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Brightfields: Sustainable Opportunities for Renewable Energy Projects on Environmentally Impaired Lands

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Charles B. Howland, Esq.

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Today there is renewed hope that idle, unproductive contaminated sites and brownfields can be repurposed as productive renewable energy projects (brightfields). The increasing demand for renewable energy, innovative project financing structures, new insurance products, and the work of federal and state lawmakers and regulators to address uncertainty about environmental liability are together leading to exciting real estate opportunities reflecting that the highest and best use of environmentally impaired land may well be brightfields. The U.S. Environmental Protection Agency (EPA) is encouraging brightfields through its *RE-Powering America Initiative*, a unique effort of its enforcement and remediation programs. Working with the Department of Energy's National Renewable Energy Laboratory (NREL), its state environmental and energy counterparts, and external stakeholders in the financing, cleanup, redevelopment, and energy communities, EPA encourages brightfields when they align with the local communities' respective visions. As Harvard University's Ash Center for Democratic Governance and Innovation said of the *Initiative* in naming it as one of the 25 best governmental innovations of 2011-12: "[It] revitalizes degraded land by building infrastructure for our clean energy future, while preserving green space. The program turns community liabilities into assets by fostering an unconventional, collaborative network among players in the energy and remediation sectors." http://www.ash.harvard.edu/Home/News-Events/Press-Releases/Innovations/Top-25-Innovations-in-Government-Announced2/Top-25-Programs.

This article surveys the public policies and market trends that are driving

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brightfields nationally, including the various revenue streams (power, Renewable Energy Credits (RECs), and capacity) that fill out the income side of a project pro forma. It then previews some of the practical issues and opportunities in a successful brightfields project, including land acquisition, project permitting and construction, interconnection and regulatory risk (including liability issues). Brightfields projects bring together two existing camps—renewable energy project developers and brownfield developers—whose members may not be familiar to each other, affording opportunities for practitioners to bridge gaps between the two and assist the new client who needs help learning about both.

Imagine that a new client just walked through your door, curious about redevelopment possibilities and challenges for a site that he or she controls. Perhaps she is a municipal official for a town that owns a closed landfill. Once placed on EPA's National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) because of the wastes it received in the 1960s and 1970s, today the landfill is capped, groundwater is meeting required cleanup standards, and the site has been delisted from the NPL. But the site is not contributing any taxes to the town coffers, and keeping local teenagers on ATVs from sneaking in and turfing the cap is a constant headache.

Or perhaps he is the in-house counsel for an industrial products company, a portion of whose operating facility is subject to an EPA corrective action order under the Resource Conservation and Recovery Act (RCRA) or state equivalent under which a legacy waste unit is being addressed. He would like to find some

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use for the parcel to help his facility's financials; moreover, he has heard about being able to generate power on-site with solar panels to help reduce and levelize the plant's electric bill, taking advantage of something called "net metering." Or perhaps his operations head is talking up the advantages of replacing the facility's heating plant with a combined heat and power (CHP) unit. He thinks either project would fit perfectly within his company's new "Sustainability 2020" plan, but he is not sure how to make either happen.

Both of these potential clients ask the same question: can you help them figure out the advantages and identify how to overcome the hurdles of developing a renewable energy or CHP project on their environmentally impaired site? This question arises because the demand for energy that's renewable (or, in the case of CHP, more efficiently generated) is increasing in the U.S., driven by various policy, market, and grid infrastructure drivers, including increasing regulation of emissions from fossil-fuel generation, increasing requirements under various states' renewable portfolio standards (RPSs), and recent dramatic drops in the price of renewable technologies, particularly solar photovoltaic (PV) panels. Finally, and contrary to the prediction of some, the tremendous increase in unconventional shale gas from fields such as the Marcellus has complicated, but not lessened, the demand for renewables, in part because of bottlenecks in existing gas and electricity transmission infrastructure. Indeed, the prospect of increased, readily dispatchable natural-gas-powered generation is expected to facilitate renewable projects using the most common resources—wind and sun—by bridging their inherent intermittency.

