TURNING POINT SOLAR

Alternatives Evaluation and Site Selection Study

(June 2011)

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ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power Inc.
AEP Ohio	American Electric Power Ohio (Columbus Southern Power Company and Ohio Power Company)
CO_2	carbon dioxide
DOE	U.S. Department of Energy
GenCo	a to be formed company, that will build and own the solar facility
Gen-tie	generation-tie-line
HVAC	heating, ventilation and air conditioning
Inc.	Incorporated
kV	kilovolt
kW	kilowatt
LLC	Limited Liability Company
M	million
MOU	Memorandum of Understanding
MW	Megawatts
MWh	megawatt-hours
NCSS	National Cooperative Soil Survey
NEPA	National Environmental Policy Act
ODNR	Ohio Department of Natural Resources
ORC	Ohio Revised Code
PJM	PJM Interconnection LLC
PUCO	Public Utility Commission of Ohio
PV	photovoltaics
REPA	Renewable Energy Power Purchase Agreement
RES	Renewable Energy Standards
RTO	regional transmission organization
RUS	Rural Utilities Service
S.B.	Senate Bill
s-REC	solar Renewable Energy Certificate
TPS	Turning Point Solar
TWh	terawatt hours
USDA	United States Department of Agriculture
US DOE	U.S. Department of Energy
US EIA	U.S. Energy Information Administration
USGS	U.S. Geological Survey

PROJECT OVERVIEW

Turning Point Solar LLC, a joint venture between Agile Energy, Inc. and New Harvest Ventures is developing a 49.9 megawatt (MW) Turning Point Solar (TPS) energy generation project on 650 acres of land in southeastern Ohio (**Exhibit 1**). The Turning Point Solar Project (the Project) is a proposed solar generation facility using photovoltaic panel arrays mounted on fixed solar racking equipment. The Project would be built on reclaimed coal strip mine land owned by Columbus Southern Power Company and Ohio Power Company, collectively American Electric Power Ohio ("AEP Ohio") at a site located in Noble County, Ohio, about eight miles northwest of Caldwell, Ohio. The land was mined by the Central Ohio Coal Company between 1969 and 1991, after which time it was reclaimed. The proposed solar generating facility would interconnect to AEP Ohio's South Cumberland 69 kV substation, subject to completion of the PJM Generation Interconnection application process (Godfrey, 2011). PJM Interconnection LLC is a regional transmission organization (RTO) which is part of the Eastern Interconnection grid and which coordinates the movement of wholesale electricity in all or parts of 13 states and the District of Columbia (PJM, 2011).

To achieve the required project output, the Project would install approximately 239,400 high-efficiency monocrystalline photovoltaic panels and would utilize fixed solar racking equipment. The Project would create enough power to service 7,500–8,000 homes and will displace around 65,000 tons of carbon dioxide (CO_2) from the environment annually [U.S. Energy Information Administration (US EIA), 2011a and 2011b]. When complete, the Turning Point facility would be the largest photovoltaic array east of the Mississippi River.

The Project is to be built in three phases: Phase 1 with 20MW is scheduled to come on-line in 2012 or 2013; Phase 2 with 15MW is scheduled to come on-line in 2014; and Phase 3, with 14.9MW, is scheduled to come on-line in 2015. Turning Point Solar LLC and AEP Ohio are currently in the final stages of negotiations of a Participation Agreement pursuant to which the Turning Point Solar will continue its development of the project including the sale of the project assets from Turning Point Solar to GenCo, a to be formed company, that will build and own the solar facility. GenCo will lease the solar facility to AEP Ohio, which will operate the solar facility over the life of the asset. AEP Ohio, an operating unit of American Electric Power Inc. ("AEP"), serves nearly 1.5 million customers in Ohio and the northern panhandle of West Virginia. AEP Ohio will use its purchase of solar energy to comply with Ohio's solar generation benchmark mandated by Section 4928.64 of the Ohio Revised Code (ORC) as established per Substitute Senate Bill 221 ("S.B. 221").

AEP Ohio and Turning Point Solar LLC entered into a Memorandum of Understanding (MOU) on October 5, 2010 wherein both parties agreed to work together on a relationship which could lead to the construction of the largest solar project in Ohio. To that end, the parties further agreed in the MOU to negotiate a Term Sheet outlining the general terms of the proposed transaction and the relationship of the parties. The Term Sheet was executed on January 21, 2011.

Turning Point Solar intentionally located the project in Ohio's Appalachian region to serve as a centerpiece for integrated rural economic development (Ohio Air Quality Development Authority, 2010). It is anticipated that the project will bring hundreds of construction jobs to Appalachian Ohio (**Figure 1**). The Appalachian region in general, and Appalachian Ohio specifically, have historically been among the regions of the country with the highest poverty and unemployment rates. Despite some recent gains, Appalachia still does not enjoy the same economic vitality as the rest of the nation. Central Appalachia, in particular, still battles economic distress, with concentrated areas of high poverty, unemployment, poor health, and severe educational disparities.

Figure 1. Appalachian Ohio Counties

Recent economic data show that the Region has fared far worse in the current recession than the rest of the nation (Appalachian Regional Commission, 2011). U.S. Census Bureau data show that Noble and Morgan Counties have per capita incomes only about two-thirds that of Ohio as a whole, with Muskingum at about 83 percent (**Table 1**). The percentage of people below the poverty level in Noble and Muskingum Counties is about 25 percent higher than Ohio as a whole, while Morgan County is about 58 percent higher (U.S. Census Bureau, 2010). Noble and Morgan Counties are considered "distressed counties" in the Appalachian Regional Commission's Fiscal Year 2012 rankings (**Exhibit 2**). Distressed counties are the most economically depressed counties. They rank in the worst 10 percent of the nation's counties (Appalachian Regional Commission, 2011). In the most recently available unemployment statistics (January 2011), Morgan (#3), Noble (#8), and Muskingum (#10) Counties rank in the top ten highest unemployment rates in Ohio (Bureau of Labor Market Information, 2011).

