distance between intersections) within a ¼ mile radius of the site < 400 feet long (or, for non-rectangular blocks, is the total perimeter of street circling the site no greater than 1600 feet)? | E/G |
| **V. Transit Friendly** | |
| 1. Is a bus commuter and/or rail line located less than 1/4 mile from the site? | E |
| 2. Is a bus commuter and/or rail line located within a 1/2 mile of the site? | G |
| **VI. Mixed Land Use Area** | |
| 1. Is there a diversity of retail, commercial, residential, etc. uses at or in the vicinity of the site, e.g., within 1/4 mile? *Mixed-use development, for example, might include retail-commercial on the first floor of a building or along major streets, with residential households located above the first floor and along side streets.* | E/G |
| **VII. Public/Open Spaces** | |
| 1. Is a park or other public space located < 1/8 mile from the site? | E |
| 2. Is a park or other public space located > 1/8 mile from but < 1/2 mile from the site? | G |
| **VIII. Access to major institutions** | |
| 1. Are major city social, retail, commercial, and other (schools, churches, etc.) located < 1/4 mile from the site? | E |
| 2. Are major institutions generally located > 1/4 mile but < 3/4 mile or less from the site? | G |

| Criteria | "Yes" Rating |
|---|---|
| **IX. Bike Route** | |
| 1. Is there an existing bike route < 1/4 mile from the site? | E |
| 2. Is there an existing bike route > 1/4 mile but < 3/4 mile from the site? | G |
| **X. Community revitalization area** | |
| 1. Is the site located along a commercial strip corridor undergoing a local planning revitalization process or restructuring review? | G |
| 2. If the answer to 1 is YES, is the site also located at or close to a crossroad identified in the local planning process or in an economic market analysis as particularly favorable to retail development, i.e., a "retail centered location"? | E |

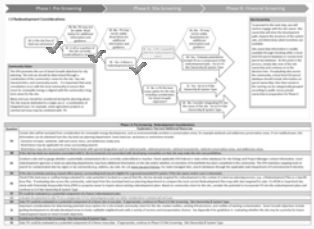
# I.3 Redevelopment Considerations

*Wind*



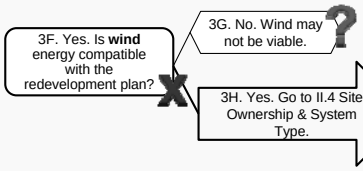

We have been screening the site for PV and wind in parallel. So far, everything looks good for both. Now, determine if wind energy is compatible with the plan.

Based on the existing plan, wind energy is not part of the community vision for the site.



# I.3 Redevelopment Considerations

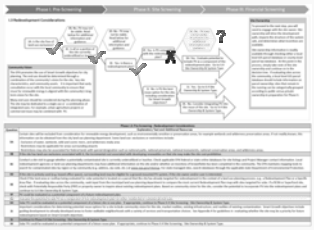
*Wind*

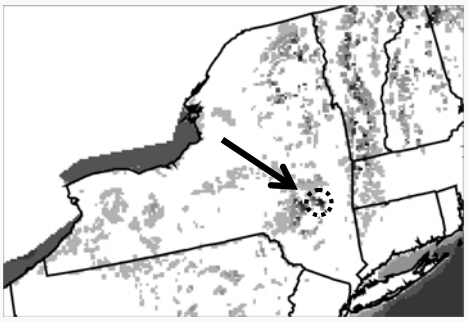



Consider incorporating wind energy into the redevelopment plan.

