Screening Sites for Wind Energy Potential

Emphasis on Redevelopment of Potentially Contaminated Lands or Underutilized Sites

RE-Powering America's Land Initiative: Wind Energy Decision Tree

Through ongoing collaboration, the Environmental Protection Agency (EPA) and Department of Energy's National Renewable Energy Laboratory (NREL) created a decision tree to guide state and local governments and other stakeholders through a process for screening sites for their suitability for future redevelopment with wind energy.

Targeted sites include brownfields, Superfund sites, RCRA sites, abandoned parcels, landfills, and mining sites. EPA encourages the development of these targeted sites, instead of green space.

This decision tree can be used to screen individual sites for wind energy potential or for a community-scale evaluation of multiple sites. The process is also applicable for a range of sites, from single turbine installations to large wind farms.

It is not intended to replace or substitute the need for a detailed site-specific assessment that would follow an initial screening based on the decision tree. Tips on how to obtain information relevant to various parameters in the decision tree are provided.

Through the RE-Powering America's Land initiative, the EPA encourages renewable energy development on potentially contaminated land when aligned with the community's vision for the site. This tool outlines considerations specific to the redevelopment of potentially contaminated sites. Potentially contaminated land includes sites where contamination is suspected but has not been confirmed and sites where contamination has been identified.

The EPA also promotes redevelopment of urban sites to achieve "Smart Growth" objectives. Community vision for the site, as well as the site's key attributes, should shape the redevelopment plan.

Many additional resources can be found on the following EPA and NREL websites:

www.epa.gov/renewableenergyland
www.nrel.gov/learning/re_wind.html

Process Overview

I. Pre-Screening
- Wind Resource
- Available Area
- Distance to Existing Infrastructure
- Site Topography
- Redevelopment Priorities & Land Use Exclusions

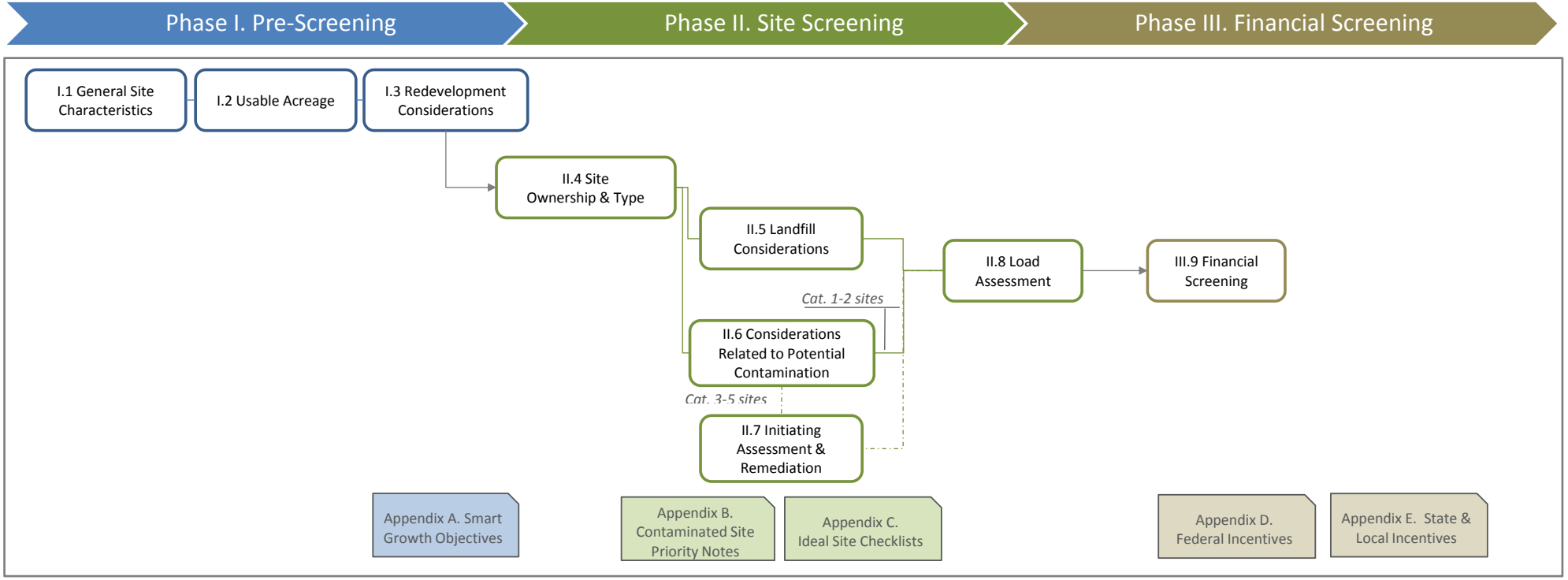
II. Site Screening
- Owner interest
- System Type
- Contaminated Site Considerations, Status, and Readiness
- Electricity Costs
- Energy Demand

III. Financial Screening
- Policy Considerations
- Federal and State rebates and incentives
- Installation costs

Key Audiences & Document Purpose	
Stakeholder	**Purpose**
State and Local Governments	To help states and municipalities screen and prioritize existing sites for their suitability for wind installations. Targeted sites include brownfields, Superfund sites, RCRA sites, publicly owned facilities, abandoned parcels, landfills, and mining sites.
Clean-up Project Managers	To aid clean-up project managers to screen their potentially contaminated sites for wind development potential.
Renewable Energy Developers	To introduce renewable energy developers to considerations unique to redevelopment of potentially contaminated sites and provide a common framework for discussions with state and local governments at the project development phase for a wind installation. This content is primarily covered in Phase II of the screening process.
Site Owners	To help site owners evaluate a given property for renewable energy potential.

EPA United States Environmental Protection Agency

NREL NATIONAL RENEWABLE ENERGY LABORATORY



Screening Process Overview	
Phase	**Explanatory Text and Additional Resources**
I	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.
II	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.
III	Financial Screening: Addresses economic, policy, and incentive factors that further influence payback.

Decision Tree: Tool Features

Guide to Decision Tree Features

The Wind Energy Decision Tree is designed to guide users through a three-phase process to assess sites for redevelopment with wind energy.

This tool utilizes several components to facilitate the screening process and to provide users with additional information on each of the screening criteria.

Users navigate the decision tree by responding to questions in the "Evaluation" boxes. Depending on the response, the user is directed to the next criteria or alerted to an potential obstacle by the "Flags." The user is directed to the next process step by "Arrows."

Tips on how users can obtain information relevant to various parameters in the tree are provided in the "Notes" and "Highlights."

For each "Evaluation" box, the corresponding "Note" section provides a brief explanation associated with the question posed.

For each "Flag," the corresponding "Note" summarizes the potential impact of the obstacle to the viability of the wind energy redevelopment project. In some cases, the tool also provides information on alternatives or additional considerations that may mitigate the impact of a given obstacle.

Supplemental information related to many process steps is provided in the "Highlights" boxes.

If you have questions or feedback on the tool, please contact Lura Matthews of the RE-Power team:

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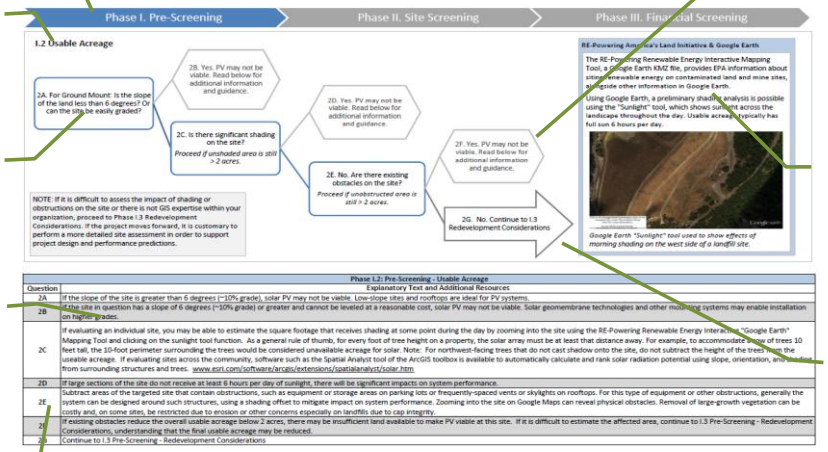
Process flow chart
Indicates active phase in the site screening process

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."