Table 1. Per capita Income and Percent Below Poverty, Selected Appalachian Ohio Counties[1]

	USA	Ohio	Noble Co.	Morgan Co.	Muskingum Co.
Per capita money income, 1999	$21,587	$21,003	$14,100	$13,967	$17,533
Persons below poverty level, percent, 2008	13.20%	13.30%	16.50%	21.10%	16.90%

[1]Source: U.S. Census Bureau. 2010. State & County QuickFacts

PURPOSE OF AND NEED FOR THE PROPOSAL

In May 2008, Ohio enacted broad electric industry restructuring legislation (S.B. 221) containing advanced energy and renewable energy generation and procurement requirements for the state's electric distribution utilities and electric service companies. Under the standard, utilities must provide 25% of their retail electricity supply from alternative energy sources by 2025. The purpose of the proposal is to provide solar energy for AEP Ohio to meet its targets for renewable energy generally and solar energy, specifically, as required under Section 4928.64 of the ORC as established per S.B. 221.

AEP Ohio and its affiliates are taking steps to reduce and offset their greenhouse gas emissions, including demonstrating carbon capture and storage technology, making power plants more efficient, offsetting emissions through forestry programs and increasing renewable generation. AEP and its affiliates have committed to add renewable energy resources to their generation portfolio assuming timely regulatory approval. Through 2009, the company had secured 1,013 MW of renewable energy through power purchase agreements, including 10.1 MW of solar power from the Wyandot Solar Farm located near Upper Sandusky, Ohio. AEP Ohio's integrated resource plan contains a 10 percent (3.2 million megawatt-hours (MWh)) renewable energy target by 2020 (AEP Ohio, 2010; **Appendix A**).

As stated above, Ohio law (ORC 4928.64) requires electric distribution utilities and electric services companies to secure a portion of their electricity supplies from alternative energy resources. By the year 2025, 25 percent of the electricity sold by each utility or electric services company within Ohio must be generated from alternative energy sources. At least 12.5 percent must be generated from renewable energy resources, including wind, hydro, biomass and solar. The remainder can be generated from advanced energy resources, including nuclear, clean coal and certain types of fuel cells. In addition, at least one half of the renewable energy requirement must be generated by facilities located in Ohio and the other 50% could be generated by resources that must be shown to be deliverable into the state. All companies must meet annual renewable and solar energy benchmarks which, when viewed as a percentage of the electric supplied, increase annually.

Furthermore, there is solar carve out with an ultimate solar target of 0.5% of total electricity supply in 2024 and thereafter. The total renewable percentage requirement (discussed above) includes the solar specific portion. The detailed schedule of annual compliance benchmarks for renewable and solar energy is as follows (**Table 2**). An s-REC is a solar renewable energy credit (also referred to as a solar Renewable Energy Certificate). It represents the environmental benefits of producing one megawatt hour of electricity using renewable solar technology. Only solar photovoltaic installations in Ohio and bordering states are eligible for Ohio s-RECs (IN, KY, WV, PA, and MI). However, of these, only those produced in Ohio meet the in-state requirements.

Table 2. Energy Benchmarks Mandated by Ohio Law (ORC 4928.64)

By end of year:	Renewable energy resources	Solar energy resources
2011	1.0%	0.030%
2012	1.5%	0.060%
2013	2.0%	0.090%
2014	2.5%	0.12%

Table 2. Energy Benchmarks Mandated by Ohio Law (ORC 4928.64)

By end of year:	Renewable energy resources	Solar energy resources
2015	3.5%	0.15%
2016	4.5%	0.18%
2017	5.5%	0.22%
2018	6.5%	0.26%
2019	7.5%	0.30%
2020	8.5%	0.34%
2021	9.5%	0.38%
2022	10.5%	0.42%
2023	11.5%	0.46%
2024 and each calendar year thereafter	12.5%	0.50%

Accordingly, by 2020, 0.34 percent, or 133,167 MWh of AEP Ohio's generating capacity must be supplied from solar sources. According to AEP Ohio's 2010 Integrated Resource Plan, the cumulative solar (nameplate) capability required for AEP Ohio by the year 2015 was established at 56.2 MW. Nameplate capacity is the number registered with authorities for classifying the power output of a power station usually expressed in MW. Therefore, the current Project, at 49.9 MW, when combined with the previously-mentioned Wyandot Solar Farm at 10.1MW, will slightly exceed (49.9 MW + 10.1 MW = 60.0 MW) the 56.2 MW required to meet AEP Ohio's benchmark within the timeframe under which this project is proposed (i.e., the phasing of the project) (AEP Ohio, 2010). In addition, all of this capability is to be generated at facilities located in Ohio, which satisfies the minimum in-state generation requirement.

The United States Department of Agriculture Rural Utilities Service's (USDA RUS) decision is whether or not to provide the financing assistance to TPS for the Proposal. In accordance with the National Environmental Policy Act (NEPA), RUS is required to evaluate the environmental impacts of its proposed actions, and to consider alternatives to those actions.

ALTERNATIVES ANALYSIS

Satisfying AEP Ohio's in-state solar requirements as discussed above in the Purpose and Need section can be accomplished by: AEP Ohio building solar generation in-state; contracting for some or all of the output of an in-state solar facility built by another entity; or purchasing available (Ohio) s-RECs. All of the options above require the construction of solar facilities in Ohio by some entity (AEP Ohio, 2010). AEP Ohio has concluded that it is a viable strategy to procure its renewable needs through options that not only meet current needs and take advantage of federal tax benefits, but also assist in bringing manufacturing and construction jobs to Ohio and provide a means of future compliance with Ohio's solar benchmarks (Godfrey, 2011). These options, as well as others, are discussed in more detail below.

1) AEP Ohio Building Solar Generation In-State

AEP Ohio has the option of pursuing future alternative solar projects in Ohio.

As with many utilities in Ohio and in other states, AEP Ohio is in a challenging position to meet its mandated solar benchmark by building solar generation capacity in Ohio in the near term if it were to begin developing a green-field project today from scratch. The timeline required to plan, permit, construct, certify, and bring certain facilities on-line can be two years. Unless the planning process is currently under way, utilities will likely not meet the renewable benchmark required under Ohio law in the required timeframe.