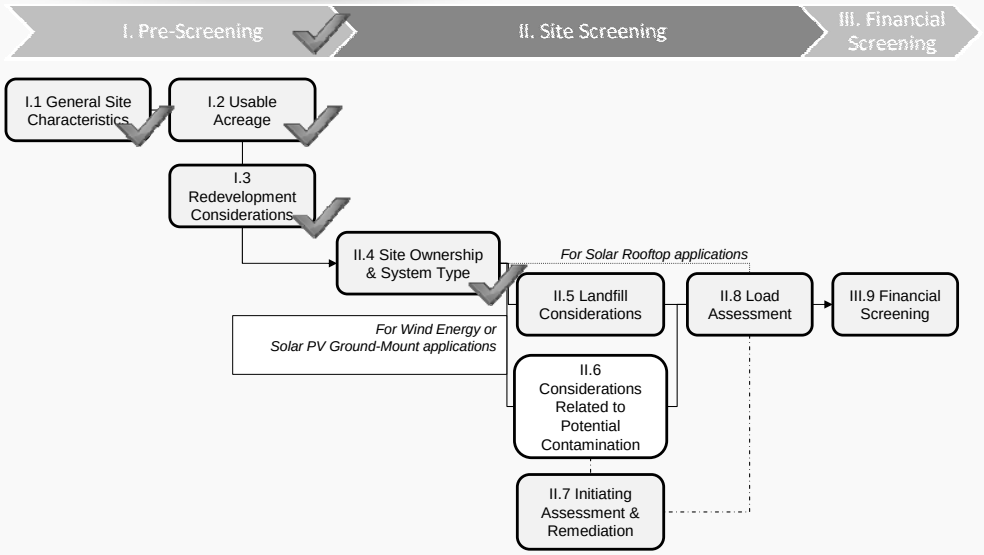
- Has wind already been considered as an element of the new site plan?
- If so, why was it ruled out?
- If not, does wind continue to meet the screening criteria when developed in parallel with solar PV?

Based on the available resource and other factors, it may be advisable to continue in the wind decision tree.

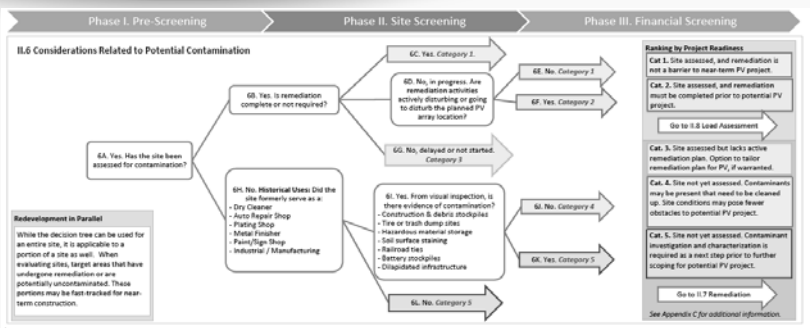




# Process Demonstration



# II.6 Considerations Related to Potential Contamination




**Phase II.6: Site Screening - Contaminated Land Prioritization**

| Question | Explanatory Text and Additional Resources |
|---|---|
| 6A | A site assessment and characterization will ensure that you are aware of any need for future cleanup, which areas on the site may be exempt from redevelopment, and estimated usable acreage. To find information on potentially contaminated lands and their status, search applicable Federal and State online databases. For community-scale evaluation of eligible sites, inquire about any brownfield grants from the State or EPA to determine which sites may have already been assessed or cleaned up, but not yet redeveloped. |
| 6B | Determine status of remediation work on site. |
| 6C | As remediation has been completed or determined to be not required, the site can be ranked under Category 1. Go to II.8 Site Screening - Load Assessment. |
| 6D | For the targeted area, determine if remediation activities are expected to disturb the useable acreage for a period extending up to 20 years. For example, soil removal will need to be completed prior to initiating PV system construction. Once the PV system is installed, it may be difficult to access the area beneath the mounting system. |
| 6E | Based on planned remediation activities, the site can be ranked under Category 1; see Appendix C. Go to II.8 Site Screening - Load Assessment. |
| 6F | Based on planned remediation activities, the site can be ranked under Category 2; see Appendix C. Go to II.8 Site Screening - Load Assessment. |
| 6G | If remediation activities have not yet started or are delayed, the site ranks under Category 3; see Appendix C. Go to II.7 Site Screening - Initiating Assessment and Remediation. |
| 6H | If site characterization and investigation is not yet in the early stages, begin this process prior to developing a solar resource at the site. This screening list gives general guidance on how the site can be prioritized for future redevelopment with solar. Input from community stakeholders may also be helpful in understanding the site's historical uses, assessment prospects, and redevelopment priorities. Certain historical uses may be indicative of the type and extent of contamination, as well as degree of difficulty to clean-up the site. For more information on site investigation and characterization, see EPA's tools and resources to assist in contaminated site characterization and monitoring: www.epa.gov/superfund/remedytech/char.htm. |
| 6I | Based on observations from the site visit, note any signs of contamination on the site and document locations within usable acreage identified during Phase I.1. Visible evidence of contamination may be an indicator of the extent of remediation. An assessment will be required to determine the contaminants present. |
| 6J | Given historic use of the site and visual observations, the site ranks under Category 4; see Appendix C. Go to II.7 Site Screening - Initiating Assessment and Remediation. |
| 6K | Given historic use of the site and visual observations, the site ranks under Category 4; see Appendix C. Go to II.7 Site Screening - Initiating Assessment and Remediation. |
| 6L | Given historic use of the site, the site ranks under Category 5; see Appendix C. Go to II.7 Site Screening - Initiating Assessment and Remediation. |
| Cat. 1-5 | See Appendix C for additional information and guidance on Contaminated Sites & Project Readiness |

# II.6 Considerations Related to Potential Contamination

6A. Yes. Has the site been assessed for contamination?