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But there is a problem. Utility-scale renewable energy facilities often require large amounts of land that can displace open space, agricultural lands, or other greenfield lands. Additionally, "NIMBYism" can be an issue, fueled by legitimate fears about aesthetic and ecological impacts from large scale projects. Recall concerns about the Cape Wind project off Cape Cod, flicker and sound issues associated with 100-meter-tall wind turbines, and dead California condors at the early Altamont Pass wind farm in California.

Meanwhile, across the country thousands of former commercial, industrial and mining sites comprising millions of acres of land lie fallow. Contaminated land may pose a threat to public health and the environment, and the mere possibility of that can depress property values and lead to land underuse or abandonment. At some locations where contamination is confirmed, the final remedy might allow for limited activities on the land while other uses, including groundwater use, must be restricted until cleanup goals are met. At other sites, investigation is ongoing. Collectively, these properties are environmentally impaired. Any activity that could exacerbate environmental impacts must be avoided. Yet many of these sites are located near urban centers and other areas of increasing electricity load. Placing solar or wind farms on them, where only their surface would be impacted, would seem to be a perfect fit.

But again, there is a problem. CERCLA, RCRA, and similar state statutes reflect that the cleanup of these sites should be done by those who created the problem. After years of litigation, courts confirmed that these statutes impose strict joint and several liability on current and prior property owners and others

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responsible for contamination. But the debate over the fairness of these liability regimes continues. One of the tougher conversations I had as a government attorney pursuing a CERCLA claim in the 1990s was explaining to the new landowner or lessee at the initial meeting of potentially responsible parties why he was liable, notwithstanding his arguments that he had not initially created the contamination or made it worse.

Market and Government Drivers for Brightfields Projects

With this background in mind, the first step with your new client is to review the specific drivers causing increased demand for renewable energy in the U.S. For many years, voluntary demand for renewable energy supported individual projects. Indeed, until 2010 voluntary REC purchases in the U.S. exceeded those by utilities meeting their RPS mandates. (Typically, one REC represents the generation of one megawatt hour of electricity production from a renewable energy project.) In Pennsylvania, for example, wind and solar developer Community Energy works with universities and others to voluntarily reduce their carbon footprint by entering into multiyear contracts for power (power purchase agreements and RECs), which in turn allow the developer to obtain construction financing. The University of Pennsylvania has been the largest purchaser of RECs in the Commonwealth (including both the voluntary and compliance markets). Swarthmore College, Drexel University and other state institutions have committed to purchasing RECs sufficient to cover 100 percent of their electricity consumption, also under power purchase agreements.

A significant number of private businesses are also buying renewable

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energy to meet customer demand and achieve sustainability goals. Increasingly they are looking for specific projects to support rather than merely purchasing RECs. On July 11, 2014 a dozen of the country's largest corporations, including Bloomberg, Facebook, Hewlettt-Packard, Intel, Johnson & Johnson, Proctor and Gamble, and Walmart, working with the World Wildlife Fund and the World Resources Institute, issued the "Renewable Energy Buyers' Principles." Recognizing that "sixty percent of the largest US businesses have set public climate and energy goals to increase their use of renewable energy," the consortium set forth six principles that will guide their acquisition of renewable energy, several of which favor exactly the kind of Brightfields project that your client is offering. These include preferences for projects that offer energy bundled with the RECs; involve creative, long term financing to lower the cost of capital and yield stable income streams; and that "are located close to our operations and/or on the regional energy grids that supply our facilities so our efforts benefit local economies and communities as well as enhance the resilience and security of the local grid."
http://assets.worldwildlife.org/publications/705/files/original/Corporate_RE_buyers_principles_Final.pdf?1404842446.