Phase I.2: Pre-Screening - Usable Acreage

Question	Explanatory Text and Additional Resources
2A	If the slope of the site is greater than 6 degrees (~10% grade), solar PV may not be viable. Low-slope sites and rooftops are ideal for PV systems.
2B	If the site in question has a slope of 6 degrees (~10% grade) or greater and cannot be leveled at a reasonable cost, solar PV may not be viable. Solar geomembrane technologies and other mounting systems may enable installation on higher grades.
2C	If evaluating an individual site, you may be able to estimate the square footage that receives shading at some point during the day by zooming into the site using the RE-Powering Renewable Energy Interactive "Google Earth" Mapping Tool and clicking on the sunlight tool function. As a general rule of thumb, for every foot of tree height on a property, the solar array must be at least that distance away. For example, to accommodate a row of trees 10 feet tall, the 10-foot perimeter surrounding the trees would be considered unavailable acreage for solar. Note: For northwest-facing trees that do not cast shadow onto the site, do not subtract the height of the trees from the usable acreage. If evaluating sites across the community, software such as the Spatial Analyst tool of the ArcGIS toolbox is available to automatically calculate and rank solar radiation potential using slope, orientation, and shading from surrounding structures and trees. www.esri.com/software/arcgis/extensions/spatialanalyst/solar.htm
2D	If large sections of the site do not receive at least 6 hours per day of sunlight, there will be significant impacts on system performance.
2E	Subtract areas of the targeted site that contain obstructions, such as equipment or storage areas on parking lots or frequently-spaced vents or skylights on rooftops. For this type of equipment or other obstructions, generally the system can be designed around such structures, using a shading offset to mitigate impact on system performance. Zooming into the site on Google Maps can reveal physical obstacles. Removal of large-growth vegetation can be costly and, on some sites, be restricted due to erosion or other concerns especially on landfills due to cap integrity.
2F	If existing obstacles reduce the overall usable acreage below 2 acres, there may be insufficient land available to make PV viable at this site. If it is difficult to estimate the affected area, continue to I.3 Pre-Screening – Redevelopment Considerations, understanding that the final usable acreage may be reduced.
2G	Continue to I.3 Pre-Screening - Redevelopment Considerations

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

Phase I. Pre-Screening | Phase II. Site Screening | Phase III. Financial Screening

I.1 General Site Characteristics

1A. Is the wind resource at the site at least 5.5 m/s at 80 m?

1B. No. Wind may not be viable. Read below for additional information and guidance.

1C. Yes. Is the usable space at least 2 acres?

1D. No. Large-scale wind may not be viable. Consider small-scale turbines. Read below for additional information and guidance.

If powering remediation, continue to 1E.

1E.Yes. Is distance to 3-phase distribution lines less than 1 mile?

1F. No. Wind may not be viable. Read below for additional information and guidance.

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

1H. No. Wind may not be viable. Read below for additional information and guidance

1I. Yes. Continue to I.2 Usable Acreage

Turbine Size	Nameplate Rating	Nominal Tip Height
Small	< 100 kW	150 ft
Mid	100 kW – 1 MW	300 ft
Large	> 1 MW	400 ft

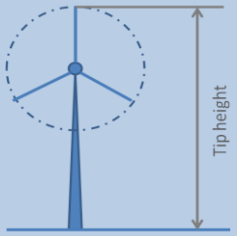
Site Geometry & Turbine Selection

Site geometry impacts selection of turbine sizes based on available land at the targeted location.

As a general rule, turbines require a minimum of 1-1.5 times the tip height of the turbine from all surrounding buildings or existing infrastructure. Sites should be prioritized that meet this minimum threshold, plus have additional 350 feet to allow for optimal siting. For example, a location with 1000 ft radius available can accommodate a turbine with 400-ft tip height.

(1.5 x 400 ft) + 350 ft = 950 ft ideal < *1000 ft available*

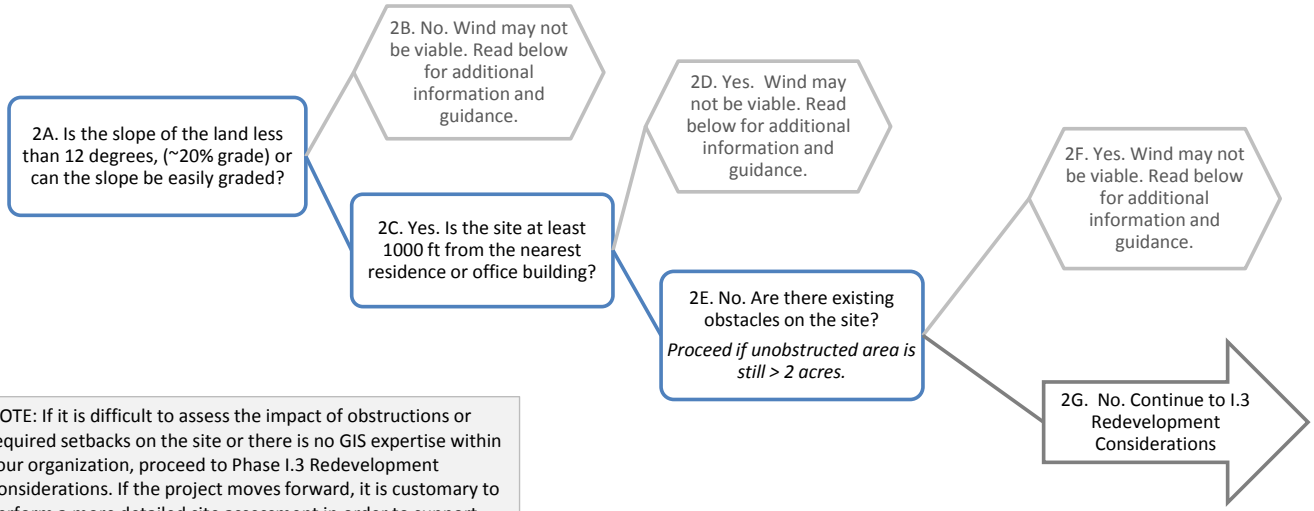
Project economics will be largely driven by turbine size. In general, the larger the turbine, the lower the unit costs ($/kW).



Phase I.1: Pre-Screening - General Site Characteristics	
Question	**Explanatory Text and Additional Resources**
1A	The wind resource potential, or average annual wind speed, is measured in meters per second (m/s). NREL and AWS Truepower utility-scale, land-based 80-meter wind map (www.windpoweringamerica.gov/wind_maps.asp) or NREL's Renewable Energy Resource 50-m map (www.nrel.gov/gis/wind.html) provide information at the regional level. The EPA Renewable Energy Interactive Mapping "Google Earth" Tool (www.epa.gov/renewableenergyland/mapping_tool.htm) provides information for specific sites that screened by EPA-NREL for renewable energy potential.
1B	If the wind resource for this particular site is classified as less than 5.5 m/s at 80 m above ground level (AGL), a wind turbine may not be ideal for redevelopment at this site. The following other considerations may improve the viability of the site: (i) local topography that may increase wind resource; (ii) >$0.08/kWh cost of energy; (iii) strong local incentives; and (iv) powering off-grid sites. If these factors do not improve the sites viability, consider other renewable energy technologies. If appropriate, go to Question 1C.
1C	Usable acreage is generally characterized as open, gently sloping areas. For a site to be viable for redevelopment with wind, the usable acreage should be at least 2 acres. A site this size will accommodate a turbine up to 100 kW. If the usable acreage is 2+ acres, larger turbines can be considered. If the site is smaller than 2 acres, very small wind turbines can be considered.
1D	If the usable acreage is less than 2 acres, large wind turbines may not be viable at this site. Larger sites will have more siting opportunities for one or more turbines but further investigation into the possible turbine types as well as present and future land use should be considered. If the site is smaller than 2 acres, small wind turbines may still be cost effective. If considering wind energy to power remediation activities (e.g. pump and heat) at a clean-up site, a smaller wind turbine may be able to power on-site loads. In this case, the area threshold may not be applicable depending on the energy demand and turbine size. Continue to Question 1E.
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 mile, wind may not be viable due to the additional cost associated with connecting the system to the nearest grid tie-in. However, for larger projects (>10 MW), a site-specific study may find the site to be viable despite the additional cost of building the required infrastructure. 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 mile, the additional cost associated with developing access roads may make wind development cost-prohibitive. However, for larger projects (> 10 MW), a site-specific study may find the site to be viable despite the additional cost of this building this infrastructure. 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, go to Phase I.2 Pre-Screening - Usable Acreage.
1I	Continue to Phase I.2 Pre-Screening - Usable Acreage

Phase I. Pre-Screening | Phase II. Site Screening | Phase III. Financial Screening

I.2 Usable Acreage

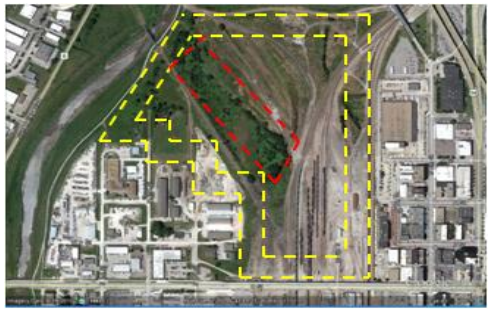


NOTE: If it is difficult to assess the impact of obstructions or required setbacks on the site or there is no GIS expertise within your organization, proceed to Phase I.3 Redevelopment Considerations. If the project moves forward, it is customary to perform a more detailed site assessment in order to support project design and performance predictions.

