Appendix E – Prioritization Tool and Handbook

Prioritization Tool Handbook
Sustainable Energy Parks

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Purpose and Introduction

The purpose of the Prioritization Tool (hereinafter referred to as 'the Tool') is to facilitate and guide information gathering to qualitatively and quantitatively classify and evaluate properties using identified screening criteria to establish their potential as Sustainable Energy Parks. The Tool will provide community members, local and state officials, energy and property developers, landowners, mine operators, entrepreneurs, and all other stakeholders with site data to help with decision-making for future energy development opportunities on potential candidate sites.

The Handbook was developed primarily to show the user how to gather and input data into each section, or Tab. Additionally, the Handbook will provide some background information, descriptions of the needed data, and other crucial and beneficial information to help users understand the Tool.

Goals and Objectives

The primary goal of the Tool will be to aid the user with development of the following objectives:

- The selection of potential properties for Sustainable Energy Parks consideration
- Creating a standard and consistent set of data among all candidate properties to help with evaluating top sites
- Determining threshold criteria and market values for each energy type
- Displaying feasibility of each sustainable energy type per site
- Evaluating potential profits from multiple sustainable energy types
- Providing common ground between developers and communities through complete set of gathered data that provides potential SEP properties
- Enabling communities to attract interested energy developers

Background Information and Considerations

The Prioritization Tool was created as part of the Environmental Protection Agency Region III's *Sustainable Energy Parks on Mine-Scarred Lands In Appalachia* project that was a result of a Training, Research, and Technical Assistance Grant awarded to the West Virginia Water Research Institute (WVWRI) at West Virginia University in 2008.

The following background information will be useful when entering data into the Tool and is provided to help users with planning considerations that should be used to guide the data collection and assembly.

The Tool was created in a Microsoft Excel® spreadsheet, which was chosen due to its widespread availability and user-friendliness. Our goal with this choice was to include users with a range of technical abilities.

It is highly recommended that users save the original version of the Tool and create a second copy for editing in order to prevent errors within your original file.

Also, it is important to periodically evaluate and update the screening criteria and market values prior completion of output results. Constantly changing market conditions and various state and federal incentives and taxes must match the current economic climate.

Also, never rule out site-specific anomalies or ownership considerations that may be too difficult to overcome for a site to become a viable candidate for sustainable energy.

Stakeholder Use

Community leaders can use the Tool to attract energy developers to their properties for consideration as Sustainable Energy Parks. Energy developers can use the Tool's completed information to quickly select the top sites for energy developers. Local and state officials can use the Tool to bridge the gaps between community members and developers and to seek outside federal, state, and local funding opportunities. Landowners and mine operators can use the Tool to understand if their property has the potential to be used as a Sustainable Energy Park.

Other stakeholders may realize similar uses described above in this section. However, they may also use the Tool for planning and forecasting future development.

Prioritization Tool Use and Guidance

The Tool has two data inputs tabs and three data outputs tabs, which are described in the following sections. The 'tab' simply refers to what Microsoft Excel® refers to as a 'Worksheet'. Located at the bottom of the spreadsheet, the tabs look similar to hard copy file folder tabs (See **Figure 1** below).

The data inputs tabs (see **Figure 2** below) require users to import and update screening criteria, market values, and site characteristics, which are linked to the outputs tabs (See **Figure 3** below). The data inputs tabs include:

- the *Screening and Market Inputs* tab
- the *Site Characteristic Inputs* tab

Once users successfully enter all required inputs on the '*Screening and Market Inputs*' and '*Site Characteristic Inputs*' tabs, the Tool will automatically populate the outputs tabs (See **Figure 3** below). The data outputs tabs include:

- the *Biofuel Outputs* tab
- the *Solar Outputs* tab
- the *Wind Outputs* tab

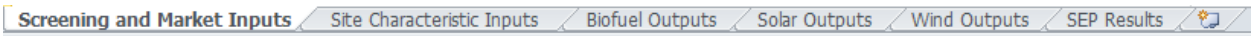

Figure 1: Prioritization Tool data inputs and outputs tabs.

Figure 2: Prioritization Tool data inputs tabs.

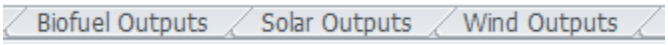

Figure 3: Prioritization Tool data outputs tabs

The *Biofuel*, *Solar*, and *Wind Outputs* tabs will then provide results on whether particular properties have the potential for that energy type, the quantity of energy production per site, and financial outputs and values of each site (See **Figures 1, 3, and 6-8**).