A site assessment and characterization will ensure that you are aware of any need for future cleanup, which areas on the site may be exempt from redevelopment, and estimated usable acreage.

To find information on potentially contaminated lands and their status, search applicable Federal and State online databases.

For this site, assessment was completed under EPA's Resource Conservation and Recovery Act (RCRA) program.

# II.6 Considerations Related to Potential Contamination

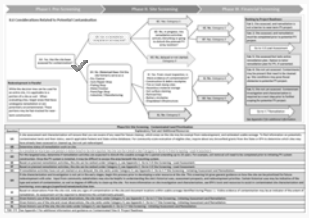
6A. Yes. Has the site been assessed for contamination?

6B. Yes. Is remediation complete or not required?

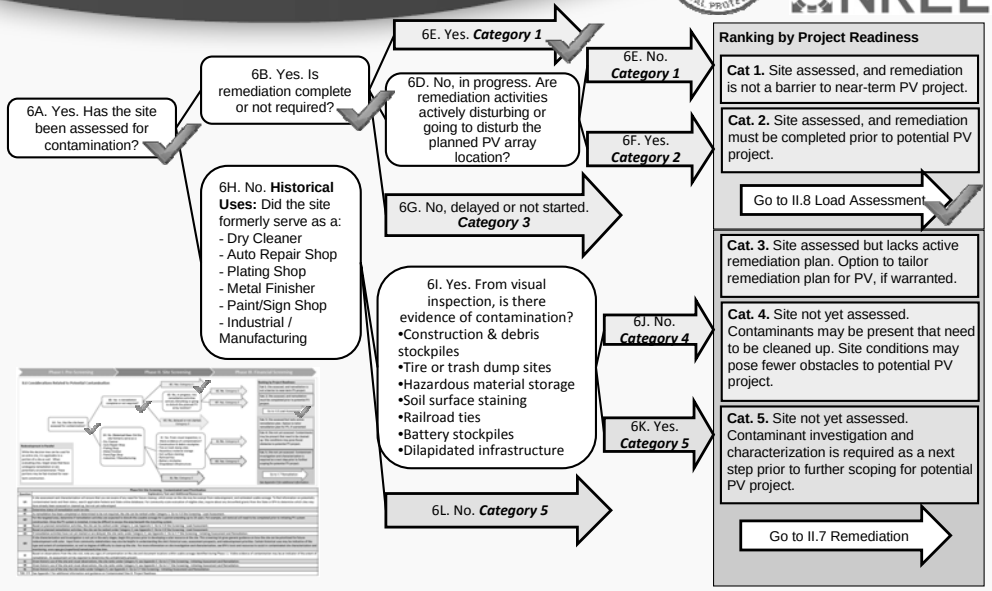
6H. No. **Historical Uses:** Did the site formerly serve as a:
- Dry Cleaner
- Auto Repair Shop
- Plating Shop
- Metal Finisher
- Paint/Sign Shop
- Industrial / Manufacturing

Determine remediation status based on documentation from site owner or applicable state or federal program.