RE-Powering America's Land Initiative & Google Earth

EPA's Renewable Energy Interactive Mapping Tool, a Google Earth KMZ file, provides EPA information about siting renewable energy on contaminated land and mine sites, alongside other information in Google Earth.

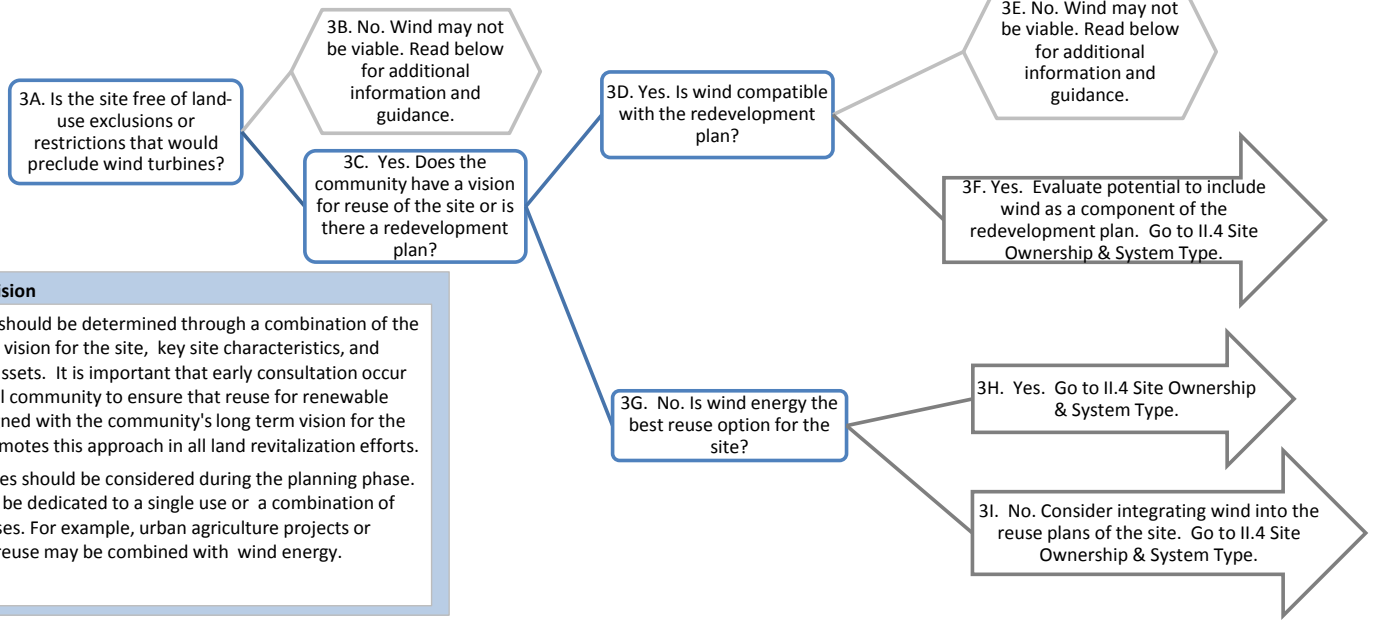
Using Google Earth, perform a preliminary assessment of usable acreage by identifying areas with existing obstructions (roads, drainage ditches, trees, etc.) and areas where setbacks from buildings and other infrastructure may be required.



Phase I.2: Pre-Screening - Usable Acreage	
Question	**Explanatory Text and Additional Resources**
2A	If the slope of the site is greater than 12 degrees (~20% grade), ridge-top development or small turbines may be an option. Exceptions include areas where significant grading is viable.
2B	If the site in question has a slope of 20% or greater, small wind turbines may still be constructible. Depending on the usable acreage, large wind farm projects may also be viable. Further study into the size and total potential of the site should be undertaken if small wind turbines or a large wind farm are possible.
2C	Due to noise considerations, a 1000-ft offset is generally recommended for offices or residential dwellings. Depending on orientation of the building relative to the turbine(s) and predominant wind direction, offsets can range from as close as 500 ft to in excess of 1500 ft. For screening purposes, assume a 1000-ft offset, assuming further refinement during the design phase. Predominate wind direction, for the purposes of wind energy assessment, requires technical analysis support. Wind roses show predominant wind direction based on the frequency of wind from a particular direction (http://www.wcc.nrcs.usda.gov/climate/windrose.html). However, for wind energy potential, identifying the direction of higher speed winds is the objective, as higher speed winds contain much more energy than lower speed winds. The frequency-based predominant wind direction may not align the high-speed wind direction. During an investment-grade feasibility study, coordinate with a local engineering firm to determine the relationship of the predominant wind direction relative to any buildings onsite to evaluate potential issues associated with noise.
2D	If existing buildings may be negatively impacted by noises from the turbines, redevelopment with wind energy may not be viable at this site.
2E	Using Google Earth or observations from a site visit, identify physical obstacles that may limit usable acreage on the site. Consider 1000-ft set backs for buildings and other large obstructions. Subtract space and associated setbacks from the usable acreage. Confirm that the reduced area still meets the 2 acre threshold.
2F	If existing obstacles reduce the overall usable acreage below 2 acres, there may be insufficient land available to make a wind installation viable at this site. For green remediation, the area threshold may not be applicable depending on on-site energy demand.
2G	Continue to I.3 Pre-Screening - Redevelopment Considerations

Phase I. Pre-Screening | Phase II. Site Screening | Phase III. Financial Screening

I.3 Redevelopment Considerations



Community Vision

The end use should be determined through a combination of the community's vision for the site, key site characteristics, and community assets. It is important that early consultation occur with the local community to ensure that reuse for renewable energy is aligned with the community's long term vision for the site. EPA promotes this approach in all land revitalization efforts.

Many end uses should be considered during the planning phase. The site may be dedicated to a single use or a combination of integrated uses. For example, urban agriculture projects or commercial reuse may be combined with wind energy.

Site Ownership

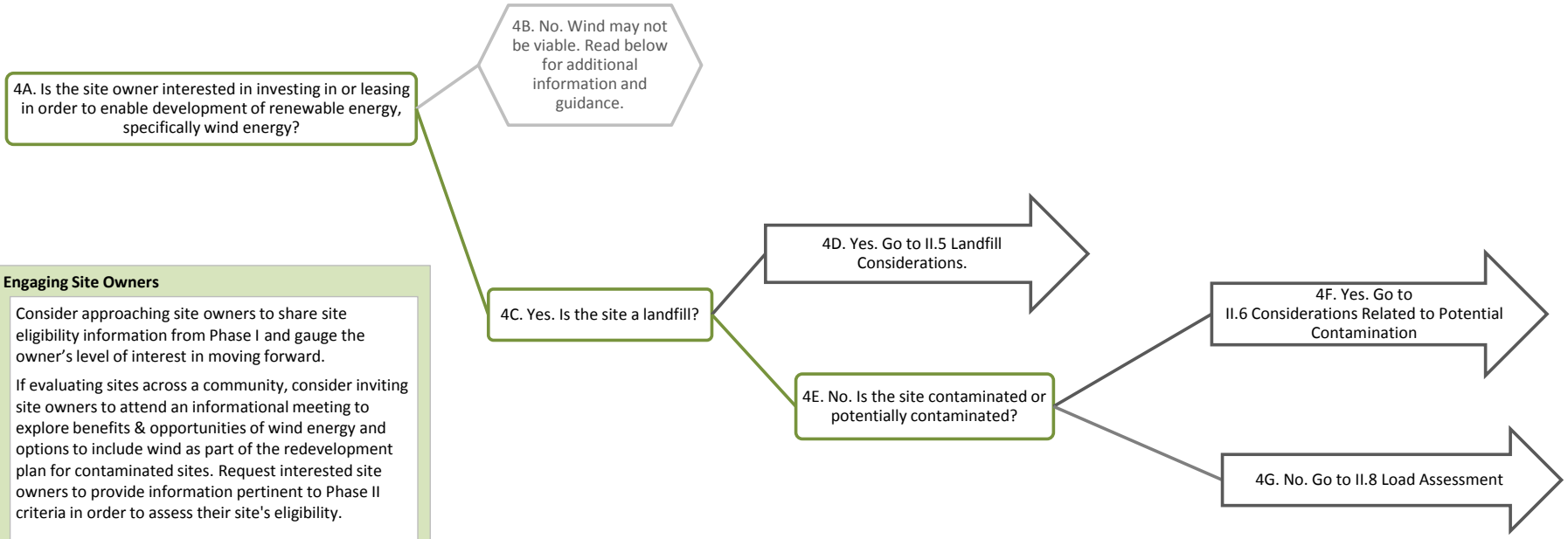
To proceed to the next step, you will need to engage with the site owner. Site ownership will drive the development path, impacts the structure of the system sale, and determines what incentives are available.