The biggest consumers of energy—the federal and state governments—similarly are putting their buying power behind renewable energy projects, particularly brightfields. In a December 5, 2013, Presidential Memorandum, *Federal Leadership on Energy Management* (and in accord with the June 2013 national Climate Action Plan), President Obama directed that all federal agencies

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obtain 10 percent of their yearly electricity needs from renewable resources by 2015 (including CHP) and 20 percent by 2020, with the further directive that "[a]gencies shall consider opportunities, to the extent economically feasible and technically practical, to install or contract for energy installed on current or formerly contaminated lands, landfills, and mine sites." Similarly, Maryland requires that at least six percent of the electricity consumed by state-owned facilities must come from green energy sources such as wind, solar, landfill gas and other biomass resources. In short, voluntary demand for renewable energy projects will only grow over time, and many of these purchasers likely will prefer generation from sites located on contaminated land over agricultural or other green spaces.

While voluntary purchases of renewable energy will remain significant, RPSs and other compliance markets are for now the principal source of demand for renewable energy projects. Twenty-nine states and the District of Columbia have enacted an RPS, requiring that a state's electricity suppliers obtain an escalating percentage of their generation from renewable resources, either directly or through their purchase of RECs.

An increasing number of states give preferences in their RPSs to projects located on environmentally impaired land. In 2012, New Jersey revised its RPS in part by narrowing the types of sites that are solar REC-qualified, which now include (among others) those that are on a "brownfield" or a "properly closed landfill." *See* http://www.njleg.state.nj.us/2012/Bills/AL12/24_.PDF. As Governor Chris Christie stated in his 2011 Energy Master Plan:

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> Brownfields and landfills, in particular, are well-suited for the development of large solar generation. Some of these properties cannot be developed for general commercial or residential purposes and may not provide adequate revenue to the towns and counties where they are situated. However, solar development can offset the costs to cap and or remediate these sites and should be encouraged where local government has determined it to be the best use of the property.

New Jersey Energy Master Plan, Dec. 6, 2011, at 107, *available at* http://nj.gov/emp/docs/pdf/2011_Final_Energy_Master_Plan.pdf.

Similarly, on April 24, 2014, Massachusetts launched its "Solar Carve-Out II Program" as part of its RPS, aimed at adding 1,600 MW of solar PV in the state. To qualify, a "generation unit" must belong to one of several specified market sectors, two of which are landfills that have "received an approval from MassDEP for the use of a solar photovoltaic Generation Unit" in accordance with an approved post-closure permit, and a "Brownfields," a "disposal site . . . the redevelopment or reuse of which is hindered by the presence of oil or hazardous materials." 225 CMR §§ 14.02, 14.05(9)(l)2.c.ii.

A related category of policies that encourages brightfields is found in state directives that mandate or otherwise encourage their utilities to obtain power (renewable and otherwise) from power plants located on brownfields. For example, Delaware's Electric Utility Retail Customer Supply Act of 2006 requires the utility to give a preference to generation projects on brownfields as part of its Integrated Resource Planning process. Del. Code Ann. Tit. 26, § 1007(d)(1)(f). *See also* California Public Utility Commission Decision No. 04-12-048 (Dec. 20, 2004) (favoring brownfields for new power generation projects).

Finally, all states' RPSs include methane recovered from landfills as an

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REC-qualified energy source. But the fact that a combustible (albeit renewable) fuel is being burned (albeit trading emissions of greenhouse-gas-intensive methane for carbon dioxide), as well as the presence of co-contaminants, makes the lifecycle sustainability analysis of these projects more complicated.

Net-Metered Projects

Thus far, the discussion with your new client has focused on the drivers for brightfields projects whose power (and RECs) serves consumers dispersed across the grid. Another type of renewable energy project (including brightfields) of potentially greater interest to your client is one that directly serves the client's own facility, through net metering. Forty-three states (plus Washington, D.C.) have adopted net metering policies under which the local utility is required to offset, typically at the retail rate, a customer's utility bill by the electricity generated by the customer's on-site, behind-the-meter renewable energy project. A net-metered project offers the chance to hedge volatile (and likely rising) energy costs, particularly when using solar PV, whose peak time of production can shave off the most expensive peak energy from a user's load. A net-metered project must be sized to generate no more than the facility's own average electrical usage, typically up to an absolute cap of one to five MW.