To meet the Ohio mandates for in-state generation, AEP Ohio may construct solar facilities on rooftops or build ground-mounted solar panels. Regardless of the solar installation, specific design and siting criteria are necessary for environmental, safety, construction, and feasibility reasons. The two sub-options under this alternative are discussed in more detail below.

1A) Distributed and Building-Mounted Solar Photovoltaic (PV) Panels

Distributed solar energy refers to smaller energy systems that produce energy on-site, such as roof-mounted solar PV systems. Unlike traditional "centralized" systems, where electricity is generated at a remotely located, large-scale power plant and then transmitted through power lines to consumers, distributed energy, such as PV panels, could potentially be installed on private or publicly-owned residential, commercial, or industrial building rooftops or in other disturbed areas such as parking lots or disturbed areas adjacent to existing structures such as substations. To be a viable alternative to the proposed Turning Point Solar Project, 49.9 MW of newly installed solar capacity would be necessary.

The small-scale and high costs of distributed energy resources are usually prohibitive factors for meeting large energy benchmarks such as those required for Ohio's Renewable Energy Standards (RES) for several reasons. First, for building-mounted projects, not all buildings are structurally capable of supporting solar equipment on rooftops. Feasibility studies relating to building structure and load capabilities, system sizing, access, security and energy production are necessary, yet time-consuming,

requirements for any type of solar installation, especially on buildings. Rooftop space is often limited in size due to other systems already existing on the roof (e.g., HVAC, etc.). A 2008 study by the National Renewable Energy Laboratory found that "only 22 to 27% of residential rooftop area is suitable for hosting an on-site PV system after adjusting for structural, shading, or ownership issues." [U.S. Department of Energy (US DOE, 2010a)]. Second, ownership and/or lease opportunities are often a limiting factor. The project owner must obtain exclusive rights to build a solar project if they are not the property owner. This is usually negotiated through a land lease agreement with the property owner and/or site host. Although buildings might exist that are structurally sound to support a solar project, if the building or property is not owned by AEP Ohio, building owners may not choose to enter into negotiations for a solar project to be built on their property. Proper consideration should be given to site selection, to minimize the environmental footprint and harmonize with existing land uses.

A market model report shows that distributed rooftop solar PV – comprised of small, grid-tied rooftop solar PV systems, ranging in size from 1 kilowatt (kW) to about 15 kW, represents the largest segment of both U.S. and global PV markets (Easan and Denholm, 2010). In some areas of the country these small systems can aggregate to substantial megawatts. For example, California currently has over 812 MW of distributed PV systems installed, but this is spread over 79,128 separate solar projects, for an average capacity of about 10.3 kW each (Go Solar California, 2011). At this average capacity, it would take nearly 5,000 separate projects to equal Turning Point Solar's 49.9 MW capacity. While distributed generation is an important part of renewable electricity generation, permitting, certifying and installing distributed solar on this scale would be much more difficult and costly to ratepayers. .

1B) Ground-mounted Solar Photovoltaics (PV) on Reclaimed Land

Ground-mounted solar facilities, especially on land not otherwise suitable for development, offer several advantages and are viewed as a valuable opportunity in the U.S. to convert brownfields into viable opportunities for clean energy and economic development. Solar energy technologies and PV systems in particular, are well-suited to application on brownfield sites. They require little maintenance and can stand directly on the ground with little disturbance to existing site conditions. Brownfield sites are often large in size and offer the right amount of space for the construction and operation of a large solar project. The US Deparment of Energy (DOE) encourages brownfield revitalization by implementing renewable energy projects through many of its programs. One example specific to solar energy is the DOE's "Brightfields" program (US DOE, 2009). The Brightfields program offers a range of opportunities to link solar energy to brownfields redevelopment which can transform community hazards and eyesores into productive, green ventures. The DOE touts the conversion of brownfields to green initiatives, particularly through the use of solar, as a clean and green option for serving local energy needs without adversely affecting air quality and climate. Solar energy systems provide a clean and reliable energy source that can be used to serve community businesses and residential homes, among other energy users, who previously did not have the capacity that a large revitalized site can bring to their community. Another US DOE initiative, the Loan Guarantee Program, also encourages renewable energy projects on

brownfield sites due to fewer environmental constraints that come with other sites (US DOE, 2010b).

2) Contracting for the Output of an In-State Solar Facility Built by Another Entity

AEP Ohio has positioned itself to contract for the output of Turning Point Solar via a capital lease (the proposed Project). AEP Ohio has supported Turning Point Solar in advancing the project through planning and land acquisition assistance. The s-RECs produced by the proposed new solar generation facility will contribute to AEP Ohio's ability to continue to meet its ongoing s-REC benchmarks as well as stimulating the Ohio economy. Due to the still developing market for Ohio s-RECs, AEP Ohio believes it is prudent to procure its renewable energy needs through options that not only meet current needs, but also bring manufacturing and construction jobs to Ohio and provide a means of future compliance with Ohio's increasing annual solar energy benchmarks. AEP Ohio's involvement in the Turning Point Solar project is to invest in, lease and operate the new solar generation facility for the benefit of its customers and the State of Ohio (Godfrey, 2011).

3) Purchasing Available (Ohio) s-RECs

As addressed previously, AEP Ohio must satisfy at least half of its solar requirement with solar energy produced within Ohio, while the balance may be produced by Public Utilities Commission of Ohio (PUCO) certified out of state generators whose power generation must be shown to be deliverable into Ohio. Compliance with the benchmark requirements may be satisfied by purchasing s-RECs. **Table 3** shows the solar generation available to satisfy mandated solar benchmarks as of December 2010, assuming all generation performs as certified.