Site ownership information is readily available through checking either a local-level GIS parcel database or county-level parcel tax database. At this point in the process, simply take note of the site ownership and continue on in the decision tree. If evaluating sites across the community, a local-level GIS parcel database should include information on parcel ownership; sites that remain in the running can be categorically grouped according to public versus private ownership in preparation for Phase II.

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: - Exclusion of dense urban areas, water, wetlands, wild and scenic rivers, wilderness study areas, and critical habitat areas for endangered or threatened species - Exclusion of areas within 10,000 ft of airport runways https://oeaaa.faa.gov/oeaaa/external/gisTools/gisAction.jsp?action=showNoNoticeRequiredToolForm - Exclusion of specific areas near radar installations https://oeaaa.faa.gov/oeaaa/external/gisTools/gisAction.jsp?action=showLongRangeRadarToolForm - Restrictions may be applicable for migratory paths for birds and bats - 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. Refer to the DOD-NRDC Renewable Energy and Defense (READ) geospatial database to identify appropriate sites that may be unlikely to interfere with military activities and training and may have the fewest environmental conflicts. www.nrdc.org/energy/readgdb.asp
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	Check if the land area being evaluated for wind energy 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 wind energy. If a RCRA or Superfund site, check with EPA or State Clean-Up Manager, 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 wind energy into the redevelopment plans and continue to II.4 Site Ownership & System Type.
3D	Wind energy could be evaluated as a potential component of a future redevelopment plan.
3E	Evaluate the potential to add wind energy as a component of the redevelopment plan for either residential or commercial end uses.
3F	Wind energy 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.
3G	In some cases, the site or designated planning area in which the site is located may not have been through a community visioning process, which takes into account various future land re-use scenarios. 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, if present. EPA encourages meaningful community involvement in a locally-driven planning process. EPA has developed tools and programs to assist communities in this process, such as Smart Growth and Brownfields Area-Wide Planning initiatives. Through the planning and visioning process, communities may determine that residential or commercial infill may yield more benefits when compared to wind energy as an end use. See Appendix A for guidelines in evaluating whether the site may be a priority for future redevelopment based on Smart Growth objectives.
3H	Continue to Phase II.4 Site Screening - Site Ownership & System Type.
3I	Wind energy 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.

Phase I. Pre-Screening | Phase II. Site Screening | Phase III. Financial Screening

II.4 Site Ownership & Type



Engaging Site Owners

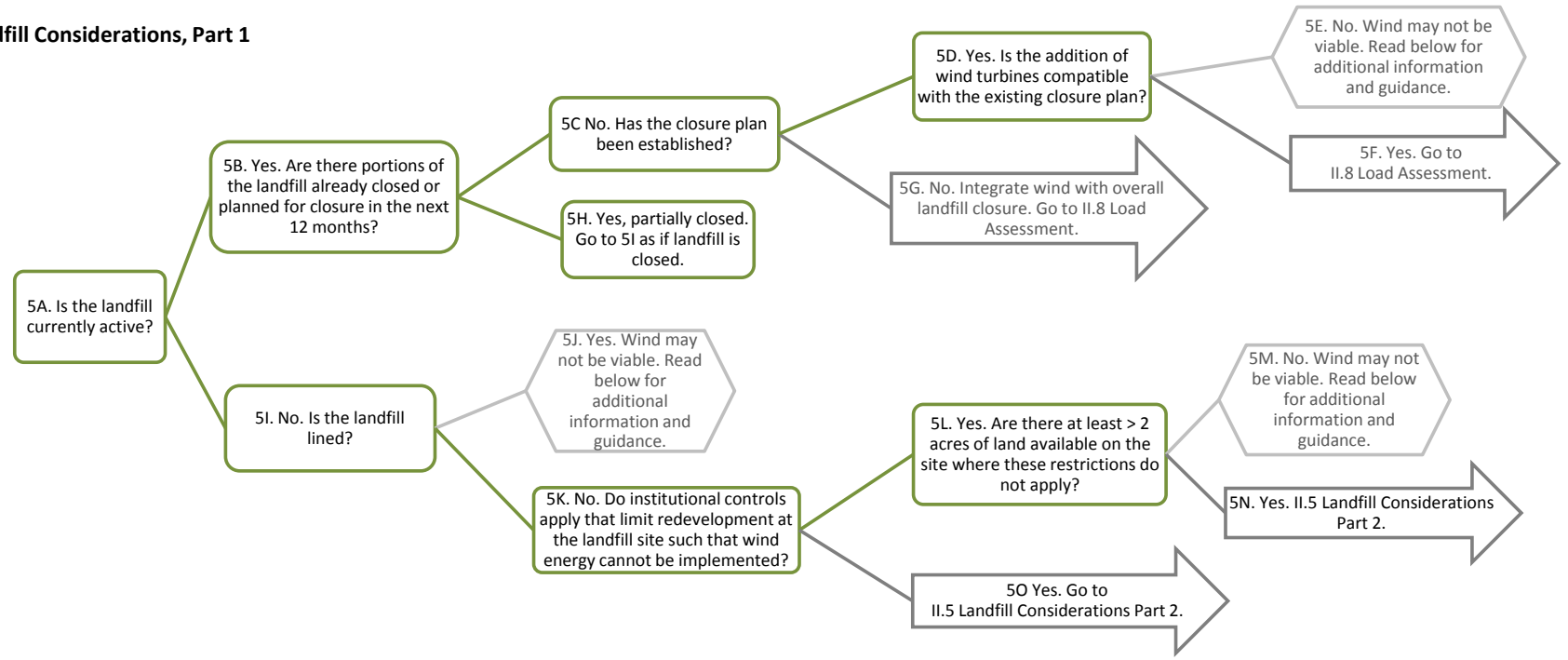
Consider approaching site owners to share site eligibility information from Phase I and gauge the owner's level of interest in moving forward.

If evaluating sites across a community, consider inviting site owners to attend an informational meeting to explore benefits & opportunities of wind energy and options to include wind as part of the redevelopment plan for contaminated sites. Request interested site owners to provide information pertinent to Phase II criteria in order to assess their site's eligibility.

Phase II.4: Site Screening - Site Ownership & System Type	
Question	**Explanatory Text and Additional Resources**
4A	Engage the site owner to gauge level of interest and what role the site owner would be interested in playing with respect to the wind energy system. At this stage, determine whether there are any restrictions that would preclude a long-term lease.
4B	If the site-owner is not interested in investing in redevelopment with wind energy, the project may not be viable at this time. You may wish to explore opportunities and resources to help inform the site-owner of possible benefits associated with redeveloping with renewable energy. Additional resources are available through the EPA and NREL websites referenced in the introduction.
4C	Remediation and installation considerations are different for landfill applications, as compared to general contaminated sites.
4D	Continue to II.5 Site Screening - Landfill Prioritization
4E	Contaminated sites may require additional design, construction, and maintenance considerations. These potential considerations should be taken into account during the screening process.
4F	Continue to II.6 Site Screening - Considerations Related to Potential Contamination.
4G	Continue to II.8 Site Screening - Load Assessment

Phase I. Pre-Screening | Phase II. Site Screening | Phase III. Financial Screening