Today, some states' regulations governing net metering are in flux, and a fight is underway between advocates of net metering (and policies that support distributed energy generally) and utilities. Several states are refining or expanding the scope of their net-metering regulations, particularly with respect to virtual aggregation (which 10 states now offer). *See, e.g.*, California SB 43,

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available at http://www.energy.ca.gov/2010publications/CEC-300-2010-007/CEC-300-2010-007-CMF.PDF ("Solar Gardens law," enabling creation of community-owned solar projects). Meanwhile, many traditional utilities are challenging net metering as being bad policy, arguing that it unfairly increases costs for non-net-metered customers.

Notwithstanding these issues, net metering and similar policies that encourage self- and distributed generation will undoubtedly be a key part of most states' energy policies and should be of particular interest to any energy-intensive industrial or commercial facility looking to stabilize and lower its energy costs, particularly in a time of increasingly unpredictable energy prices. *See* Hannah Northey & Rod Kuckro, *Deep Freeze Exposes Challenges for Gas-Dependent Grid Operator*, Greenwire, Jan. 23, 2014 (reporting on January 2014 record-setting price spikes in PJM Interconnection's wholesale Real Time Market, attributable to the Polar Vortex, high demand, gas transmission constraints and the unexpected unavailability of certain generation units), *available at* http://www.eenews.net/stories/1059993365.

Other Economic Drivers for Brightfields Projects

Besides the sale (or consumption) of power and RECs, you advise your client that other attributes of renewable energy projects, including brightfields projects, also have monetary value. For example, as for any other power project, a brightfields' ability to commit to being available to the grid at specified times may make it eligible for compensation, apart from its hourly power production. Either as part of a regulated utility's Integrated Resource Planning program or in a

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capacity market operated by one of the wholesale electricity markets overseen by the Federal Energy Regulatory Commission, even intermittent renewable projects such as wind and solar can receive payments. For example, in the 13 states covered by the PJM wholesale market, wind and solar projects can bid into its capacity market (which focuses on summer peak hours) and are presumptively assigned a capacity factor of 13 percent and 38 percent, respectively.

Finally, apart from the direct financial incentives that come from generating RECs and/or creating capacity, and whether built on a landfill by a third-party developer or on a legacy waste site on one's own grounds as a net-metered project, a unique value of a brightfield is the fact that at the same time it restores a property to productive use, it can help ensure performance of an existing cap, groundwater extraction and monitoring wells, and other engineered and institutional controls that are protecting the environment. A well thought out, multimillion-dollar investment in a brightfield, with the infrastructure and manpower to build and operate it, lessens the likelihood of inadvertent damage to remedial measures, consumption of groundwater, or inappropriate development of residences or a day-care center. *See, e.g.*, Tina Kelley, *After Mercury Pollutes a Day Care Center, Everyone Points Elsewhere*, New York Times, Aug. 19, 2006 (day-care center, mistakenly allowed to operate in former mercury thermometer factory, shut down after mercury found in children).

Making the Project Financials of a Brightfield Project Work

Having reviewed some of the economic drivers and policy incentives for brightfields with your new client, you move on to drill down into some of the

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financing and expense items to ensure that the project pencils out. As with a renewable energy project generally, the financials for a third-party-financed brightfields project typically require a tighter analysis and more conservative assumptions than the net-metered project that is being funded off a corporate balance sheet and a structure that ensures income flows and ownership interests that meet the income and tax-credit needs of the various parties. However structured, the brightfields project will look to maximize the federal and state loan, tax, and grant programs familiar to renewable energy developers. See www.dsireusa.org for up-to-date details.