Table 3

Excerpted from AEP Ohio, 2010 (Appendix A, Table 1, page 9 of 14)

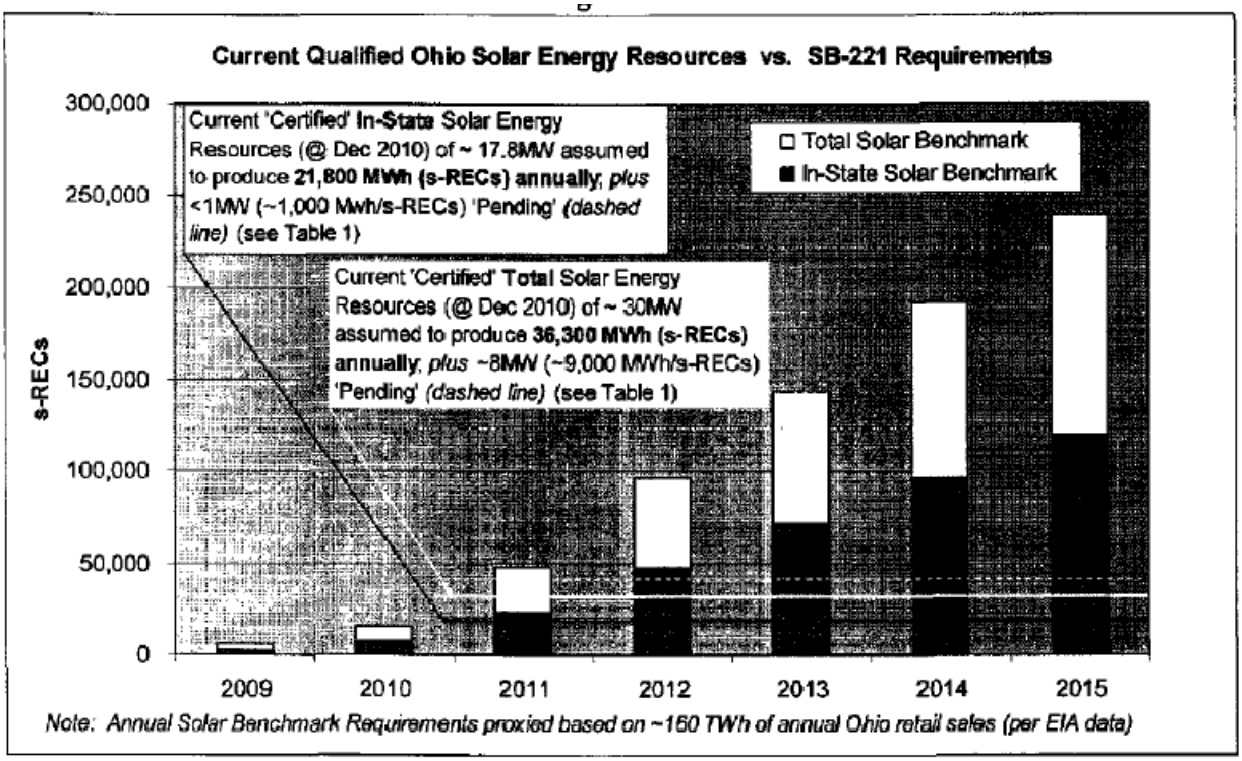
Ohio Solar Generation Status - December 8, 2010*			
Domiciled	Status	MW (nameplate)	Annual MWh**
Ohio	Certified	17.8	21,802
	Pending	0.8	879
	Sub-total	18.5	22,680
Out-of-State	Certified	11.8	14,467
	Pending	7.0	8,114
	Sub-total	18.8	22,581
Total	Certified	29.6	36,269
	Pending	7.8	8,992
	Sub-total	37.4	45,261

** Status from PUCO; "AEP_REN_INFO.xls" dated: Dec. 8, 2010*
*** Assumes 13% capacity factor for 1000kW or smaller installations, 14% capacity factor for larger installations, and a 17% capacity factor for Wyandot*

The certified solar generation values shown in **Table 3** are expressed in **Figure 2**, below, as approximate benchmark requirements based on an assumption of 160 terawatt hours (TWh) annual retail sales in Ohio. ORC Sec. 4928.64 dictates that the actual benchmarks would depend on the actual sales in the preceding three calendar years.

If aggregate in-state solar capacity is in excess of what is necessary to satisfy mandated annual benchmarks, a competitive and liquid s-REC market might be expected to emerge that would provide a viable alternative to building (or buying) additional solar generation. An analysis of the existing Ohio solar generation (as of December 2010) prepared by AEP Ohio indicates the absence of any additional Ohio solar generation *above* what is required in 2011, indicating a very "tight" market for Ohio s-RECs in 2011 (**Figure 2** - AEP Ohio, 2010). Since the solar benchmark mandated by Ohio law doubles in 2012 (**Table 2**), the market for available s-RECs deteriorates proportionally, barring significant, additional, Ohio-based solar generation being certified and coming on-line (AEP Ohio, 2010). The addition of the Turning Point Solar facility, along with the 10 MW Wyandot Solar Farm, in Wyandot County, Ohio, will satisfy AEP Ohio's in-state (minimum of 50% of all solar) requirement through 2020 (AEP Ohio, 2010).

Figure 2
Excerpted from AEP Ohio, 2010 (Appendix A, Figure 1, page 10 of 14)



An electric distribution utility or electric services company may request the PUCO to make a *force majeure* determination regarding all or part of the utility's or company's compliance obligation during any year (Union of Concerned Scientists, 2008). For purposes of a utility's compliance obligation, *force majeure* is defined under Section

4928.64 of the Ohio Revised Code as the circumstance in which a utility's reasonably expected cost of compliance exceeds its reasonably expected cost of otherwise producing or acquiring the requisite electricity by three percent or more. AEP may request the commission to make a force majeure determination pursuant to this section. The commission would consider whether AEP had made a good faith effort to acquire sufficient solar energy resources to comply, including but not limited to, by banking or seeking renewable energy resource credits or by seeking resources through long-term contracts. If the commission determines that renewable energy or solar energy resources are not reasonably available to permit AEP to comply, the commission shall modify the compliance obligation of AEP for that compliance year. In October of 2009, AEP Ohio filed an application with the PUCO to amend the Company's 2009 solar energy benchmarks and requested that the PUCO determine for solar benchmark compliance purposes a finding of *force majeure* due to the lack of supply in the Ohio solar REC market. Also in 2009, AEP Ohio issued an Ohio solar REC-only RFP for which no bids were received. The PUCO acknowledged the lack of supply in the Ohio solar REC market and granted AEP Ohio's request for *force majeure*. This decision allowed AEP Ohio to add the 2009 solar benchmark shortfall amounts to its 2010 compliance benchmark. In June 2009, the AEP Ohio also entered into a long-term Renewable Energy Power Purchase Agreement (REPA) for the output from the 10 MW Wyandot Solar Farm generation facility located near Upper Sandusky, Ohio. This new solar facility came on-line in April of 2010, and will aid AEP Ohio in complying with the 2010 and 2011 solar portion of the renewable energy benchmarks. However, even with the s-RECs from the Wyandot REPA, AEP Ohio will find itself short of solar RECs by the end of 2012 due to the increasing solar benchmarks it must meet for compliance with Ohio's RES (Godfrey, 2011).