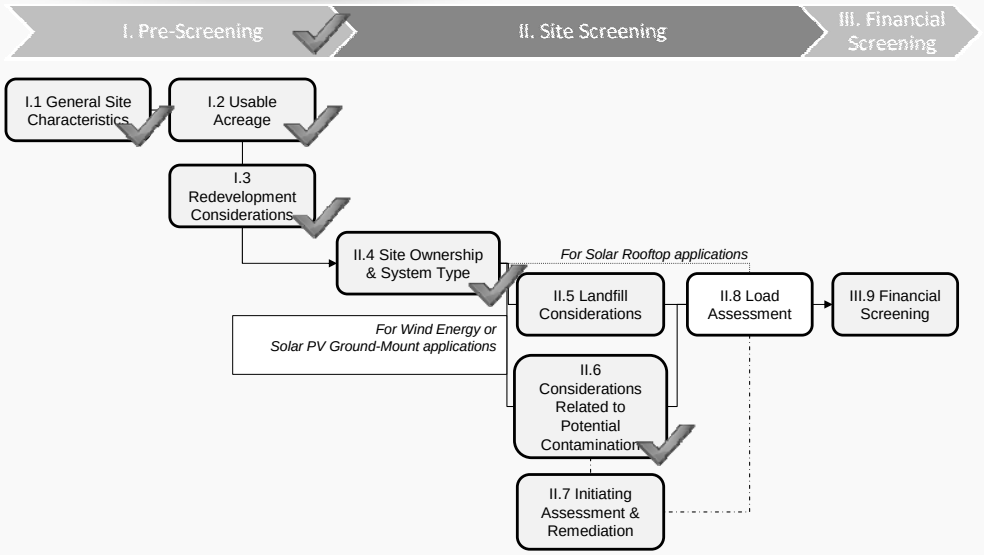
For this site, RCRA remediation is in progress with a Pump & Treat system installed and operating. Based on recent data, the plume is decreasing in size, and contaminate concentration is down.



# II.6 Considerations Related to Potential Contamination

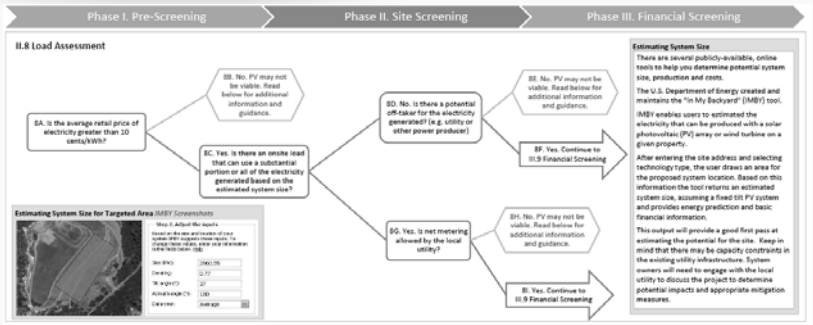


# Process Demonstration



# II.8 Load Assessment

*Solar*



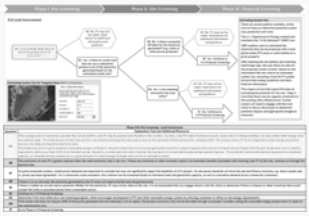

| Phase II.8: Site Screening - Load Assessment | |
|---|---|
| **Question** | **Explanatory Text and Additional Resources** |
| 8A | If the average price of electricity is greater than 10 cents/kWh, solar PV may be economically feasible in this location. Typically, solar PV makes the best economic sense when it is being installed in an area where other energy costs are relatively high. The levelized cost of electricity (LCOE) is calculated by dividing the total system costs by the estimated lifetime production, yielding $/kWh. This analysis allows PV to be compared to other energy production sources, including existing retail electricity rates.<br>The break-even cost for grid-connected, renewable energy is defined as the point where the cost of system-generated electricity is equal or greater than the cost of electricity purchased from the grid. Break-even cost is typically expressed in dollars per Watt ($/W) of an installed system. Generally, as retail electricity rates increase, the economics of a renewable energy project greatly improve. The predicted system performance (expressed as nameplate capacity, or estimated annual production) is a good indicator for determining the break-even cost for a renewable system. |
| 8B | The economics of solar PV is greatly reduced when the retail electricity rate is very low. If there are incentives or other monetary and/or non-monetary benefits associated with installing solar PV at this site, continue on through the decision tree. |
| 8C | For grid-connected systems, onsite power demands are important to consider but may not significantly impact the feasibility of a PV project. On-site power demands will drive the sale and finance structure, e.g. direct system sale vs. power purchase agreement. For a community-scale evaluation, this criterion can be evaluated based on individual loads and generation capacity, as well as cumulative demand across community customers. |
| 8D | If there is no on-site load, the electricity generated by the PV array will need to be fed onto the grid and sold. |
| 8E | If there is neither an on-site load or potential offtaker for the electricity, PV may not be viable at this site. It is recommended that you engage directly with the utility to determine if there is interest or other incentives that would compel the utility to purchase power from a renewable source. |
| 8F | Continue to III.9 Financial Screening |
| 8G | Determine if the local utility has a net metering program, which encourages development of PV and other renewable energy systems by allowing customers to offset on-site energy requirements. |
| 8H | If the onsite load does not require 100% of the power generated and net metering is not an option, the project economics may not be favorable enough to proceed. Consider scaling the renewable energy project down to meet on-site requirements only. |
| 8I | Go to Phase III.9 Financial Screening |

# II.8 Load Assessment

*Solar*

8A. Is the average retail price of electricity greater than 10 cents/kWh?

