Brownfields to Brightfields:

State Policy Models to Facilitate the Reuse of Degraded Lands for Renewable Energy

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CENTER FOR THE NEW ENERGY ECONOMY
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Combe Fill North Landfill, New Jersey.

"Largest Landfill Solar Project in North America Enables Town to Recoup $2.3 Million."
Source: CEP Renewables 2023

Executive Summary

This report examines strategies to promote siting renewable energy projects on degraded lands. As states seek to deploy renewable energy, the issue of siting has become increasingly contentious. Clean power projects located on undeveloped "greenfields" can encounter opposition. Steering these projects towards contaminated, underutilized, and degraded lands provides an alternative with many advantages. Converting degraded "brownfield" properties into clean energy installations is commonly known as "brightfield" development. Unfortunately, several obstacles hinder such development. Although brightfields have been successfully developed in 46 states, states with multiple policies to encourage this approach have the most projects by a serious margin. This report first discusses the advantages and obstacles to siting renewable energy on degraded lands. We then provide a toolkit of programs, with existing state policy examples, that states can employ to facilitate brightfield development.

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List of Acronyms

AML – Abandoned Mine Land

BPU – Board of Public Utilities (NJ)

CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act

CERP – Clean Energy Results Program (MA)

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CSP – Concentrating Solar Power

DEEP – Department of Energy and Environmental Protection (CT)

DEM – Department of Environmental Management (RI)

DEQ – Department of Environmental Quality

DOER – Department of Energy Resources (MA)

EIS – Environmental Impact Statement

EPA – U.S Environmental Protection Agency

IRA – Inflation Reduction Act

ITC – Investment Tax Credit

LMI – Low- or Moderate-Income

MassDEP – Massachusetts Department of Environmental Protection

MW – Megawatt

MWh – Megawatt Hour

NEPA – National Environmental Policy Act

NJDEP – New Jersey Department of Environmental Protection

NREL – National Renewable Energy Laboratory

NYSDEC – New York State Department of Environmental Conservation

NYSERDA – New York State Energy Research and Development Authority

OER – Office of Energy Resources

OPPN – Office of Permitting and Project Navigation (NJ)

PILOT – Payment In Lieu Of Taxes

PTC – Production Tax Credit

PUC – Public Utility Commission

PV – Photovoltaic

REC – Renewable Energy Credit

REF – Renewable Energy Fund (RI)

RCRA – Resource Conservation and Recovery Act

RGGI – Regional Greenhouse Gas Initiative

RPS – Renewable Portfolio Standard

SEQR – State Environmental Quality Review (NY)

SMCRA – Surface Mining Control and Reclamation Act

SREC – Solar Renewable Energy Credit

TREC – Transition Renewable Energy Certificate (NJ)

VCP – Voluntary Cleanup Program

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Introduction

To address the threat of climate change, it is paramount that states accelerate the deployment of renewable energy resources. A National Renewable Energy Laboratory (NREL) report found that "the total amount of land needed by 2035 to achieve [U.S.] clean power goals with wind, solar, and long-distance transmission lines [is] 19,700 square miles." An area much smaller than the 40,500 square miles currently dedicated to active oil and gas leases (Clemmer 2023). However, the issue of siting renewable energy resources has become contentious. This can be the case especially when developers look to site projects on natural areas and farmland – undeveloped tracts collectively referred to as "greenfields."

Previously degraded lands – brownfields, landfills, abandoned mine lands (AMLs), gravel pits, quarries, Superfund sites, and sites subject to action under the Resource Conservation and Recovery Act (RCRA) – offer states an opportunity to balance renewable energy development and greenfield preservation. Blighted properties represent impressive potential for renewable energy: "Of the estimated 80 million acres of contaminated and disturbed land in the United States, approximately 20 million acres could be suitable to host deployment of utility and commercial scale [photovoltaic (PV)] and [concentrating solar power (CSP)] technologies […]" (Macknick, et al. 2013, p. 26).