Perhaps less familiar to renewable energy developers are similar programs available to brownfields developments. For example, EPA's Brownfields Program provides direct funding for brownfields assessment, cleanup, revolving loans, and environmental job training, as well as technical information on brownfields financing matters. *See* http://www.epa.gov/brownfields/grant_info/index.htm. Many states have similar programs. *See, e.g., State Brownfields and Voluntary Response Programs* (EPA 2013), *available at* http://www.epa.gov/brownfields/state_tribal/2013_brownfields_state_report_508_web_050913.pdf.

Turning to specific cost elements of a brightfield, a number of unique opportunities and challenges arise. Perhaps the most basic variable in developing a brightfield is the nature and value of the fuel source. Aside from capacity sales, a brightfield's income stream is from the sale of power and RECs, and it will be

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paid only for what is actually produced. While the cost of fuel is free (or cheap biomass), the resource must still be accurately quantified, particularly for intermittent resources such as the wind and sun. For this reason, the projected income stream in the pro forma must be based on site-specific, scientifically valid resource estimates.

EPA's *Re-Powering America Initiative* is tracking approximately 66,000 environmentally impaired sites across the U.S. comprising almost 35 million acres. To facilitate their potential for renewable energy projects, EPA has developed tools to help developers correlate specific parcels with their renewable energy potential and access to necessary infrastructure. EPA offers a Google-based Earth interactive mapping tool with data overlays showing federal- and state-tracked sites allowing prospecting for potential sites in a particular area or across the country, organized by renewable energy technology or type of contaminated site. For each site, the information includes the site's location, acreage, resource availability (wind, solar, etc., based on NREL resource data), cleanup status, and (where relevant) EPA contact.
See http://www.epa.gov/oswercpa/rd_mapping_tool.htm. Ultimately, your client's project will require a site-specific resource assessment, especially if third-party financing is required. For example, a wind project typically requires a year or more of data from one or more on-site meteorological towers, correlated with a nearby airport's longer-term data set; a solar project typically requires an 8760 evaluation, i.e., projected insolation for every hour in a year.

Besides providing free or cheap fuel from renewable resources, another

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advantage of a brightfields project is the potential availability of existing infrastructure. Former electric distribution lines, often at higher voltages, that once fed electricity to the former facility can now be used to send electricity to the grid. Even if upgrading or replacing the lines is required, the necessary infrastructure and utility easements already may be in place. Similarly, such sites may be served by rail or road networks that can facilitate a project's construction and operation. Most importantly, they likely are already zoned to permit brightfields. As NREL notes, such sites often have "existing transmission capacity, roads, industrial zoning, and all other critical infrastructure in place for PV systems." Lars Lisell & Gail Mosey, *Feasibility Study of Economics and Performance of Solar Photovoltaics in Nitro, West Virginia*, NREL/TP-6A, 2-48594 at 27 (Aug. 2010), *available at* http://www.nrel.gov/docs/fy10osti/48594.pdf.

On a related point, a particular advantage of a smaller-sized, utility-scale brightfield, i.e., less than 6 MW, is its potential ability to interconnect on the distribution rather than transmission systems. In addition to its substantially cheaper interconnection costs (both technical and administrative/legal), there is a much higher likelihood that a distribution line of sufficient capacity will be located nearby, if not on the property itself.

Finally, many environmentally impaired lands, especially larger ones, may offer many acres of land with one site owner and may be located in areas where, whether because of remoteness or prior industrial use, the presence of renewable energy facilities is less likely to face aesthetic opposition. This brings us to what

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remains the biggest opportunity and challenge of a brightfield—the low costs of land control, due largely to the specter of liability that gave your new client pause in the first place.