Based on current electric bills, the on-site tenants are paying between $0.15-0.17/kWh.



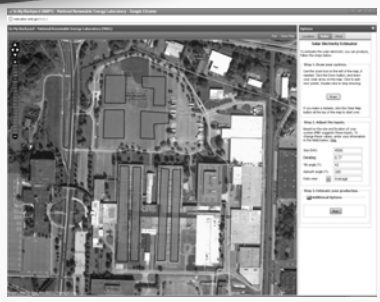
# II.8 Load Assessment

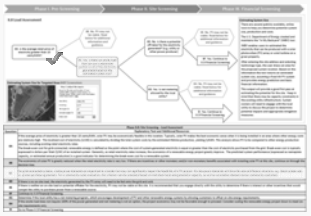
*Solar*

8A. Is the average retail price of electricity greater than 10 cents/kWh?

3B. No. PV may not be viable.

8C. Yes. Is there an onsite load that can use a substantial portion or all of the electricity generated based on the estimated system size?





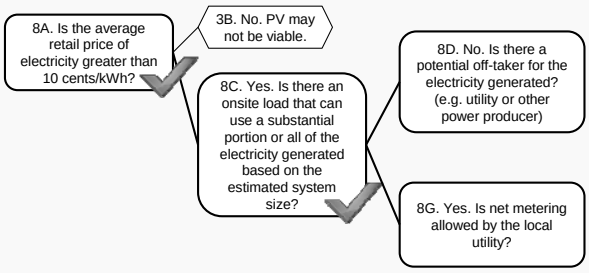
Based on a cumulative estimate of multiple areas on existing and planned buildings, an estimated 4.5 MW could be built out.

Existing buildings have been repurposed primarily for manufacturing use, including solar and LED manufacturing, as well as a solar thermal provider. Further build-out of the site will bring in additional tenants.

Comparing current bills to the estimated system production for arrays on existing builds shows that the system will shave electricity usage at the site.

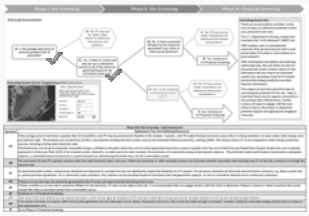
# II.8 Load Assessment

*Solar*

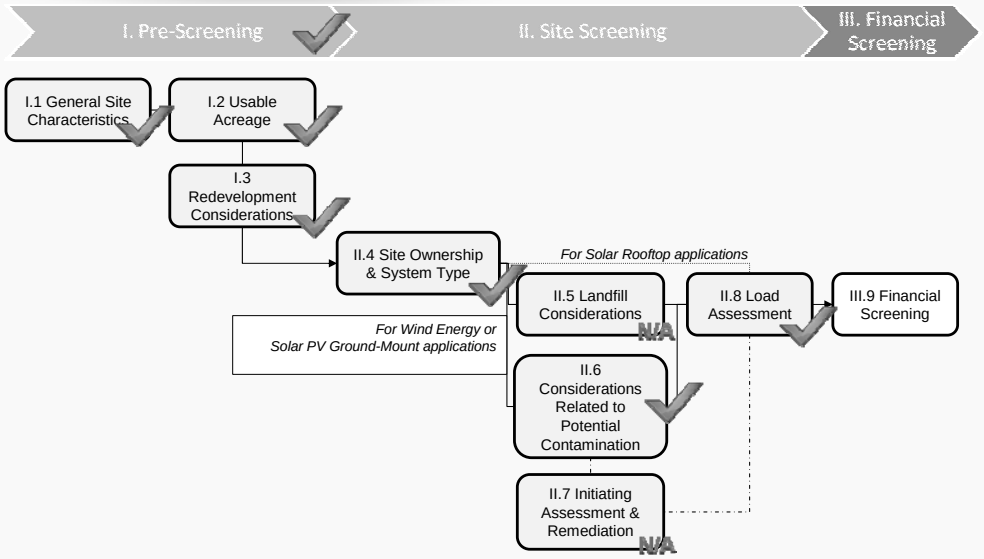



Yes, New York has passed net metering laws that support distributed generation.