4) Banked Compliance

An electric distribution utility or electric services company may use RECs any time in the five calendar years following the date of their purchase or acquisition from any entity (Union of Concerned Scientists, 2008). Solar RECs that are in excess of AEP Ohio's annual solar benchmark obligations under SB 221 can be banked for future years' compliance requirements. Since the solar benchmarks increase annually, any RECs that are "banked" in the short-run would eventually be depleted if no additional resources are added beyond the Turning Point Solar Project (Godfrey, 2011). Without the Turning Point Solar Project, banked compliance is not a viable option for AEP Ohio since, as is demonstrated above, the current s-REC market is extremely "tight," especially in the short to medium term given long lead times for brining utility-scale projects online.

5) Renewable Energy Compliance Payment

The Public Utilities Commission of Ohio (PUCO) has the authority to levy a renewable energy compliance payment on electric distribution utilities or electric services companies that fail to comply with the annual requirements. An electric distribution utility or an electric services company does not have to comply with the annual requirements to the extent that its reasonably expected cost of compliance exceeds its reasonably expected cost of otherwise producing or acquiring the requisite electricity by

three percent or more. In addition, a renewable energy compliance payment, administered by PUCO for non-compliance, serves as a de facto cost cap for retailers. Moreover, renewable energy compliance payments—if administered by PUCO—are not permitted to be passed through to consumers by the electric distribution utility or electric services company (Union of Concerned Scientists, 2008). Based on conversations with the utility, AEP Ohio's cost of renewable energy procurement isn't expected to exceed 3% of their total generation cost.

For solar energy resource requirements, the compliance payment began at $450 per megawatt-hour (MWh) of under compliance or noncompliance for 2009, decreased to $400/MWh for 2010 and 2011, and similarly decreases every two years thereafter through 2024 by $50, to a minimum of $50/MWh. **Table 4** shows the potential costs to AEP Ohio for noncompliance.

At its discretion, the PUCO may increase the amount of the compliance payment to ensure that it is not used to achieve compliance in lieu of actually acquiring or realizing energy derived from renewable energy resources. This along with the potential compliance payments illustrated in **Table 4** highlight that compliance payments are not a feasible option for AEP Ohio.

Table 4. Potential Compliance Payments for Noncompliance 2011 - 2020

Year	Benchmark Solar MWh[1]	Compliance Payment per MWh of Noncompliance[2]	Total Potential Compliance Payment
2011	12,999	$400	$5,199,600
2012	24,954	$350	$8,733,900
2013	36,512	$350	$12,779,200
2014	47,823	$300	$14,346,900
2015	59,045	$300	$17,713,500
2016	70,490	$250	$17,622,500
2017	85,792	$250	$21,448,000
2018	100,955	$200	$20,191,000
2019	116,117	$200	$23,223,400
2020	131,170	$150	$19,675,500

[1] Source: AEP Ohio, 2010; [2] Source: Union of Concerned Scientists, 2008

Other Alternatives That Do Not Meet the Purpose and Need

Purchase of Out-of-State s-RECs

Utilities in Ohio are allowed to procure 50% of their s-RECs from out of state facilities. However, these states must be contiguous with Ohio (IN, KY, WV, PA, and MI). Moreover, s-RECs purchased from theses state cannot be used to meet the 50% mandated as in-state by Ohio law. Therefore, purchase of out-of-state s-RECs, even if available, would not fulfill the project purpose and need.

Wind Energy
Wind energy has developed rapidly during the past decade due in part to the Production Tax Credits and the rapidly decreasing cost of wind generation. Fuel costs are non-existent and the only costs are the capital costs associated with the initial installation of the equipment, including the transmission lines, and maintenance costs. Although the purchase of wind energy may assist AEP Ohio in meeting their renewable energy resources benchmark mandated by Ohio law, it does not count toward the solar benchmark. Therefore, wind energy would not fulfill the project purpose and need.

Biomass
Biomass is a renewable resource of high potential in southeastern Ohio due to the extensive forest reserves in the region. Conventional steam electric generation is capable of using biomass fuels to provide some of the energy requirements. Although the use of biomass fuels may assist AEP Ohio in meeting their renewable energy resources benchmark mandated by Ohio law, it does not count toward the solar benchmark. Therefore, biomass energy would not fulfill the project purpose and need.

Hydropower
Hydropower systems function by backing up a river to create a deep, slow-moving body of water behind a concrete dam. The force of water being let out through the dam, either at a constant rate or at certain times of the day or seasons of the year, generates electricity that is sent to remote regions via power lines. Other large dam systems generate energy through a process of moving water from different elevations within a multi-dam system. However, large-scale hydropower can have serious consequences for native species, local lifestyles, and the landscape. Although the use of hydropower may assist AEP Ohio in meeting their renewable energy resources benchmark mandated by Ohio law, it does not count toward the solar benchmark. Furthermore, no new hydropower facilities have been built in Ohio in the last several years. Therefore, hydropower would not fulfill the project purpose and need.

Alternative Analysis Conclusion
Only Alternative 2, contracting for some or all of the output of an in-state solar facility built by another entity, will allow AEP Ohio to achieve their designated near to medium term solar energy benchmarks required under Ohio law. Alternatives 1, 3, 4 and 5 are not currently reasonable. Other feasible alternatives such as purchase of out-of-state s-RECs, wind energy, biomass fuels, or hydropower would not fulfill the project purpose and need.