Dealing with Liability Concerns

It is fear of uncertain, potentially unlimited liability under federal and state environmental laws that has made brownfields particularly difficult to develop. In recent decades, Congress, EPA, and many states have sought to address these concerns. The 2002 federal Small Business Liability Relief and Brownfields Revitalization Act added several potential safe harbors from CERCLA liability. For example, one who purchased a parcel after January 2002 can be a bona fide prospective purchaser (BFPP) and therefore not a CERCLA-liable party, so long as he or she completes All Appropriate Inquiries (AAI) into the property's history and conditions before purchase, and after acquisition undertakes "Reasonable Steps" and meets certain other requirements. *See* 42 U.S.C. §§ 9601(35)(B)(iii), 9601(40), 9607(r); 40 C.F.R. Part 312. CERCLA's BFPP provisions apply only to owners, not tenants, and thus excludes the typical utility-scale, non-net-metered renewable energy project that is sited on leased property. In part to encourage brightfields, on December 5, 2012, EPA issued its *Revised Enforcement Guidance Regarding the Treatment of Tenants Under the CERCLA Bona Fide Prospective Purchaser Provision* (2012 CERCLA Tenant Guidance), which extends to lessees the ability to undertake AAI and maintain Reasonable Steps and avoid liability as a matter of EPA's enforcement discretion.

See http://www2.epa.gov/enforcement/guidance-treatment-tenants-under-cerclas-

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bona-fide-prospective-purchaser-bfpp-provision.

An arguably more straightforward course to a CERCLA enforcement safe harbor is offered to one who takes an "eligible response site" through a "state response program." 42 U.S.C. §§ 9601(39), 9601(41) 9628(b). While close review of these statutory terms is required since important conditions apply, essentially a site that is not already subject to an EPA enforcement action under CERCLA or RCRA, or that is not eligible for inclusion on the NPL, will be exempt from EPA enforcement action if it is enrolled in a comprehensive state voluntary or similar cleanup program. *Id.* This second safe harbor is particularly important because the vast majority of contaminated sites are supervised by state agencies, not EPA. Moreover, typical state cleanup programs include certification of completion by the state agency and a covenant not to sue (*see State Brownfields and Voluntary Response Programs*, *supra*) and may even include contribution protection under state law (*see, e.g.*, Maryland Voluntary Cleanup Program, *information available at* http://www.mde.state.md.us/programs/Land/MarylandBrownfieldVCP/MDVCPInformation/Pages/programs/landprograms/errp_brownfields/vcp_info/index.aspx). EPA, on the other hand, recognizes that CERCLA's BFPP provisions are self-executing, and cannot give covenants or contribution protection outside of a site-specific settlement. *See Applicability of Policy Against "No Action" Assurances to CERCLA* (June 16, 2000), *available at* http://www2.epa.gov/sites/production/files/2013-10/documents/noact-assur-mem.pdf. However, EPA will consider issuing a comfort letter that sets forth

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information known to EPA about a site that may help a developer gain and maintain its BFPP status. *See* 2012 CERCLA Tenant Guidance, *supra* (including model comfort letters for brightfields projects). In July, 2014 EPA issued its *Liability Reference Guide for Siting Renewable Energy on Contaminated Properties, available at* http://www2.epa.gov/enforcement/liability-reference-guide-siting-renewable-energy-contaminated-property, which answers common questions about liability and potentially contaminated property under CERCLA and RCRA, as well as state statutes, and summarizes available resources and policy tools that can facilitate brightfields. *See also The Revitalization Handbook - Revitalizing Contaminated Lands: Addressing Liability Concerns,*" June, 2014, *available at* http://www2.epa.gov/enforcement/revitalization-handbook. Finally, EPA has issued several best-practices documents to help brightfields developers coordinate construction of their projects with ongoing remediation activities, *see, e.g.*, EPA, *Handbook on Siting Renewable Energy Projects While Addressing Environmental Issues, available at* http://www.epa.gov/oswercpa/rd_tools.htm, as have several states. *See, e.g., Guidance for Installation of Solar Renewable Energy Systems On Landfills in New Jersey* (updated January 8, 2013), *available at* http://www.nj.gov/dep/dshw/lhwp/solarguidance.pdf; *Developing Renewable Energy Facilities on Closed Landfills* (MassDEP 2009), *available at* http://www.mass.gov/eea/docs/dep/energy/fslfenergy.pdf. In sum, it is much easier today to quantify and manage the regulatory risk presented by brightfields.