Step-by-step guidance is provided below to help users input data into each tab within the Tool.

Screening Criteria

The screening criteria within the Tool are located on the *Screening and Market Inputs* tab (See **Figure 4** below). These screening criteria will provide the threshold values that will be factored into selecting or deselecting certain properties. If a property doesn't meet the minimum threshold value for at least one of the screening criteria, a 'no' value will be returned in the *Biofuel Possible*, *Solar Possible*, or *Wind Possible* columns within the Outputs tabs (See **Figures 6-8** below).

For example, let's look at calculating the possibility of wind on a particular property based on the prefilled *Wind Resource Potential* of 5.5 m/s at a height of 80 meters (See **Figure 4** below). If all screening criteria exceed their threshold values, except the *Wind Resource Potential* is below 5.5 m/s, the site will not be viable for wind. This means that the wind speed at that site is not sufficient enough, and therefore will not be a viable site for wind energy. However, exclusion from being viable for wind energy does not exclude that site from having the potential to be viable for one or both of the other energy types, because the screening criteria and threshold values differ between energy types. It may very well be suitable for consideration of another energy type.

The screening criteria and threshold values that are currently loaded in the tool on the *Screening and Market Inputs* tab were collected from these documents:

- 'Screening Sites for Solar PV Potential' by EPA/NREL
- 'Screening Sites for Wind Energy Potential' by EPA/NREL
- 'Market Opportunities for Switchgrass' prepared by Marshall University's Center for Business and Economic Research

On the *Screening and Market Inputs* Tab these values are considered screening criteria:

<u>Wind</u>

- Wind Resource Potential (m/s @ 80m)
- Minimum Available Land – Ridgetops (acres)
- Distance to Transmission Lines (Miles)

- Distance to Nearest Road (Miles)

Solar

- Solar Resource Potential (kWh/m^2/day)
- Minimum Available Land (Acres)
- Distance to Nearest Road (Miles)
- Distance to Graded Road (Miles)
- MW Generation Potential (Acres/MW)

Biofuels

- Minimum Available Land (Acres)
- Distance to Nearest Processing Facility (Miles)
- Distance to Nearest Road (Miles)

The market values include:

Wind

- Wind system cost ($/kW)

Solar

- MW Generation Potential (Acres/MW)
- PV System Cost ($/watt)

Biofuel

- Biofuel Yield (tons/acre)
- Biofuel Production Costs ($/acre)
- Biofuel Value ($/ton)

Screening and Market Inputs Tab

The *Screening and Market Inputs* Tab within the Prioritization Tool is provided for the user to input and/or adjust the key screening criteria and update market values based on the current economics for each of the three energy types (See **Figure 4** below). In this section, we will discuss how to determine whether the screening criteria or market values need updated or not. You'll notice that in the Tool some values have already been prefilled. These are based on known research or documents discussed below.

Screening and Market Inputs		
Wind Screening Criteria and Market Values		
Wind Resource Potential[1]	5.5	m/s @ 80m
Minimum Available Land (Ridgetops)[1]	2	Acres
Distance to Transmission Lines[1]	1	Mile(s)
Distance to Nearest Road[1]	1	Mile(s)
Wind System Cost[2]	$ 3,000.00	$/kilowatt
Solar Screening Criteria and Market Values		
Solar Resource Potential[3]	3.5	kWh/m2/day
Minimum Available Land (Solar)[3]	2	Acre(s)
Distance to Nearest Road[3]	0.5	Mile(s)
Distance to Graded Road[3]	1	Mile(s)
MW Generation Potential[4]	5	Acres/MW
PV System Cost[5]	4.50	$/watt
Biofuels Screening Criteria and Market Values		
Mininum Available Land (Biofuels)[6]	10	Acre (s)
Distance to Nearest Processing Facility[6]	150	Mile(s)
Distance to Nearest Road[6]	5	Mile(s)
Biofuel Yield[6]	4	tons/acre
Biofuel Production Costs[6]	171.42	$/acre
Biofuel Value[6]		$/ton

Figure 4: Screening and Market Inputs tab with pre-filled data

Wind Screening Criteria and Market Values Box

The prefilled ***Wind Resource Potential*** screening criteria value is calculated in meters per second (m/s) averaged over an entire year at a specified height measured in meters above ground level. For our purposes, we've adopted the 5.5 m/s at 80-meters based on the *EPA/NREL Screening Sites for Wind Energy Potential* document. So, for this criterion alone, anything above 5.5 m/s at 80 meters has enough wind potential to be a viable site. However, all other wind screening criteria, market values, and site characteristics still need to be evaluated to determine viability (See **Figure 4** above). See the *Wind Resource Potential* section on **Page 14** within the *Site Characteristic Inputs Tab* section to learn how to estimate your wind resource potential for particular sites.