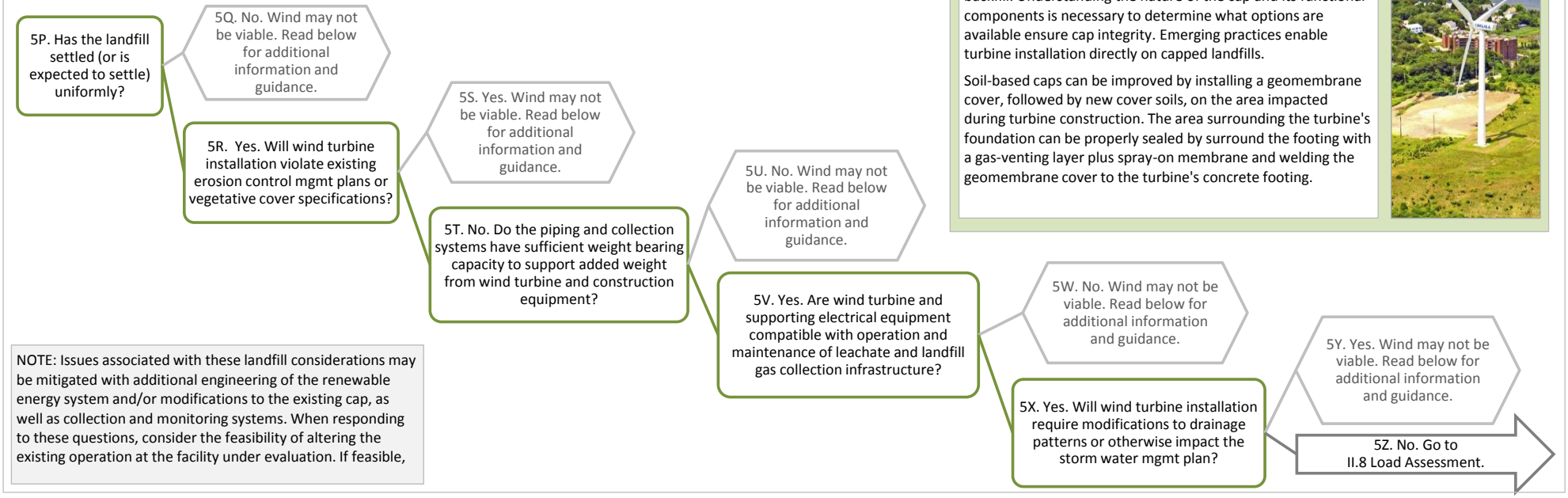
II.5 Landfill Considerations, Part 1



Phase II.5: Site Screening - Landfill Considerations, Part 1	
Question	**Explanatory Text and Additional Resources**
5A	Candidate landfills should be carefully selected based on status. There are opportunities for both active and closed landfills; each require special design considerations.
5B	Target cells that are (i) planned for closure or (ii) have been closed for near-term installations. For long-term planning purposes, consider designing a wind energy system integrated into the closure plan.
5C	For active sites, consider (i) installing wind turbines in buffer zones on the site and/or (ii) integrating a wind system into the closure plan. Buffer zones will likely place fewer design restrictions on turbine locations, while integrating the turbine locations with the closure plan provides an opportunity to focus on which wind turbine design works best with various landfill caps.
5D	If there is an existing closure plan, evaluate options to add wind turbines as part of the design.
5E	If the closure plan is not compatible, reconsider use of buffer zones. See 5C notes for benefits of developing buffer zones.
5F	Continue to II.8 Site Screening - Load Assessment
5G	Integrating wind turbines with the closure plan allows for optimization of both systems by building the required infrastructure for the wind energy system into the cap design and vice versa. Continue to II.8 Site Screening - Load Assessment
5H	If the landfill has closed cells, target these portions for near-term development. Go to Question 5I.
5I	Obtain records associated with landfill design to determine overall construction. Modern landfill are well-engineered facilities that are designed, operated, and monitored to protect the environment from contaminants that may be present in the solid waste stream. If active prior to 1970, there is a high likelihood that the site may not be lined and may contain contaminants.
5J	In the case that the landfill is lined, there may be restrictions on redevelopment due to potential for landfill contents to pass through the liner at driven pile locations. Explore technical solutions (e.g. backfill) to restore the integrity of the liner at foundation locations.
5K	Institutional controls include (i) proprietary controls, i.e. easements or covenants; (ii) governmental controls, i.e. zoning or building codes; (iii) enforcement and permit tools, i.e. restrictive landfill closure permits; and (iv) informational devices, i.e. deed notices.
5L	Re-evaluate usable acreage taking into account the impacts of applicable institutional controls. The 2-acre threshold, introduced in Phase I, continues to hold for mid-size to large turbines.
5M	If the usable acreage does not meet the size threshold, consider bundling multiple sites or co-locating with a solar PV system. If the usable acreage still does not meet the required threshold, redevelopment with wind energy may not be viable at this site.
5N	If there is the sufficient usable acreage, go to II.5 Landfill Considerations, Part 2.
5O	If redevelopment at the site is not limited by institutional controls, go to II.5 Landfill Considerations, Part 2.

Phase I. Pre-Screening | Phase II. Site Screening | Phase III. Financial Screening

II.5 Landfill Considerations, Part 2



NOTE: Issues associated with these landfill considerations may be mitigated with additional engineering of the renewable energy system and/or modifications to the existing cap, as well as collection and monitoring systems. When responding to these questions, consider the feasibility of altering the existing operation at the facility under evaluation. If feasible,

Integrating Foundation Design with Landfill Cap Restoration

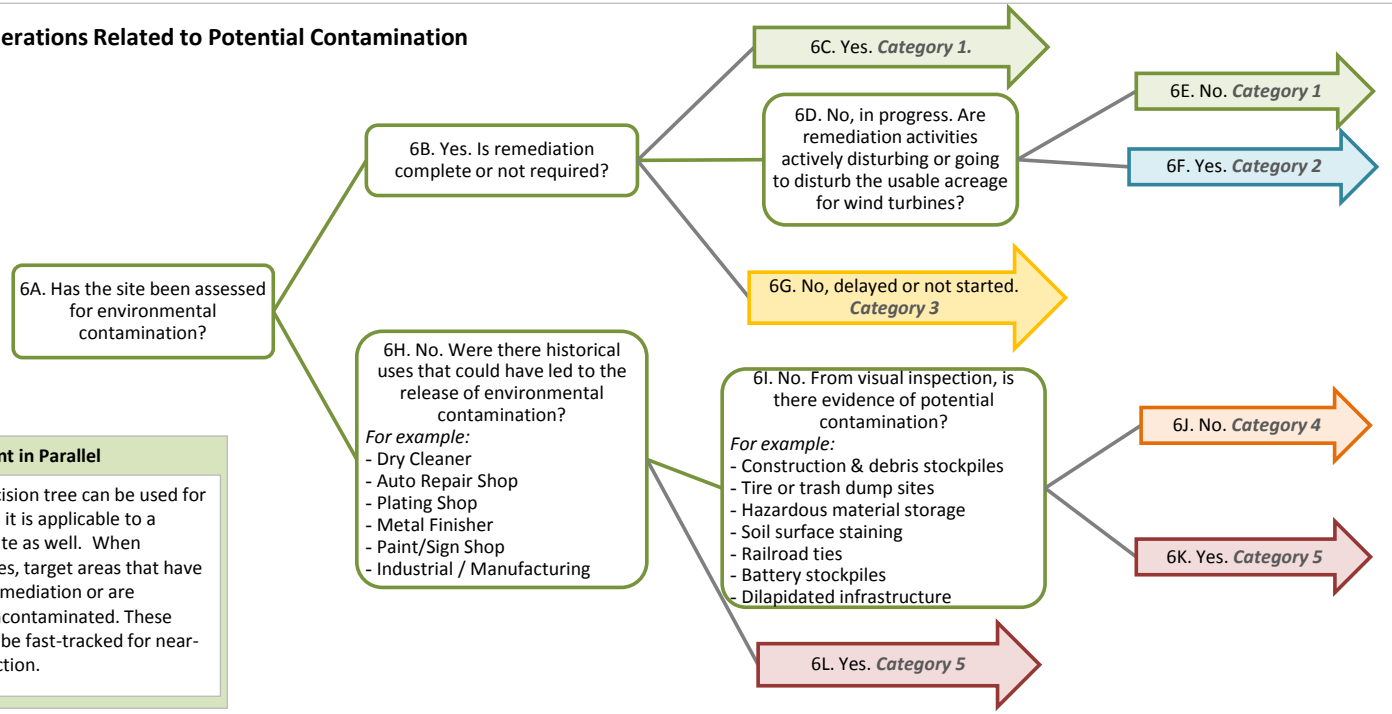
Landfill caps range from highly engineered systems to simple backfill. Understanding the nature of the cap and its functional components is necessary to determine what options are available ensure cap integrity. Emerging practices enable turbine installation directly on capped landfills.

Soil-based caps can be improved by installing a geomembrane cover, followed by new cover soils, on the area impacted during turbine construction. The area surrounding the turbine's foundation can be properly sealed by surround the footing with a gas-venting layer plus spray-on membrane and welding the geomembrane cover to the turbine's concrete footing.