To put the challenges and opportunities presented by brightfields into perspective, I am often reminded of an experience I had while serving as general

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counsel for a renewable energy developer. The firm had learned that the township in which it had optioned a parcel of farmland for a possible solar project had amended its zoning ordinance, restricting solar projects to areas zoned industrial. My arguments to convince the town council to change the zoning back were markedly unsuccessful. At the end of the evening, the mayor came up and said, "You know, we really do like your project, but we'd rather see it on the old landfill we own, instead of on farmland. What do you think?"

This is the question that is being asked at environmentally impaired sites across the country. Successfully completing a utility-scale brightfields project sometimes feels like a whack-a-mole arcade game, a truism that you keep explaining to your client. You think you have all necessary elements lined up: resources accurately predicted, land secured, project financing committed, and all necessary permits in place. And then suddenly new data comes in from your bat and bird study, and it turns out that the proposed turbines are not ideally located. Or the local utility decides that additional capacity upgrades will be required to the substation to which you plan to interconnect and the costs will increase by $500,000. Or the political winds change and your state public utility commission announces plans to revisit the size of the solar set-aside in certain out-years, thus changing your pro forma. You and your client soldier on, recalling that across the country over 100 brightfields have already been built. Some technical, economic, and regulatory uncertainty is inevitable for these projects, but the opportunities, not to mention the broader societal stakes, suggest that the results will be well worth the challenges.

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Charles B. Howland

Charlie Howland is an attorney with USEPA Region III, where he specializes in complex CERCLA and RCRA cleanups at private and federal facilities, including contaminated sediment sites and formerly used defense sites. He is part of the Agency's RePowering America's Land Initiative, which encourages development of renewable energy facilities on contaminated lands. He has served on several Agency workgroups which have written national EPA enforcement policies under CERCLA (MSW, tenant liability, FUDS).

In 2008 and 2009 on a leave of absence from EPA Mr. Howland served as general counsel for a utility scale renewable energy project developer, where he helped develop projects for the Ontario Power Authority's Feed-In Tariff. Mr. Howland was also responsible for all interconnection and permitting issues for the firm's U.S. and Canadian wind and solar projects, as well as assessing various energy portfolio standards and electricity (local and RTO) regulations to identify project opportunities.

Outside of EPA, Mr. Howland helped develop and is co-teaching a course in energy law at Villanova Law School, and co-organized the 2011Matthew J. Ryan Public Policy Forum, *The Future of Electricity Markets in Pennsylvania*. From 2002 through March, 2011 he served on the board of directors of the Energy Cooperative of Pennsylvania, a nonprofit, member-owned oil and electricity supply cooperative serving residential, commercial and municipal members throughout Southeastern Pennsylvania. Between 2003 and 2013 he served as a founding member of the board of directors of BlackGold Biofuels, LLC, which developed technology to turn commercial kitchen trap grease into bio-diesel.

Mr. Howland has taught environmental law courses in graduate programs at the University of Pennsylvania's Wharton Business School and its Institute for Environmental Studies, and Drexel University. He has lectured on environmental and energy law and ethics issues at national and international forums, including numerous colleges and universities, EPA's National Superfund Training Academy, the U.S. Department of Justice, professional and industry associations and in Eastern Europe through the Harvard Institute for International Development.

Since 2004 Mr. Howland has been a member of the Lower Merion Township Planning Commission, and currently serves as co-chair. He is a member of the Philadelphia (co-chair, Environmental Law and Energy Committee – 2011-12) and American Bar Associations, and is past president of the Delaware Valley Environmental Inn of Court. In addition to being a graduate of Cornell University (B.A. History 1980) and Villanova University School of Law (J.D. 1985), in 2003 he completed the Executive Program on Economics and the Environment at the JFK School of Government, Harvard University, and in 2013 he was one of 18 people from governmental, private and civic organizations in the U.S. and abroad selected to participate in the Energy Executive Leadership Institute, sponsored by the U.S. Department of Energy's National Renewable Energy Laboratory.

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