Similar to the ***Wind Resource Potential*** discussed above, the prefilled ***Minimum Available Land*** at 2 acres, the ***Distance to Transmission Lines*** value of 1 mile(s), and the ***Distance to Nearest Road*** value of 1 mile within the *Wind Screening Criteria and Market Values* box are values calculated by the *EPA/NREL Screening Sites for Wind Energy Potential* document. These values are shown in **Figure 4** above. However, all

screening criteria values within this box should be verified by visiting this website for the EPA/NREL document screening document: www.epa.gov/oswercpa/docs/wind_decision_tree.pdf. Page 4 of 18 references the screening criteria values listed above. Please verify that these are still current.

The ***Wind System Cost*** market value of $3000/kW was determined in 2011 by Marshall University's Center for Business and Economic Research and was based on information gathered from both federal and state resources.

Solar Screening Criteria and Market Values Box

The prefilled ***Solar Resource Potential*** screening criteria is calculated in kWh/m^2/day. Again, we've adopted the 3.5 kWh/m^2/day value based on the *EPA/NREL Screening Sites for Solar PV Potential* document. Again, if we assume all of the other screening criteria will be met, and we assume a value of 3.5 or above, there is a sufficient amount of solar energy to be a viable site. Naturally, values of 3.5 or less would exclude sites from being viable for solar energy. Of course, all other solar screening criteria, market values, and site characteristics will still need evaluated for suitability (See **Figure 4** above). See the *Solar Resource Potential* section on **Page 14** within the *Site Characteristic Inputs Tab* section to learn how to estimate your solar resource potential for particular sites.

Similar to the ***Solar Resource Potential*** discussed above, the prefilled ***Minimum Available Land*** at 2 acres, the ***Distance to Nearest Road*** value of 0.5 mile(s), and the ***Distance to Graded Road*** value of 1 mile within the *Solar Screening Criteria and Market Values* box are values calculated by the *EPA/NREL Screening Sites for Solar PV Potential* document. These values are shown in **Figure 4** above. Again, all screening criteria values within this box should be verified by visiting this website for the EPA/NREL document screening document: http://www.epa.gov/oswercpa/docs/solar_decision_tree.pdf . Page 4 of 18 references the solar screening criteria values listed above. Please verify that these are still current.

The ***MW Generation Potential*** market value of 5 acres/MW was determined by the *EPA/NREL Screening Sites for Solar PV Potential* document. Again, please verify that this value is still current using the solar screening document provided by EPA/NREL.

The ***PV System Cost*** market value is the approximate cost of installing a photovoltaic system on the selected parcel for solar energy collection. This value is determined by taking the MW Potential calculated previously and multiplying it by a known installation cost for a PV system and then by a multiplier to go from watts to megawatts.

Biofuels Screening Criteria and Market Values Box

The prefilled ***Minimum Available Land (Biofuels)*** screening criteria is calculated in acres. We've established the 10 acre value based on the *'Market Opportunities for Switchgrass'* study prepared by Marshall University's Center for Business and Economic Research (CBER). Again, if all of the other screening criteria will be met,

and we assume a value of 10 acres or above, there is a sufficient amount of available land to be a viable site. Naturally, values of less than 10 acres would exclude sites from being viable for biofuel energy. Of course, all other biofuel screening criteria, market values, and site characteristics will still need evaluated for suitability (See **Figure 4** above).

Similar to the ***Minimum Available Land (Biofuels)*** discussed above, the prefilled ***Distance to Nearest Processing Facility*** value at 150 miles, the ***Distance to Nearest Road*** value of 5 mile(s), the ***Biofuel Yield*** value of 4 tons/acre, and the ***Biofuel Value*** of within the *Biofuels Screening Criteria and Market Values* box are values determined from the research provided in the CBER *'Market Opportunities for Switchgrass'* study. These values are shown in **Figure 4** above. The screening criteria values within this box should be verified, and updated if necessary, by reviewing the CBER document.