Phase II.5: Site Screening - Landfill Considerations, Part 2	
Question	**Explanatory Text and Additional Resources**
5P	All landfills are prone to settlement, but the type and magnitude of the settlement varies depending on landfill design, age, and composition of the waste materials. Uniform settlement refers to waste material decaying evenly, resulting in the landfill cap settling at a similar rate over large areas. Differential settlement refers to material decaying at different rates throughout the landfill, resulting in an uneven surface. As a general rule, developers target sites that have been capped for longer than 2-3 years due to the high rate of settlement expected after closure. If the landfill has exhibited uniform settlement in the past, the site may be viable. Settlement predictions will need to be adjusted to account for effects on the settlement rate and/or pattern due to wind turbines.
5Q	Differential settlement may be a significant concern for landfill-based wind projects. This type of settlement may result in uneven stresses on the mounting system and foundations, causing potential structural issues and impacting system performance. Consult a developer or civil engineer to evaluate feasibility concerns. If appropriate, go to Question 5R.
5R	Review the erosion control management plan and vegetative cover specifications in order to ensure compliance with post-closure plan requirements. During the proposal, design, and construction process, communicate these requirements clearly in order to avoid compliance issues and costly rework.
5S	The design and specification of erosion control measures may be modified to include placement of turbine foundations and support structures when using ballasted or shallow-poured foundations. If appropriate, go to Question 5T.
5T	Nearly all landfills incorporate the use of leachate and landfill gas collection and/or treatment systems. Both systems generally consist of a network of pipes imbedded through the waste material in the landfill cells. Obtain design documentation for these systems to confirm that additional loading from wind turbines will not exceed the bearing capacity of these systems.
5U	Investigate the use of light weight systems or alternate foundation designs that may distribute the turbine weight to an acceptable level. If appropriate, go to Question 5V.
5V	The infrastructure for leachate and landfill gas systems will also need to be taken into account for laying out the wind turbines to ensure that there is not physical interference and proper clearances are maintained for operation, maintenance, and safety.
5W	Evaluate the impact of creating setbacks in specific portions of the landfill to avoid this infrastructure. If these considerations reduce the usable area below 2 acres, wind may not be viable.
5X	Review the storm water management plan incorporated into the landfill post-closure plan. Storm water management is closely tied to erosion control and vegetative cover systems. The landfill components are designed to (i) absorb a portion of storm water runoff; (ii) convey additional runoff to retention ponds either at or below the surface. This system is designed to prevent channeling of storm water runoff which can lead to erosion and fissures in the landfill cap.
5Y	Propose the development of an alternate storm water management plan that takes into account grading, fill, and compaction requirements for wind turbines. Designing the storm water management and wind turbine array as an integrated system can result in considerable savings. If appropriate, proceed to II.8 Site Screening - Load Assessment.
5Z	Continue to II.8 Site Screening - Load Assessment

Phase I. Pre-Screening | Phase II. Site Screening | Phase III. Financial Screening

II.6 Considerations Related to Potential Contamination



Redevelopment in Parallel

While the decision tree can be used for an entire site, it is applicable to a portion of a site as well. When evaluating sites, target areas that have undergone remediation or are potentially uncontaminated. These portions may be fast-tracked for near-term construction.

Ranking by Project Readiness

Cat 1. Site assessed, and remediation is not a barrier to near-term wind project.

Cat. 2. Site assessed, and remediation must be completed prior to potential wind energy project.

Go to II.8 Load Assessment

Cat. 3. Site assessed but lacks active remediation plan. Option to tailor remediation plan for wind, if warranted.

Cat. 4. Site not yet assessed. Contaminants may be present that need to be addressed. Site conditions may pose fewer obstacles to potential PV project.

Cat. 5. Site not yet assessed. Site investigation and characterization is required as a next step prior to further scoping for potential wind energy project.

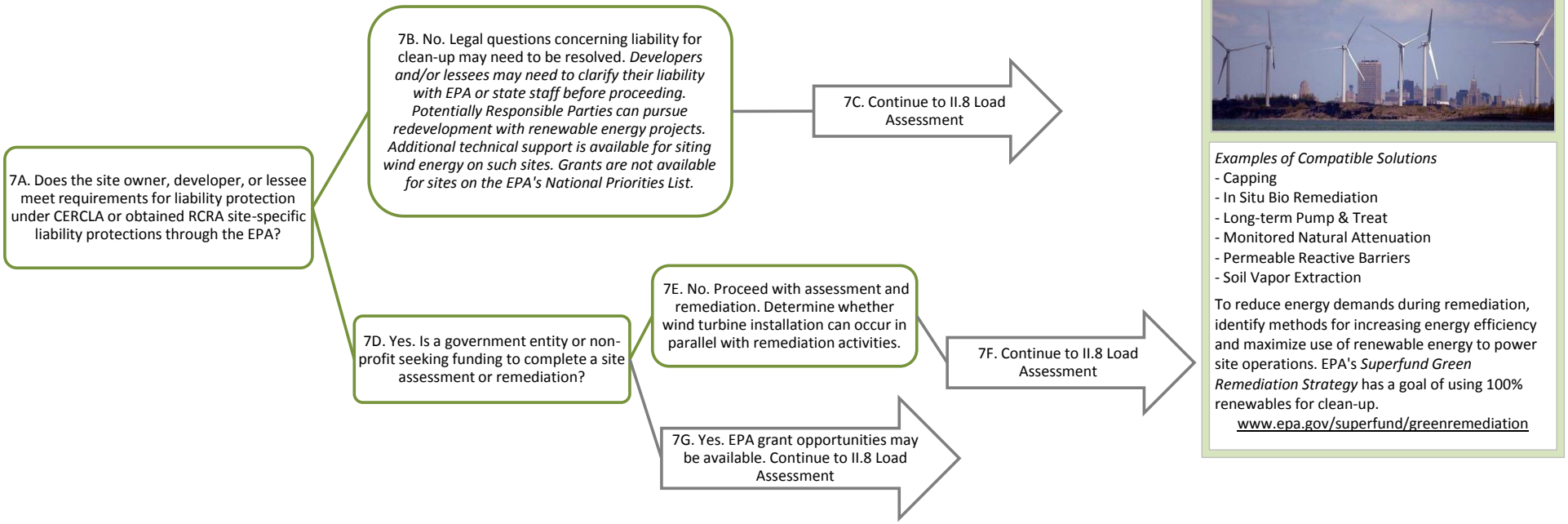
Go to II.7 Remediation

See Appendix B for additional information.

Phase II.6: Site Screening - Contaminated Land Prioritization	
Question	**Explanatory Text and Additional Resources**
6A	A site assessment and characterization will identify need for future cleanup, which areas on the site may be excluded from redevelopment, and estimated usable acreage. To find information on potentially contaminated lands and their status, check applicable Federal (EPA) and State online databases for siting listings and Project Manager contact information. 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. 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. 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	If remediation has been completed or determined to not be 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 may need to be completed prior to initiating wind turbine construction. Once the wind turbine is installed, it will be difficult to access the area beneath and surrounding the turbine foundation.
6E	Based on planned remediation activities, the site can be ranked under Category 1; see Appendix B. Go to II.8 Site Screening - Load Assessment.
6F	Based on planned remediation activities, the site can be ranked under Category 2; see Appendix B 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 B. Go to II.7 Site Screening - Initiating Assessment and Remediation.
6H	If site characterization and investigation is not yet complete, begin this process prior to developing a wind energy resource at the site. This screening list gives general guidance on how the site can be prioritized for future redevelopment with wind energy. 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 or www.brownfieldstsc.org.
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 B. 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 5; see Appendix B. 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 B. 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

Phase I. Pre-Screening | Phase II. Site Screening | Phase III. Financial Screening

II.7 Initiating Assessment & Remediation *Potentially Contaminated Land Categories 3, 4, & 5*



Remediation Plans Compatible with Wind

Examples of Compatible Solutions
- Capping
- In Situ Bio Remediation
- Long-term Pump & Treat
- Monitored Natural Attenuation
- Permeable Reactive Barriers
- Soil Vapor Extraction

To reduce energy demands during remediation, identify methods for increasing energy efficiency and maximize use of renewable energy to power site operations. EPA's *Superfund Green Remediation Strategy* has a goal of using 100% renewables for clean-up.
www.epa.gov/superfund/greenremediation

Phase II.7: Site Screening - Remediation	
Question	**Explanatory Text and Additional Resources**
7A	***Following an initial assessment seek legal counsel to make final determination with regard to liability in coordination with the appropriate EPA office.*** There are two principle federal clean-up laws that govern contaminated sites: the *Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)* or the *Resource Conservation and Recovery Act* (RCRA). CERCLA and RCRA liability considerations and protections for renewable-energy development projects are addressed in EPA's March 2011 publication entitled, "Siting Renewable Energy on Contaminated Properties: Addressing Liability Concerns." Document No. EPA-330-F-11-001. For city-owned or to-be-acquired parcels, see EPA's March 2011 factsheet entitled, "CERCLA Liability and Local Government Acquisitions and Other Activities." Document No. EPA-330-F-11-003.
7B	If the site owner, developer, or lessee does not qualify for conditions necessary to claim liability protection, contact the EPA for additional guidance on how to proceed with redevelopment plan for this site. Resources are available through the RE-Powering America's Land Initiative (www.epa.gov/renewableenergyland/contacts.htm) or through the EPA Office of Enforcement and Compliance Assistance (www.epa.gov/compliance).
7C	Continue exploring project with knowledge that contamination issues may need to be resolved prior to redevelopment. Go to Phase II.8 Site Screening - Load Assessment.
7D	In some cases, lack of funding has delayed site assessment. EPA and other grant opportunities may be available. For more information on brownfield assessment and clean-up grant opportunities for government entities and non-profits, go to www.epa.gov/brownfields/grant_info/index.htm
7E	Continue exploring project with knowledge that contamination issues may need to be resolved prior to redevelopment.
7F	Continue to Phase II.8 Site Screening - Load Assessment.
7G	Proceed with grant application process. In parallel, continue site assessment. Continue to Phase II.8 Site Screening - Load Assessment.