SITING STUDY

Siting Criteria Development

Proper siting of a large solar generation facility requires substantial evaluation. Completing the appropriate evaluation and analysis of factors influential in siting a large facility such as the 49.9 megawatt (MW) Turning Point Solar energy generation project can reduce costs, eliminate delays, minimize potential impacts and project opposition, and streamline the regulatory process. Conversely, improper siting can have the opposite effect. Costs from the consequence of improper siting can be in terms of dollars lost or schedule delays. Site selection criteria need to be developed that reflect the specific purpose and need of the project as well as the local setting. Among the constraints of siting a solar electric generation facility is the need to be in close proximity to suitable electrical transmission lines. While the cost of construction of miles of transmission lines may be a smaller percentage of the total construction cost for a large generation facility (hundreds or more MW), the same infrastructure is a larger percent of the cost for a relatively small generating facility such as the Project (49.9 MW). As a rule of thumb, for conceptual transmission planning, AEP Ohio estimates transmission line construction at approximately $1 million per mile. Another constraint of siting, especially in the construction phase, is the need for suitable surface transportation infrastructure (roads/highways) while minimizing the need for access road construction. In addition to being costly, infrastructure construction also represents additional development risks to AEP Ohio. Construction of this infrastructure may involve negotiating property acquisitions with multiple owners, which can be a long and expensive process. Therefore, proximity of the site to transmission and transportation infrastructure is important, as well as the avoidance of negative social, environmental, and regulatory impacts.

In order to conduct a technically-sound site selection process Turning Point Solar worked in cooperation with AEP Ohio and other project stakeholders to develop criteria specifically applicable to the Project's purpose and need.

Siting Criteria

Location in Appalachian Ohio/within AEP Ohio Service Area:

As discussed in the Project Description, Turning Point Solar intentionally located the project in Ohio's Appalachian region to serve as a centerpiece for integrated rural economic development (Ohio Air Quality Development Authority, 2010). Since the power will be provided to AEP Ohio, the starting location for the siting study was AEP Ohio's service area, which covers most of central-eastern Ohio (Ohio Power–**Exhibit 3**) and southeastern Ohio (Columbus Southern Power–**Exhibit 4**). The availability of large tracts of previously disturbed (strip-mined) land in this area also allows for creative and productive re-use of this disturbed resource. A target area of three counties was established based on a central location in AEP Ohio's service area that would minimize transmission construction for energy delivery, and the presence of large tracts of reclaimed strip-mined land. These counties are: Morgan, Muskingum, and Noble.

Transmission Line Proximity
Close proximity (within one mile is preferred) to a transmission line is necessary in order to minimize interconnection costs and environmental and cultural impacts as well as cost considerations of building the generation-tie-line (Gen-tie) from the generation facility to the point of interconnection. The availability of an existing transmission right-of-way is preferred in order to minimize the impacts of building the Gen-tie. Transmission lines and substations in the three-county area are shown in **Exhibit 5a** Transmission lines and substations within an eight mile project area are shown in **Exhibit 5b.**

Highway Access
Highway access by way of the Interstate Highway System, US Routes or State Routes is necessary for site access. During construction of the project, truck transportation will be used to deliver the facility components and materials. Construction workers will also need efficient road transportation to commute to the worksite. Following construction, operations and maintenance crews will continue to require efficient roadway access to accomplish their missions. Close proximity (within one mile) to an Interstate Highway is preferred, followed by close proximity to a US Route, then a State Route.

Property Available for Sale/Owned by AEP Ohio or Minimal Number of Landowners
The Proposal needs a minimum of approximately 500 acres; however, higher acreage (up to 1,000 or more) allows for greater flexibility in design. Reclaimed strip-mined acreage currently owned by AEP Ohio is preferred, since this will reduce acquisition costs and allow for productive reuse of these disturbed lands. If additional land, not currently in AEP Ohio ownership, needs to be acquired, a smaller number of landowners are preferred.

Topography/Current Site Use
Large tracts (500+ acres) of level land generally do not exist in Appalachian Ohio, except in the larger river bottoms. However, a relatively level site is preferred over one with highly variable topography to minimize the cost of grading or shading. Greater use of reclaimed strip-mined land represents the best solution for reducing costs and impacts for solar facility development and represents a productive use of a disturbed resource.

The Project requires a contiguous 500 acre site with tracts of land that are an average grade of less than 5 percent to keep site preparation work to a minimum.

Much of the strip-mined land in the three-county target area was mined during the 1970s and 1980s. Surface mining and reclamation laws during 1940 through 1972 required that trees be planted as the final vegetative cover. That type of reclamation produced forested hills and valleys. In 1972 new surface mining and reclamation laws were enacted that now result in gently rolling grasslands. Under current reclamation practices, the topsoil is removed to gain access to the coal seam. Once the coal is extracted, the land is backfilled and graded to create the contours designated in the reclamation plans. Water run-offs, created to protect against soil erosion, feed into the ponds and lakes built into the reclaimed land. The topsoil that was removed before the land was mined is distributed

over the area; fertilizers are used to improve the quality of the soil. Finally, the area is sown with a variety of grasses, which protect the soil from erosion and restore the land for useful purposes (AEP, 2011a).

Adjacent Land Use

To minimize social impacts and be consistent with land use policies, surrounding industrial use or reclaimed strip-mined land is preferred; however, agricultural land is acceptable. Siting near residential uses should be avoided (while satisfying necessary criteria regarding infrastructure). Site selection criteria also favor a site that minimizes impacts to parks, public recreational areas, natural areas, historic properties, and important cultural resources.

Impacts on Floodplains

Construction in floodplains needs to be avoided. This is to avoid the negative environmental impacts of building in floodplains as well as to avoid potential damage to the facility from flooding.

Impacts on Waters of the United States

Construction in Waters of the United States (including ponds, streams and wetlands) needs to be avoided/minimized to the extent practicable to avoid impacts to these resources and preclude potential delays associated with the need to obtain permits under Section 404/401 of the Clean Water Act.