The ***Biofuel Production Costs*** market value of $171.42 per acre and the ***Biofuel Value*** market value of $45 per ton were determined by the CBER research. Again, please verify that these values are still current using the current trends in comparison to the CBER research. If help is needed, please contact the WVWRI or CBER.

Site Characteristic Inputs Tab

The *Site Characteristic Inputs* tab is provided for the user to input and/or adjust the site characteristic values on a site-by-site basis (See **Figure 5** below). Users are able to input values for one site or many sites at one time. In this section, we will discuss how to derive and obtain the values to input. You'll notice that in this tab, the values are prefilled. This will allow users to see actual site characteristic values obtained for actual sites. We removed the county, latitude, and longitude values to keep original sites confidential.

Site Characteristic Inputs

Parcel ID	County	Latitude (UTM's)	Longitiude (UTM's)	Site Acreage	Available Land Biomass* (acres)	Distance to Nearest Processing Facility (Biofuel)	Available Land Solar** (acres)	Available Land Wind*** (acres)	Distance to Transmission (mile)	Distance to Nearest Road (mile)	Solar Resource Potential (kWh/m^2/day)	Wind Resource Potential (m/s @ 80m)
175				145.67	3.781	2.78	0.22	43.13	2.78	11.77	4.38	5.9
176				103.31	8.006	0.56	1.78	5.87	0.56	22.61	4.35	4.1
177				107.35	0.890	4.52	0.22	32.49	4.52	10.17	4.37	4.9
178				1798.55	18.236	0.65	0.44	355.05	0.65	20.40	4.36	4.3
179				116.60	1.112	0.56	0.00	7.77	0.56	22.90	4.35	4.6
180				776.64	217.946	0.23	11.34	286.40	0.23	17.21	4.36	5.1
181				105.17	0.000	0.68	0.00	46.66	0.68	3.64	4.36	5.8

Figure 5: Site Characteristic Inputs tab

Biofuel Outputs Tab

As discussed above, if the biofuel inputs are correctly entered in the *Screening and Market Inputs* and *Site Characteristic Inputs* tabs, the *Biofuel Outputs* tab will provide results on whether particular properties have the potential for biofuel energy, the expected yield, and financial outputs and values of each site (See **Figures 4-6**). Several columns from the *Biofuel Outputs* tab are linked and will prefill from other tabs.

If entered correctly, these values will prefill on the *Biofuel Outputs* tab from the *Site Characteristic Inputs* tab

- Parcel ID
- Available Land (Biofuel)
- Distance to Nearest Road
- Distance to Nearest Processing Facility

Then the *Biofuel Outputs* tab will generate these values:

- Biofuel possible
- Yield
- Production costs ($/acre)
- Production costs ($/ton/acre)
- Total Value per Site

Biofuel Outputs

Parcel ID	Available Land (Biofuel)	Distance to Nearest Road	Distance to Nearest Processing Facility	Biofuel Possible?	Yield	Production Costs ($/acre)	Production Costs ($/ton/acre)	Total Value per site
1	0	10.71	0.00	No				
2	193.483	10.66	0.00	No				
3	0.222	14.28	0.85	No				
4	40.253	12.90	0.93	No				
5	53.152	15.11	1.07	No				
6	43.589	9.67	1.10	No				
7	196.819	14.78	1.90	No				
8	8.006	14.95	0.60	No				
9	98.965	2.30	3.07	Yes	395.86	$ 16,965	$ 4,241	
10	8.451	16.14	0.38	No				
11	2.446	14.46	0.00	No				

Figure 6: Biofuel Outputs tab showing viability, energy production, and financial outputs.

Solar Outputs Tab

The *Solar Outputs* tab will provide results on whether particular properties have the potential for solar energy, the expected energy potential, and financial outputs and values of each site (See **Figure 7**). However, the solar inputs must be initially entered in the *Screening and Market Inputs* and *Site Characteristic Inputs* tabs (See **Figures 4** and **5**). Once that is complete, the first five linked columns in the *Solar Outputs* tab and will prefill and produce the output values.