Phase I. Pre-Screening | Phase II. Site Screening | Phase III. Financial Screening

II.8 Load Assessment

8A. Is the estimated system size at least 100 kW?

8B. No. Wind may not be viable. Read below for additional information and guidance.

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?

8D. No. Is there a potential off-taker for the electricity generated? (e.g. utility, third-party or other power producer)

8E. No. Wind may not be viable. Read below for additional information and guidance.

8F. Yes. Continue to III.9 Financial Screening

8G Yes. Is net metering allowed by the local utility?

8H. No. Wind may not be viable. Read below for additional information and guidance.

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

8J. No. Wind may not be viable. Read below for additional information and guidance.

8K. Yes. Continue to III.9 Financial Screening

Example Wind Farm Layouts

(i) Single string; (ii) Multiple stings
Source: National Renewable Energy Laboratory

Estimating System Size

System size is dependent on a wide range of factors: (i) available resource; (ii) available land (iii) site topography; (iv) land costs; (v) setback requirements; and (vi) turbine selection.

While the individual turbine footprint is relatively small (0.25 acres per turbine), significant acreage is required for space between turbines and setbacks from existing structures. Typically, wind farms are designed with 3-15 rotor diameters between turbines. This space may be utilized for an alternate use.

The U.S. Department of Energy classifies small turbines at <100 kW, mid-size turbines in the 100 kW to 1 MW range, and large turbines > 1 MW.

Historically, projects have used between 8 to 50 acres per MW installed, based on turbine size and spacing requirements. For the purposes of this exercise, use the land requirement estimates below based on "1.5 x tip height" setbacks for the following turbine sizes:

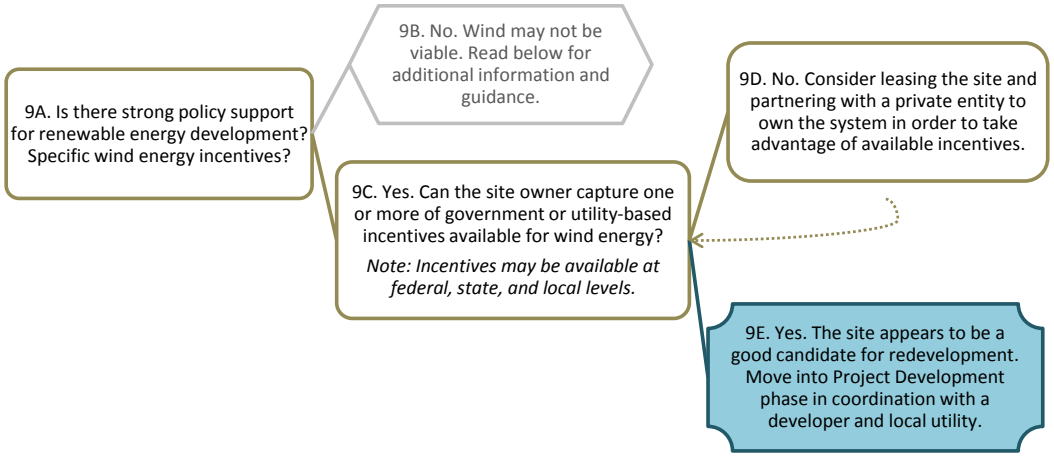
Turbine Size	Machine Rating	Hub Height	Rotor Diameter	Acres per Turbine
Small	100 kW	32 m	21 m	1.3
Mid	900 kW	70 m	60 m	6.8
Large	2 MW	80 m	90 m	10.6

For a single line of turbines built perpendicular to the predominant wind direction, assume 2 acres/MW.

Phase II.8: Site Screening - Load Assessment	
Question	**Explanatory Text and Additional Resources**
8A	A system of 100 kW or greater is most likely to be economically viable. The larger the wind turbine, the more power will be produced per installed cost, the faster the payback, and the lower the lifecycle energy costs will be due to economies of scale.
8B	If the estimated system size is less than 100 kW, determine if a smaller wide turbine could be economically viable. There are many turbines available in the 1-50 kW range. However, turbines in this range generally have a higher cost of electricity.
8C	For grid-connected systems, on-site power demands are important to consider but may not significantly impact the feasibility of a wind energy 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. For all facilities, confirm that the facility is expected to be in use for the life of the system.
8D	If there is no on-site load, the electricity generated by the wind turbines will need to be fed onto the grid and sold to the utility at a wholesale rate, which is considerably lower than retail rates.
8E	If there is neither an on-site load or potential offtaker for the electricity, wind energy may not be viable at this site. It is recommended to 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 wind energy and other renewable sources 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; proceed to Phase III.9 Financial Screening. Alternatively, consider selling power directly back to the utility at wholesale rates; go to 8D.
8I	If the average price of electricity is greater than 8 cents/kWh, wind energy may be economically feasible in this location. Typically, wind energy makes the best economic sense when it is being installed in an area where electricity costs are relatively high or incentives are high. The levelized cost of electricity (LCOE) is calculated by dividing the total system costs by the estimated lifetime production, yielding $/kWh. Using LCOE allows wind energy to be compared to other energy production sources, including existing retail electricity rates. Generally, as retail electricity rates increase, the economics of a renewable energy project greatly improve.
8J	The economics of wind energy is greatly reduced when the retail electricity rate is very low. If there are other monetary and/or non-monetary benefits associated with installing wind turbines at this site or if considering an off-grid system, continue on to Phase III.9 Financial Screening. As an alternative, consider selling power directly to the utility at a wholesale rate; proceed to 8D if appropriate.
8K	Go to Phase III.9 Financial Screening

Phase I. Pre-Screening | Phase II. Site Screening | Phase III. Financial Screening

III.9 Financial Screening



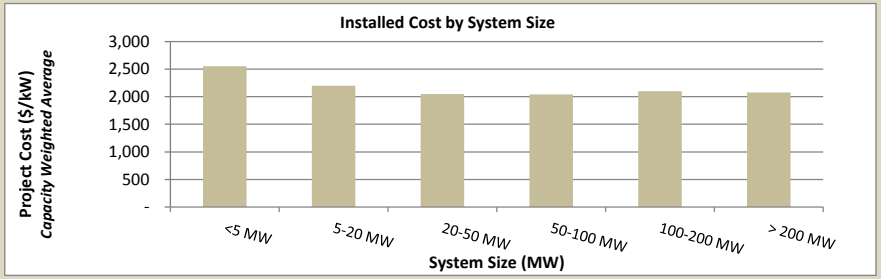
Wind System Price & Project Economics

Wind turbine price is set through a combination of turbine size and overall system size. Economies of scale are realized both with larger turbines and for larger wind farms. System price is typically expressed in dollars per kilowatt ($/kW). Generally, prices are less than $3,000/kW.

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, interconnection upgrades, and availability of installers within a particular area.

Project economics are generally assessed based on common economic measures (net present value and payback period) as well as the levelized cost of electricity (LCOE) compared to existing and projected electricity costs.

The U.S. Department of Energy created and maintains the "System Advisor Model" (SAM) tool, which enables users to calculate LCOE and other performance and economic metrics for wind, PV, concentrating solar power, solar water heating, and geothermal systems. https://sam.nrel.gov. When evaluating system prices, additional support may be available through NREL's Technical Assistance Program.



Source: *2010 Wind Technologies Market Report, Lawrence Berkeley Laboratory*

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 wind energy project. Strong state policies can support renewable energy development by promoting market demand, providing certainty in the investment market, and incorporating the external benefits of the technologies into cost/benefit calculations. The economic feasibility of wind energy 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 wind installations. Combined with federal programs, such as the Federal Investment Tax Credit, state incentives significantly decrease the cost of installing wind turbines. 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" (www.nrel.gov/analysis/pdfs/45971.pdf)
9B	Without strong policy support for renewable energy development at the federal, state, or local level, a wind energy 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 wind energy 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 (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	Congratulations! This site appears to be a good candidate for redevelopment with wind energy. Based on the desired ownership and financing model, issue a Request For Proposals (RFP) that includes information compiled during the site screening process and detailed information about the site (topo maps, soil reports, etc.). Wind energy pricing continues to evolve with market conditions. It is recommended to obtain multiple bid proposals. Once the renewable energy system is deployed, consider joining EPA's Green Power Partnership to communicate your organization's leadership in green power production to key stakeholders (www.epa.gov/greenpower). The RE-Powering initiative offers additional resources to facilitate implementation of wind energy on contaminated land. Take advantage of these resources at www.epa.gov/renewableenergyland.