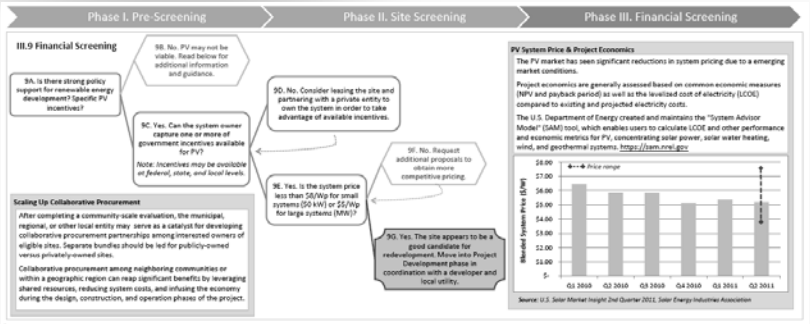
Net metering for non-residential systems is **capped at 2 MW** per utility meter. This will need to be taken into account later when designing the system.



# Process Demonstration

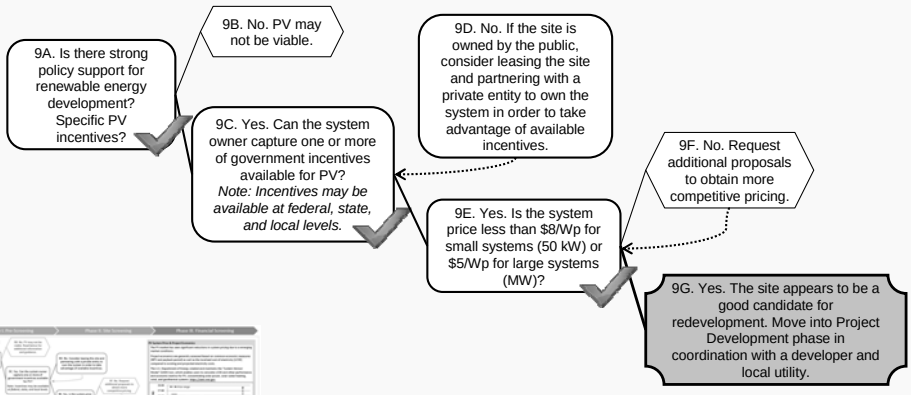


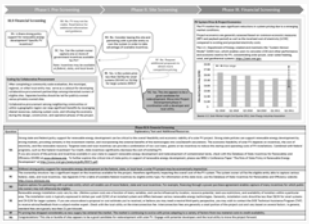
# III.9 Financial Screening




| Phase III.9: Financial Screening | |
|---|---|
| **Question** | **Explanatory Text and Additional Resources** |
| 9A | Strong state and federal policy support for renewable energy development can be critical to the overall feasibility and economic viability of a solar PV project. Strong state policies can support renewable energy development by driving markets, providing certainty in the investment market, and incorporating the external benefits of the technologies into cost/benefit calculations. The economic feasibility of solar PV depends on incentives, the cost of electricity, and the renewable resource. Targeted state and local incentives can provide a combination of low cost loans, grants or tax incentives to reduce the startup and operating costs of PV installations. Combined with federal programs, such as the Federal Investment Tax Credit, state incentives significantly decrease the cost of installing PV.<br>If you are unsure of the policies and incentives available in your state to support renewable energy development and redevelopment of contaminated lands, check with the Database of State Incentives for Renewables and Efficiency (DSIRE) at www.dsireusa.org. To further explore the critical role of state policy in support of renewable energy development, please see NREL's Conference Paper "The Role of State Policy in Renewable Energy Development" at http://www.nrel.gov/analysis/pdfs/45971.pdf. |
| 9B | Without strong policy support for renewable energy development at the federal, state, or local level, a solar PV project may be economically impractical. |
| 9C | The ownership structure has a significant impact on the incentives available for the project, therefore significantly impacting the overall cost of the PV system. The system owner will be the eligible entity able to capture various federal, state, and local incentives. See Appendix D for a table of available federal incentives by eligible entity type. For information at the state level, use the Database of State Incentives for Renewables and Efficiency website: http://www.dsireusa.org/. |
| 9D | Explore options for partnering with a private entity which will enable use of more federal, state and local incentives. For example, financing through a power purchase agreement enables capture of many incentives for which public site owners may not otherwise be eligible. |
| 9E | Renewable energy installation costs vary by site. Lifetime system costs are a function of many variables, and can be influenced by location, resource potential, land-use restrictions, and availability of installers within a particular area. The installation costs is typically expressed in dollars per watt ($/W) of an installed system and differs between various renewable energy technologies. Generally, installation costs should be less than $8/W for small systems and $4-5/W for larger systems. If you are unsure about a proposal or cost estimate you've received, or believe you may need a neutral third-party perspective, you may wish to contact the DOE Technical Assistance Program (TAP) to receive advice/feedback from a subject-matter expert. Check with the local utility on the interconnection fee. Interconnection fees are generally a small portion of the project cost and vary based on several factors. In general, standard fees are typically less than $1 per kilowatt. |
| 9F | PV pricing has dropped considerably as new supply has entered the market. The market is continuing to evolve with prices adapting to a variety of factors from raw material costs to credit availability. |
| 9G | Congratulations! This site or bundle of sites appears to be a good candidate for redevelopment with solar PV. Engage with potential developers and the local utility to move the project forward. |