In many states, degraded lands alone could be used to satisfy the state's renewable portfolio standard (RPS). For instance, brightfield development in Nevada could meet the state's RPS twenty times over without ever touching a greenfield (TNC 2022). Furthermore, the qualities that make these sites less appealing for conventional development make them excellent places for renewables. Blighted properties often have low costs, existing roads and transmission infrastructure, and favorable zoning (see: EPA 2024). Commonly known as "brightfield" development, converting brownfields to renewable energy generation facilities can provide economic and community benefits.

Despite these advantages, renewable developers have been leery of degraded lands. To date, 530 brightfield projects have been installed across the U.S. Project tracking by the EPA indicates that states with multiple policies that encourage siting on contaminated lands tend to have the highest number of such projects (EPA 2023b). Absent favorable policy, renewable energy developers may continue to forgo brownfields for greenfield locations. This presents states with a unique opportunity. By crafting policy that encourages renewable energy siting on degraded lands, states can achieve three policy goals in concert: greenfield preservation, brownfield remediation, and sustainable power generation – a win-win-win.

Advantages to Siting Renewable Energy on Degraded Lands

Siting renewable energy on degraded lands preserves natural and working lands. Accordingly, brightfield development may be less likely to encounter local opposition and may enjoy community support, especially if communities are consulted early and often during project planning.

Degraded lands also tend to be favorable sites for renewable energy generation. Typically, these sites have high renewable resource potential, and many are open and unvegetated (EPA 2011; EPA 2012a). Blighted properties may also have zoning designations compatible with renewable energy generation (rarely the case for greenfields), potentially reducing permitting timelines (TNC 2024). Moreover, these sites often feature or are located near infrastructure that facilitates power generation as a reuse. Due to their proximity to urban areas and transmission rights of way, or their prior use as mines, industrial sites, or landfills requiring electricity, degraded lands often come with transmission access and other existing electricity infrastructure. This can greatly simplify construction and

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reduce interconnection costs. Existing roadways to and within contaminated sites are a similar boon to development and some locations also provide fencing, security structures, buildings, storm water drainage systems, or loading docks. EPA estimates existing infrastructure can reduce project costs by $45 to $113 per kilowatt (kW) – 3% to 7% of total project cost (EPA 2020).

Real or potential contamination on degraded lands creates another cost advantage for renewable energy developers. Limited options for reuse and low demand for such sites generally mean that land acquisition is typically less expensive for brownfields than greenfields (TNC 2024). New federal incentives further prime brownfields for renewable energy development. The Inflation Reduction Act (IRA) encourages renewable energy investment in "energy communities." Included in this definition are brownfields and certain closed coal mines. Projects sited in energy communities are eligible for a 10% multiplier for the Production Tax Credit (PTC) or the Investment Tax Credit (ITC). Developers can stack this bonus with other multipliers for projects benefiting Tribal or low-income communities (CNEE 2023a; CNEE 2023b). Direct pay, available under both the ITC and the PTC, allows tax-exempt entities such as local governments, states, and nonprofits to benefit from these tax incentives, creating the potential for creative solutions to develop renewable energy on degraded lands.

By addressing contamination through beneficial reuse, brightfield projects can garner local support and promote environmental justice. Properties that would otherwise remain polluted and vacant can create negative environmental, health, economic, and criminal impacts for the surrounding community (EPA 2012b; Roude, et al. 2024). Redevelopment of these sites can, if done correctly and with early and frequent community input, address these issues. Renewable installations can also convert an eyesore into a point of interest. For instance, the Somerset Wind Farm, constructed atop an abandoned mine in Pennsylvania, draws a regular flow of visitors stopping to take photos (EPA 2012a).

Wind Turbines on the Somerset Wind Farm.
Photo: Jeff Kubina / Flickr
Source: The Allegheny Front

Siting renewable energy on contaminated lands can also produce economic benefits. First, these projects can supplement the local tax base. Because they often sit vacant, contaminated properties produce little to no tax revenue for the jurisdictions in which they are situated (Sullivan 2017). Brightfields can bring these properties back onto the tax register. In addition, brownfields remediation can boost neighboring property values. Some studies report a 5 - 15.2% increase in residential property value, potentially generating millions in additional tax revenue for local governments (see: Haninger, et al. 2017; Sullivan 2017). Alternatively, projects can generate revenue through land leases or payments in lieu of taxes (PILOTs).