Appendix A. Smart Growth Objectives

Criteria for Smart Growth Objectives

EPA's Smart Growth program promotes visioning forums that inform communities on the benefits associated with transit-oriented development in locations that are ideally suited for infill residential or commercial redevelopment.

Sites that meet all or the majority of the following criteria may be considered to have excellent (E) or good (G) location-based Smart Growth potential for redevelopment, e.g. residential, office, or retail use.

NOTE: While quantitative criteria are used, this is not an official or comprehensive rating system but rather guidance to help users make qualitative judgments. These criteria can be addressed with information available through either Google GIS maps or local land use planning resources. For example, it does not take into account local zoning restrictions that may apply, how well the existing street infrastructure accommodates pedestrian and bicyclist safety and attractiveness, or other potential barriers to site redevelopment.

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? *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.*	E/G
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

References: The following documents were used as source material to create this qualitative assessment tool.

1. "Smart Growth for Brownfields Redevelopment: A Brownfields Screening Tool," prepared by GSG Consultants for the City of Chicago, May 2005. www.epa.gov/dced/publications.htm

2. "Restructuring the Commercial Strip: A Practical Guide for Planning the Revitalization of Deteriorating Strip Corridors," prepared by ICF International and Freedman, Tung & Sasaki, 2010, Section 2. www.epa.gov/dced/publications.htm

3. Smart Growth Project Scorecard, Smart Growth Leadership Institute, December 15, 2007. www.sgli.org/toolkit/tools/scorecard.pdf

4. Smart Growth Project Scorecard samples. www.epa.gov/smartgrowth/scorecards

Appendix B. Contaminated Sites & Project Readiness

Ranking by Project Readiness		
Category	Status Description	Explanatory Text and Additional Resources
1	Site assessed, and remediation is not a barrier to near-term wind project.	Site conditions are conducive to installing a wind energy system in the near-term. There may be institutional or engineering controls in place that may limit or restrict on-site activity and/or end use, especially if remediation included leaving waste in place. See II.7 for examples of remediation plans compatible with wind installations.
2	Site assessed, and remediation must be completed prior to potential wind project.	Site conditions are conducive to installing a wind energy system following completion of remediation activities. Check the remediation plan to determine when remediation activities will be completed.
3	Site assessed but lacks active remediation plan. Option to tailor plan to potential wind project, if warranted.	Sites in Category 3 could be experiencing delays or inactivity for a number of reasons. The next step is to contact the site's Project Manager to check into the reason(s) behind the delay. Consider whether the potential for a wind energy installation would present a re-use alternative that addresses the reason for delay or inactivity in taking the next step towards remediation.
4	Site not yet assessed. Contaminants may be present that need to be addressed. Site conditions may pose fewer obstacles to potential wind project.	There may be sites in Categories 4 and 5 that are well suited for wind energy and should not be overlooked. Several of these sites may be low priority for residential or commercial redevelopment, which could explain why they have not yet been assessed. However, the prospect of re-purposing the site for a wind energy project may trigger interest to pursue funding for a site investigation. A site investigation determines whether there is a release of environmental contamination and, if so, the extent of the contamination. These investigations help eliminate the uncertainty associated with potential or actual contamination at a property. In some cases, clean-up may not be required. The site investigation and cleanup cost analysis can be structured to include a comparison of cleanup costs that would be necessary to re-purpose the site to wind versus other potential redevelopment re-uses that may incur larger cleanup costs. See Appendix C. Ideal Site Checklists for characteristics that would make a **site** ideal for siting a wind project.
5	Site not yet assessed. Contaminant investigation and characterization is required as a next step prior to further scoping for potential wind project.	

Appendix C. Ideal Site Characteristics Checklists

Quick Guide

These checklists are designed to serve as a quick reference tool to screen landfills or potentially contaminated sites for near-term project implementation. These checklists are not comprehensive and are not meant as a substitute for use of the decision tree to screen sites.

Landfills	
☑	- Capped & closed (at least the portion being evaluated for wind); ***OR*** - Capped & pre-remedy; closure plan can readily incorporate wind installation; ***OR*** - Uncapped & pre-remedy; geotechnical and resource investigation for wind can help determine cap requirements
☑	- Owner abandoned & no incentive for private redevelopment - Site available for lease; does not need to be purchased by a developer - Site does not have an expensive or short-term lease arrangement
☑	Landfill closed more than 2-3 years prior to planned construction start and has not experienced differential settlement
☑	Wind turbine installation compatible with site's long-term monitoring and maintenance plan, including leachate and gas collection systems, erosion control and storm water management plans

Site definitions

Potentially Contaminated Site: Sites where contamination is suspected but has not been confirmed and sites where contamination has been identified.

Brownfield: Typically a site that may have (or be perceived to have) contamination issues. With certain legal exclusions and additions, the term "brownfield site" means real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.

Underutilized Spaces: Sites that are currently inactive and can be leveraged for additional benefit, e.g. abandoned parcels, parking lots, or commercial/industrial rooftops.

Potentially Contaminated Sites - Pre-Remediation	
☑	-Assessment determines that levels of contamination do not pose unacceptable risk to human health and the environment; ***OR*** - Historic uses not likely to have caused significant contamination requiring expensive cleanup; ***OR***
☑	- Cleanup costs to redevelop site to residential or commercial space are prohibitive but would not be for wind energy reuse AND site otherwise meets all other wind energy eligibility criteria
☑	Usable acreage for wind turbines at site is currently underutilized, inactive, or undisturbed
☑	-Site redevelopment plan supports renewable energy; ***OR*** -No site redevelopment plan in place and site not otherwise a priority for redevelopment for alternate uses

Contaminated Sites - During Remediation	
☑	Remediation/cleanup will not require site surface to be actively disturbed or active disturbance limited to a small portion of usable acreage for wind
☑	Design and construction of wind turbines can be created in parallel with development and implementation of remedy

Contaminated Sites - Post-Remediation	
☑	Wind turbines will not compromise remediation solution in place during construction or operation phase
☑	Zoning or other institutional controls limit redevelopment for residential, commercial, or recreational uses AND allow for redevelopment for renewable energy

Appendix D. Examples of Federal Incentive Programs

Incentive Program / Description	Residential	Multi-family	Commercial	Industrial	Manufacturing	Agricultural	Native Corporation	Schools	Non-Profits	Utility	Municipal Utility	Rural Elec. Cooperative	Public Power Entity	State Gov't	Local Gov't	Tribal Gov't	Non-Federal
	Eligible Sectors																
Investment Tax Credit (ITC)			X	X		X				X							
Production Tax Credit (PTC)			X	X		X											
Residential Energy Conservation Subsidy Exclusion (Corporate)		X															
Modified Accelerated Cost-Recovery System (MACRS)			X	X		X											
Tribal Energy Program Grant																X	
USDA – High Energy Cost Grant Program	X		X						X					X	X	X	
USDA – Rural Energy for America Program (REAP) Grants			X					X				X	X	X	X	X	
USDA – REAP Loan Guarantees			X			X											
Clean Renewable Energy Bonds (CREBs)											X	X		X	X	X	
Qualified Energy Conservation Bonds (QECBs)														X	X	X	
DOE - Loan Guarantee Program			X	X	X	X		X	X					X	X		X
Qualifying Advanced Energy Manufacturing Tax Credit			X	X	X												
Renewable Energy Production Incentive (REPI)							X				X	X		X	X	X	

Appendix E. Examples of State & Local Incentive Programs

State Incentives
Wind Energy Incentive Programs
Tax Increment Financing (TIF)
State tax credit
3rd party power purchase agreement (PPA) policies
State Grant
Interconnection Standards
Loan Program
State-wide feed-in tariff (FIT) for renewable energy
Property Tax Incentive
Public Benefits Fund
Production Incentive
Rebate Program
Sales Tax Incentive
Clean-Up Programs
Clean-Up Loans
Revolving Loan Funds
Reimbursement for Orphan Shares
Underground Storage Tank (UST) Clean-up Fund

Local Incentives
Revolving Loan Fund
Loan Program
Tax rebate (Commercial and/or Residential)
Renewable Energy Feed-in-Tariff (FIT)

Additional References

For eligibility information for state incentives, see the Database for State Incentives for Renewables and Efficiency. This online database serves as a comprehensive repository on incentive programs on a state-by-state basis. In some cases, local programs are also listed, e.g. feed-in-tariff (FIT)programs through a specific utility.
www.dsireusa.org