Impacts on Forested Areas

The use of forested areas should be avoided/minimized to the extent practicable. American Electric Power, Inc. "AEP" (the parent company of AEP Ohio) recognizes that forest protection and reforestation will not only help the company to offset greenhouse gas emissions, but also serves as a centerpiece to the company's commitment to conservation and stewardship. Efficient forestry and land use practices can significantly offset greenhouse gas emissions. AEP is attempting to increase carbon sinks, thus offsetting greenhouse gas emissions, by planting trees and preserving forests. As a result, the company is involved in several reforestation projects (AEP, 2011b).

Impacts on Prime Farmland

Use of prime farmland should be avoided/minimized to the extent practicable. Prime farmland, a designation assigned by U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses. Even though prime farmland soils may have been disturbed by mining activities, in reclamation, this soil must be restored to a depth of forty-eight inches unless a lesser depth occurred in the pre-mining soil and the operator must demonstrate restored productivity by achieving acceptable yields for three crop years before a Phase II performance security release can be approved (ODNR, 2009). A portion of the project area is mapped not as prime farmland, but as *farmland of local importance*. This farmland is considered valuable for the production of food, feed, fiber, forage, and oilseed crops and is identified by the appropriate local authorities (USDA-NCSS, 2011). Avoidance/minimization of impacts to prime farmland or farmland of local importance is positive environmental stewardship.

Based on the above discussion, the preferred site would have the following characteristics:

- Transmission line adjacent to site.
- Near a major highway.
- Property available in AEP Ohio ownership or for sale from one landowner.
- Located on relatively level reclaimed strip-mined land
- With no or few nearby residences or schools, and no nearby parks, recreational areas or important natural or cultural Resources.
- Not located in a floodplain.
- Not impacting Waters of the United States.
- Not impacting forested areas.
- Not impacting Prime Farmland or farmland of local importance.
- With a lot size 500 to 1,000+ acres (larger size allows more options for design).

Identification of Candidate Sites

Turning Point Solar applied the above criteria to identify candidate sites within the three-county target area. Three candidate sites, one in each of the counties listed above, were identified that at least minimally met the criteria below (**Exhibit 6**).

Site #1 consists of approximately 1000 acres of former strip-mined land adjacent to The Wilds, a wildlife conservation center in Meigs Township, Muskingum County.

Site #2 consists of approximately 780 acres of former strip-mined land in Brookfield Township, Noble County.

Site #3 consists of approximately 1,300 acres of former strip-mined land in Bristol and Meigsville Townships, Morgan County.

Site Descriptions

Site #1

Site #1 consists of 1,000+ acres in Sections 4, 13, 23 and 34 of Meigs Township, in extreme southeastern Muskingum County (**Exhibits 6 and 7a**). It occurs on the Cumberland, Ohio USGS quadrangle map. At its closest approach, Site #1 lies about 0.2 mile from the Muskingum/Noble County line and about 2.5 miles from the Muskingum/Morgan County line. From **Exhibit 5b**, it can be see that Site #1 is more than two miles from the nearest transmission line or substation. This means that a gen-tie line of over two miles would need to be constructed to connect the generation facility at Site #1 to the substation. At approximately $1M per mile of gen-tie line, this would cost the project an additional $2M.

By comparing the recent and historical topographic maps and recent aerial photo (**Exhibits 7a, 7b and 7c**), it is apparent that Site #1 has been strip-mined almost in its entirety. An examination of Exhibit 7b shows that originally the site consisted of a series

of ravines and ridges surrounding the headwaters and a few unnamed tributaries of Collins Fork. Since the replaced overburden must be shaped to the approximate original contour of the land so that it drains properly and pre-existing drainage patterns are replaced (ODNR, 2009), the historical topographic map gives a rough estimate of current drainage patterns. These historical drainage patterns were overlaid on the recent aerial photo (Exhibit 7d) to show this. Based on this exercise, Site #1 has four stream segments totaling 16,424 linear feet. Exhibit 7c shows that the site is currently dominated by two large linear ponds (about 37 and 33 acres) in the western and southern portion of the site. Another linear pond lies along the site's southeastern boundary. A series of two smaller ponds, connected by a short stream, lie in a remnant of the Collins Fork Valley in the northern extension of the site. A few relatively large (about 52 and 72 acres) areas of young forest occur along the west and south margins of Site #1, but site boundaries have been drawn to exclude most large forested areas. Site #1 has two relatively small areas of mapped prime farmland (**Exhibit 12a**) as well as some minor areas of "farmland of local importance" mapped along the northwest, west, and southern site boundary.

Site #2

Site #2 consists of nearly 780 acres in Sections 8, 9, 15, 16, and 17 of Brookfield Township, in western Noble County (**Exhibits 6 and 8a**). It occurs on the Cumberland and Caldwell North, Ohio USGS quadrangle maps. At its closest approach, Site #2 lies about 1.1 mile from the Muskingum/Noble County line and about 3.2 miles from the Noble/Morgan County line. From **Exhibit 5b**, it can be see that Site #2 is approximately 0.8 miles along an existing transmission line corridor from the nearest substation. Thus, gen-tie line costs for Site #2 would be approximately $800,000.

Although not apparent from the recent topographical map (**Exhibit 8a**), it is apparent from the recent aerial photograph (**Exhibit 8c**) that Site #2 has also been strip-mined almost in its entirety. An examination of the historical topographic map (**Exhibit 8b**) shows that originally the site consisted of three parallel ridges, separated by short, west/northwest-flowing unnamed tributaries of Rannells Creek, which flows northward along the far western boundary of the site. Rannells Creek joins with Collins Fork to form Buffalo Fork about 2.5 miles north of Site #2. Exhibit 8d shows that Site #2 has six stream segments totaling 21,327 linear feet. Exhibit 8c shows that the site contains some narrow ponds along its southern border, a large pond in the northern section, and a few other smaller scattered ponds. A few small areas of young forest occur along the west and south margins of Site #2, but site boundaries have been drawn to exclude large forested areas. Site #2 has no areas of mapped prime farmland (**Exhibit 12b**), but does have an area of "prime farmland if protected from flooding" mapped along the western site boundary.