On the *Solar Outputs* tab, these values will prefill from the initial inputs tabs:

- Parcel ID
- Available Land (Solar)
- Distance to Transmission Lines
- Distance to Nearest Road

Then the *Biofuel Outputs* tab will generate these values:

- Solar Possible?
- MW Potential
- PV Installation Costs
- Value Per Site

Solar Outputs								
Parcel ID	Solar Resource Potential (kWh/m2/day)	Available Land (Solar)	Distance to transmission lines	Distance to Nearest Road	Solar Possibile?	MW Potential	PV Installation Cost	Value Per Site
471	6.25	4.22549	1.807902272	4.146269767	No			
472	4.68	34.9159	0	2.440270665	No			
473	5.96	11.5645	0	2.610057199	No			
474	4.60	48.0371	0	9.293415058	No			
475	4.64	2.22394	0.021203112	0.021850567	Yes	0.44	$ 200,154.60	
476	6.60	18.0139	2.624254157	4.955871907	No			
477	4.65	26.9097	0.673350165	4.692858982	No			
478	4.25	2.89112	10.9551612	8.854837419	No			

Figure 7: Solar Outputs tab showing viability, energy production, and financial outputs.

Wind Outputs Tab

The *Wind Outputs* tab will provide results on whether particular properties have the potential for wind energy, the recommended number of turbines, the expected energy potential, and financial outputs and values of each site (See **Figure 8**). However, the wind inputs must be initially entered in the *Screening and Market Inputs* and *Site Characteristic Inputs* tabs (See **Figures 4** and **5**). Once that is complete, the first five linked columns in the *Wind Outputs* tab and will prefill and produce the output values.

On the *Wind Outputs* tab, these values will prefill from the initial inputs tabs:

- Parcel ID
- Wind Resource Potential (m/s @ 80m)
- Available Land (Wind)
- Distance to Transmission Lines
- Distance to Nearest Road

Then the *Wind Outputs* tab will generate these values:

- Wind Possible?
- # of Turbines (small, mid, large)
- MW Potential (small, mid, large)
- System Price (small, mid, large)

Wind Outputs														
Parcel ID	Wind Resource Potential (m/s @ 80m)	Available Land (Wind)	Distance to transmission lines	Distance to Nearest Road	Wind Possible?	# of turbines/site (Small)	# of turbines/site (Mid)	# of turbines/site (large)	MW Potential (Small)	MW Potential (Mid)	MW Potential (Large)	System Price (small)	System Price (mid)	System Price (large)
451	6.73133	55.28	5.690731908	12.83168662	No									
452	4.63411	52.68	2.53373337	7.216335394	No									
453	7.32521	36.91	6.220224831	12.83168662	No									
454	4.41584	387.40	0	3.516972965	No									
455	6.14567	99.58	0	0.841449264	Yes	77	15	9	8	13	19	$ -	$ -	$ -
456	4.66006	93.07	2.24480753	6.229822747	No									
457	6.99881	21.84	6.639188578	12.83168662	No									
458	4.9193	103.48	2.345507607	1.425708657	No									

Figure 8: Wind Outputs tab showing viability, energy production, and financial outputs.

Testing with Candidate Properties

The WVWRI research team used 612 Candidate SEP sites within West Virginia to test the proper functionality of the Tool. In the original *Sustainable Energy Parks on Mine-Scarred Lands In Appalachia* project, the sites were selected from WV Department of Environmental Protection (WVDEP) mine permits and WV Geological and Economic Survey (WVGES) surface mine disturbance data based on site characteristics. These sites included sites that existed prior to and after the Surface Mining Control and Reclamation Act of 1977. All of our test sites were 100 acres or larger.

Of our 612 sites, we determined that 109 sites had potential for biofuels development, 4 sites had potential for solar development, and 1 site had the potential for wind development.

Limitations

The Prioritization Tool and Handbook should not be used independently or as a primary decision-making tool. However, it should be used as guidance to select a site or list of sites that have the potential to be used as Sustainable Energy Parks. Additional research including demographics, unique property drivers, market analysis, local site knowledge, and any other important factors should be completed prior to investment.

Glossary of Terms

Acre (ac) – unit of area used in the United States and elsewhere and is defined as 1/640 of a square mile; for this project, it is used as the unit of area for each property and it's available and/or usable portion. 1 acre equals 43,560 square feet.

Acres per Turbine – the area in acres that a wind turbine's towers, roads, and support structures require for energy production. Sometimes referred to as a wind turbine's 'footprint'.