# III.9 Financial Screening



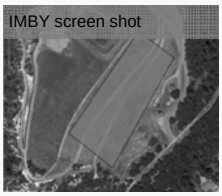
Additional highlights, topics, and information

# KEY FEATURES

# Tools & References

Throughout the process, the decision trees provide context for each screening criteria with links to additional tools and reference materials. Examples include:

- Resource potential: RE-Powering Google Earth tool for EPA-tracked sites
- Estimating system size: NREL “In My Backyard” (IMBY)
- Land use restrictions: FAA tools for airport-related offsets
- Market trends: References to industry surveys on system pricing and drivers
- Financial Incentives: Links to federal, state, and local incentive programs by system owner type

# Community Focused

- Emphasis placed on redevelopment plans being in the hands of the community
- Supplemental information on additional considerations, e.g. Smart Growth objectives, to guide decision makers in redevelopment planning
- Focus on beneficial reuse to transform contaminated or underutilized spaces into community assets

# Innovative Procurement & Financing

Building on successful city-led projects, the tools point toward potential for Site Bundling & Collaborative Procurement

Potential Benefits include:

- Reduced overhead associated with RFI/RFP and Project Management at local level
- Streamlined permitting
- Economies of scale for procurement
- Reduced engineering time
- Mitigating impact of smaller sites

# Redevelopment during Remediation

- For near-term installation, target areas that have undergone remediation or are potentially uncontaminated
- For long-term solutions, build renewable energy into overall redevelopment plan
- Use EPA resources to evaluate liability considerations for each project
- Examples of remediation plans compatible with solar and wind installations
  - *Capping*
  - *In Situ Bio Remediation*
  - *Long-term Pump & Treat*
  - *Monitored Natural Attenuation*
  - *Permeable Reactive Barriers*
  - *Soil Vapor Extraction*

# Landfill Considerations


- Introduction to unique design parameters for installing on closed landfill caps
- Information on innovative system designs for landfill closure, e.g. solar geomembranes

# Acknowledgements

EPA and NREL collaborated to develop new tools to guide state and local governments and other stakeholders through a process for screening sites for their suitability for future redevelopment with solar photovoltaic (PV) or wind energy.

This work represents ongoing collaboration between EPA headquarters, EPA Region 9, and NREL's Technical Assistance Program.

Additional thanks to the City of Richmond for serving as a pilot community during the development of the solar decision tree.

# Comments & Feedback

*Requested by February 16, 2012*

EPA and NREL welcome public feedback on the decision trees. In general, please evaluate the decision trees for:

- Process flow
- Information accuracy
- Improvements to highlights
- Missing information or considerations

We are also soliciting communities interested in beta testing the tools.

Follow-up comments and suggestions can be sent via email to Shea Jones of the RE-Powering America's Land team at *jones.shea@epa.gov* by February 16, 2012.

# Resources & Feedback

- To view a complete list of resources for this seminar, please visit the **Additional Resources**
- Please complete the **Feedback Form** to help ensure events like this are offered in the future


Need confirmation of your participation today?

Fill out the feedback form and check box for confirmation email.

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