Second, renewable energy project development and site remediation can create jobs. While these cannot guarantee a one-to-one replacement of diminishing fossil energy jobs, states should also consider the allure of clean energy for new industries. Companies in growing sectors like advanced manufacturing and data are increasingly setting emissions and renewable energy goals and looking to locate their facilities in areas that provide access to clean energy to power their facilities (Motyka, et al. 2023). Developing renewable energy projects on degraded lands can attract investment.

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Obstacles to Siting Renewables on Degraded Lands

While siting renewable energy projects on degraded lands can be favorable from a state policy and local community perspective, project developers may confront a different picture. Brightfield projects can be subject to obstacles that extend development timelines, increase costs, and discourage developer investment.

Lack of information is an important barrier to development on degraded lands. First, developers are frequently unaware that such properties are available or may not know where they are located. Similarly, developers may not be aware that renewable energy development is allowed on contaminated lands in their state (see: LaBella 2024; Schaap, et al. 2019; State of Maryland 2020). Detailed site information is even more sparse. Information like contamination status, site grade, and interconnection accessibility has significant bearing on project viability, but can be difficult to obtain. If a developer were to identify a site of interest, they may struggle to navigate land ownership. On AMLs in particular, the land is rarely owned by a single individual, and it can be hard to identify a point of contact to initiate a dialogue about renewable development (see: TNC 2024). These information gaps hamper planning and may foreclose interest in brightfield development.

Developers also confront a maze of policies governing liability for existing contamination, remediation of that contamination, and project permitting. At the federal level, liability and remediation requirements are addressed by four Acts, depending on the nature of the project site. Hard rock mining sites are subject to the General Mining Act of 1872. The Surface Mining Control and Reclamation Act (SMCRA) regulates reclamation and reuse of abandoned coal mines.[1] RCRA and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) oversee hazardous waste sites. Generally, only properties with marked public health impacts or those needing immediate action warrant federal attention under RCRA and CERCLA and most contaminated properties are addressed by state programs (EPA 2014). While renewable energy project developers report hesitation about incurring liability (Schaap, et al. 2019; Sieber 2018), and while such fears can make it difficult to obtain project financing (TNC 2024), liability protections exist for project developers.

Unfortunately, the permitting and environmental review process for renewable energy projects on degraded lands can be even longer than that for projects on other sites. Projects on degraded lands often require additional agency oversight during permitting – "generally [requiring] permits and approvals from federal, state, and local agencies not typically involved in greenfield or rooftop solar project sites" (Goodbody 2016). Given the risk of contamination, these sites may also require additional site assessments and environmental reviews, which can increase costs and create uncertainty for developers.

Construction can also be more involved on degraded lands. Projects must be compatible with planned/existing remediation, and must not exacerbate existing contamination. Existing buildings may need to be demolished; on some sites, a geo-engineered cap sits atop the waste footprint to isolate contaminants. Depending on the load limit of the cap, certain construction equipment cannot be used (ACP 2022; Popkin and Krishnan 2021). This can also impact project economics. For instance, traditional solar systems penetrate the ground (and therefore a site cap), requiring that systems be constructed using "a lighter weight, ballasted system with noninvasive foundations." Ballasted systems, however, cannot pivot to track the sun. The result can be a more expensive yet less productive system (Popkin and Krishnan 2021, p. 11). Developments on degraded lands also frequently have to account for

[1] SMCRA delegates program implementation to states by allowing them to achieve primacy. The 24 states with primacy establish permissible site uses. Because many states use terms like "industrial" or "commercial" without explicitly allowing electricity generation as a reuse, this could prove confusing to renewable energy developers (CNEE 2021).

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subsidence and steep site grades (EPA 2011; EPA 2012a; Popkin and Krishnan 2021). AML projects might encounter underground pipes, mine openings, and subsurface passageways (EPA 2011; EPA 2012a). Each site's unique engineering challenges add expense.

Ballast-Mounted Solar Array atop the Rocco Landfill, Tewksbury, MA.
Source: Syncarpha Capital

While siting renewable energy projects on degraded lands faces obstacles, the benefits are likely to outweigh the costs. At last count, only 530 brightfield projects exist nationwide despite the existence of 20 million acres of degraded land suited for renewable energy generation. Without policies tailored to dismantle these obstacles at the state level, renewable projects will continue along the path of least resistance. The good news is that states have developed policies to address obstacles that others can learn from. We provide those learnings in the sections that follow.