Site #3

Site #3 consists of 1,300+ acres in Sections 25, 26, 27, 35, and 36 of Bristol Township and Sections 1 and 2 of Meigsville Township, in northeastern Morgan County (**Exhibits 6 and 9a**). It occurs on the Reinersville and McConnellsville, Ohio USGS quadrangle maps. At its closest approach, Site #3 lies about 4.2 mile from the Morgan/Muskingum County line and about 3.7 miles from the Noble/Morgan County line. From **Exhibit 5b**,

it can be see that Site #3 is approximately 1.6 miles along an existing transmission line corridor from the nearest substation. Thus, gen-tie line costs would be approximately $1.6M.

Although not apparent from the recent topographical map (**Exhibit 9a**), it is apparent from the recent aerial photograph (**Exhibit 9c**) that Site #3 has also been strip-mined almost in its entirety. An examination of the historical topographic map (**Exhibit 9b**) shows that originally the site was dominated by a north-south trending ridge that bends to the west in the northern part of the site. Short side-ridges and ravines emanated from this central ridge, channeling runoff to two streams on either side. On the west lies Meigs Creek, a south-flowing tributary of the Muskingum River. On the east lies Dyes Fork, which flows south to join Meigs Creek about two miles south of Site #3. Exhibit 9d shows that Site #3 has 17 stream segments totaling 29,951 linear feet. **Exhibit 9c** shows that the site contains ponds scattered throughout, with a few of the larger ponds in the east- and south-central portion of the site. A few small areas of young forest occur along the south and east margins of Site #3, but site boundaries have been drawn to exclude large forested areas. Site #3 has five scattered areas of mapped prime farmland (**Exhibit 12a**) as well as relatively large areas of "farmland of local importance" mapped along the central spine of the site.

Table 1. Descriptions of Sites According to Siting Criteria

Siting Criteria	Comments		
	Site #1	**Site #2**	**Site #3**
Transmission Line Proximity	Site #1 is more than two miles from the nearest transmission line or substation. A gen-tie line of over two miles would need to be constructed to connect the generation facility at Site #1 to the substation at a cost of $2M.	Site #2 is approximately 0.8 miles along an existing transmission line corridor from the nearest substation. Thus, gen-tie line costs for Site #2 would be about $800,000.	Site #3 is approximately 1.6 miles along an existing transmission line corridor from the nearest substation. Thus, gen-tie line costs for Site #3 would be about $1.6M.
Highway Access (See **Exhibit 10**)	To access I-77 would need to travel north via SR 340/146 4.2 miles, then south via SR 340 7.2 miles, and south via SR 841 for 0.7 mile for a total of **12.1 miles**	To access I-77 would need to travel north via SR 83 2.3 miles, east via SR 340/146 0.2 miles, then south via SR 340 7.2 miles, and south via SR 841 for 0.7 mile for a total of **10.4 miles**	To access I-77 would need to travel east on an access road 0.8 miles, south via SR 78/83 1.0 mile, then east via SR 340 13.0 miles for a total of **14.8 miles**
Property Available for Sale/Minimal Landowners	Entire site currently owned by AEP Ohio	Entire site currently owned by AEP Ohio	Entire site currently owned by AEP Ohio

Siting Criteria	Comments		
	Site #1	**Site #2**	**Site #3**
Topography/ Current Site Use	Site consists of rolling slopes, virtually all of site is reclaimed strip-mined land	Site consists of relatively gentle, broad slopes, virtually all of site is reclaimed strip-mined land	Site consists of relatively steep slopes, virtually all of site is reclaimed strip-mined land
Adjacent Land Use	Site is immediately adjacent to private nature preserve (The Wilds)	Site is immediately bounded on two sides by additional reclaimed strip-mined land	Site is immediately bounded on one side by additional reclaimed strip-mined land
Avoidance/ Minimization of Floodplain Impacts	Site #1 has no impacts on floodplain (**Exhibit 11a**)	Site #2 has no impacts on floodplain (**Exhibit 11b**)	Site #3 has no impacts on floodplain (**Exhibit 11c**)
Avoidance/ Minimization of Waters of the U.S. Impacts	Site #1 includes 79 acres of ponds has four stream segments totaling 16,424 linear feet, as well as scattered small wetlands	Site #2 includes 35 acres of ponds, has six stream segments totaling 21,327 linear feet, as well as scattered small wetlands	Site #3 includes 33 acres of ponds, has 17 stream segments totaling 29,951 linear feet, as well as scattered small wetlands
Avoidance/ Minimization of Forested Areas Impacts	Site #1 includes about 165 acres of young forest	Site #2 includes about 5 acres of young forest	Site #3 includes about 65 acres of young forest
Avoidance/ Minimization of Prime Farmland Impacts	Site #1 has 14 acres of mapped prime farmland (**Exhibit 12a**).	Site #2 has 0 acres of prime farmland, but 26 acres mapped as “prime farmland if protected from flooding” (**Exhibit 12b**).	Site #3 has 30 acres of mapped prime farmland (**Exhibit 12c**).

Table 2. Ranking of Sites According to Siting Criteria

Siting Criteria	Ranking[1]		
	Site #1	**Site #2**	**Site #3**
Transmission Line Proximity	3	1	2
Highway Access	2	1	3
Property Available for Sale/Minimal Landowners	1	1	1
Topography/Current Site Use	2	1	3
Adjacent Land Use	3	1	2
Avoidance/Minimization of Floodplain Impacts	1	1	1
Avoidance Minimization of Waters of the U.S. Impacts	3	2	1
Avoidance Minimization of Forested Areas Impacts	3	1	2
Avoidance Minimization of Prime Farmland Impacts	1	2	3
Total Score	19	11	18

[1] Score of 1 is best at meeting criterion, 2 is intermediate, 3 is worst; thus lowest Total Score is best.

Site Selection Conclusion: Selection of a Preferred Site

As one can see from Table 2, Site #2 is the preferred site based for six of the nine criteria (the land owner criteria resulted in the same score for all three sites), which includes proximity to transmission lines, highway access, and land use, among others. While Site #1 and #3 are preferred for two other criteria each, they both have higher overall scores than Site #2, which has the lowest total score among the three sites, and the lowest score signifies that the site is best at meeting the criteria outlined above. Thus, based on the ranking of sites according to siting criteria as demonstrated in Table 2, Site #2 was selected as the Preferred Site.

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EXHIBITS