Biofuels – Four types of biofuels have been identified as most likely feasible for SEPs. These four types are switchgrass, arundo, miscanthus, and hybrid poplar. The following costs are identified as having an impact on biomass production: land costs, establishment cost, crop maintenance, harvesting, and opportunity cost. Profit categories are identified as cellulose production and carbon sequestration. These costs are generalized as cost/acre.

Kilowatt (kW) – unit of power equal to 1000 watts that measures the rate of energy converted or transferred.

Kilowatt hours (kWh) – unit of energy equal to 1000 watt hours. This is the most common billing unit for energy delivered to consumers by electric companies.

Latitude - measurement north or south from the equator. When used in conjunction with Longitude, it will describe an exact point or coordinate on the earth's surface.

Longitude – measurement east or west of the Prime Meridian. When used in conjunction with Latitude, it will describe an exact point or coordinate on the earth's surface.

Megawatt (MW) – unit of power equal to one million watts that measures the rate of energy converted or transferred.

Megawatt Potential – For the purpose of this handbook, the potential either solar or wind energy have to produce units of power equal to one million watts.

Meters per second (m/s) – For the purpose of this handbook, refers to the wind velocity at a specified height above the earth's surface and in line with the windmill's blades. Our values in this handbook were obtained based on measurement averaged over an entire year.

Nameplate Rating – also known as 'rated output' is a value determined by wind turbine manufacturers based on particular wind speed. Turbine's that are manufactured with a higher nameplate rating, will be placed in higher wind locations and vice versa.

Opportunity Cost - the cost of an alternative that could be gained by implementing another technology. An example of an opportunity cost would be the gain or loss made by planting a biofuel versus windmills, solar, or geothermal.

Parcel ID – Unique identification number assigned to a piece of land or lot.

Photovoltaic (PV) system – one or more solar panels that are used to convert solar energy into electricity. Must be used in conjunction with power converters, racking systems, electric interconnections, and other components for successful use.

Prioritization Tool (The Tool) – Spreadsheet created in Microsoft Excel® to facilitate and guide information gathering to qualitatively and quantitatively classify and evaluate properties using identified screening criteria to establish their potential as Sustainable Energy Parks.

Processing Facility – In the development of SEPs, processing and stockpiling areas are needed for preparation and staging for each of the sources of energy. Costs for processing and stockpiling areas will include but are not limited to capital, clearing and grubbing, building, road construction, pad development, and utility placement/installation.

Production Costs – material and labor costs incurred by energy producers when establishing alternative energy on a site.

Ridgetop Acreage – For the purpose of this handbook, acres of land associated with the crest of a ridge and of higher elevation than immediately surrounding areas. In general, these ridges more suitable for wind energy than lower surrounding elevations.

Solar – also known as 'solar radiation', energy that is derived from the sun.

Solar Resource Potential (kWh/m²/day) - often referred to as 'solar insolation', is the amount of solar radiation present on the earth's surface.

Sustainable Energy – energy that can be produced to meet present demands while maintaining the ability of future generation to meet energy needs. For the purpose of this handbook, solar, wind, and biofuels are all considered Sustainable Energies.

Sustainable Energy Parks (SEPs) – properties that have potential for Sustainable Energy development based on sufficient site characteristics.

Tip Height (wind) (ft.) – total height of a wind turbine from ground surface to the blade in its highest vertical position.

Turbine – For the purpose of this handbook, a turbine is a rotary mechanical device that extracts energy from wind turbines and transfers it onto the electrical grid system.

Value per site – This is a value that is determined by evaluating all of the potential sustainable energy technologies for estimating profit/loss

Wind – Wind is the second of the energy sources identified as having a potential in developing a SEP. The categories deemed important to wind energy production are the number of windmills per acre, windmill capital, windmill maintenance, energy transmission, and opportunity costs. Profit costs include the revenue generated from each of the respective windmill classes. These costs are generalized as watts generated/wind class.

Wind Resource Potential (m/s) – refers to wind velocity calculated in meters per second (m/s) averaged over an entire year at a specified height measured in meters above ground level.

Wind System Cost – This is the the cost for installing a wind system on a given parcel

Yield – For the purpose of this handbook, the value refers to the tons of biofuel that can be grown on a property.

References

Environmental Protection Agency Region III's *Sustainable Energy Parks on Mine-Scarred Lands In Appalachia*

Screening Sites for Solar PV Potential by EPA/NREL

Screening Sites for Wind Energy Potential by EPA/NREL

Market Opportunities for Switchgrass prepared by Marshall University's Center for Business and Economic Research