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State Policy Toolkit

Five hundred and thirty brightfield projects have been developed on degraded lands in 46 states and the EPA is tracking an additional 200 projects in different stages of development, from planning to construction. State policy drives development: "States with longstanding policies designed to encourage renewable energy development on contaminated lands tend to have the largest number of renewable energy installations on contaminated lands" (EPA 2023b, p. 3). States with successful programs also tend to have multiple complementary policies designed to incentivize brightfield developments. Such initiatives lower the cost, risk, and complexity of this development (EPA 2022c). Drawing from the experiences of successful states, this report provides a toolkit of policies, with state examples, that support brightfield projects and make degraded lands competitive with greenfields. Because each state's context is unique, this toolkit should be used as a menu of state policy options. Policies are split into seven broad categories:

1. Site Identification and Development Support
2. Education and Outreach
3. Liability Relief
4. Streamlined Permitting and Environmental Review
5. Shared Renewables Policy Reform
6. Procurement Preferences
7. Direct Financial Incentives

158-unit 237 MW Wind Farm on the Dave Johnston Coal Mine, Wyoming.
Photo: Chet Skilbred
Source: Wyoming DEQ

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Site Identification and Development Support

Obstacles addressed: lack of information, muddy site ownership, engineering complexity, and state specific barriers.

For brightfield development to occur, developers must be equipped with detailed information on available sites. Equally important, they must have access to technical assistance related to permitting, construction, and regulatory challenges. Programs in this category address the information gaps that are impediments to siting renewable energy on degraded lands.

1. **Commission a feasibility study.** Policymakers may be unaware of the resources existing in their state. As a preliminary step, policymakers can commission a feasibility study. Studies can evaluate the social and political context of renewable energy project development, as well as energy market conditions within a state to first determine if brownfield projects are economically and socially viable. Studies should also inventory and map degraded sites. Effective studies will additionally analyze renewable energy potential, site suitability, and estimated costs of development. Preliminary studies are critical because they can expose state specific obstacles and suggest policy recommendations for crafting programs that align with the state's specific circumstances to maximize success. Commissioning a study can involve appropriating state funds to allow a contractor or state agency to carry out the research.

   Example: Minnesota Senate File 19-7

   Enacted in 2019, Minnesota's Senate File 7 appropriated $300,000 to finance a feasibility study of the potential to deploy solar PV on closed landfill program sites. The resulting assessment identified 111 locations, ranked sites by viability, identified barriers to development, and provided policy recommendations to address those barriers. Importantly, the study revealed that development on Minnesota's closed landfills is precluded by bond restrictions, requiring that state policy address this issue for program success (see: Krogstad 2020).

2. **Create and publish a database of available sites.** State environmental agencies can compile site information into a single database to facilitate brightfield projects. Many states have existing databases of degraded sites, but they can be difficult to access and fragmented (one database for mine lands, another for brownfields, etc.). Furthermore, basic inventories do not tend to include information specific to renewable energy development. To successfully promote brightfields, databases should be easily accessible, comprehensive, and include information that is useful for project developers including renewable energy potential, site grade, distance to transmission lines, existing contamination, and site ownership (the last being particularly important for projects on former mine lands).

   Example: Massachusetts Department of Environmental Protection's Contaminated Land Profile List

   The Massachusetts Department of Environmental Protection (MassDEP) published a list of contaminated lands with the intent to promote brightfields projects. The database includes more than 1000 records, providing developers access to such information as site location, acreage, current use, current compliance status, wind speeds, and distance to transmission lines (see: MassDEP 2018).

3. **Create and publish a mapping tool.** GIS mapping provides a sophisticated tool for site identification. By creating publicly available maps that present degraded lands as preferred sites, agencies can help developers compare locations and direct them towards these sites. Maps can leverage existing state datasets and incorporate new information enabled by GIS. Existing projects, renewable energy potential, land use, land cover, site grade, distance to transmission infrastructure, local grid congestion, and available state and federal incentives for

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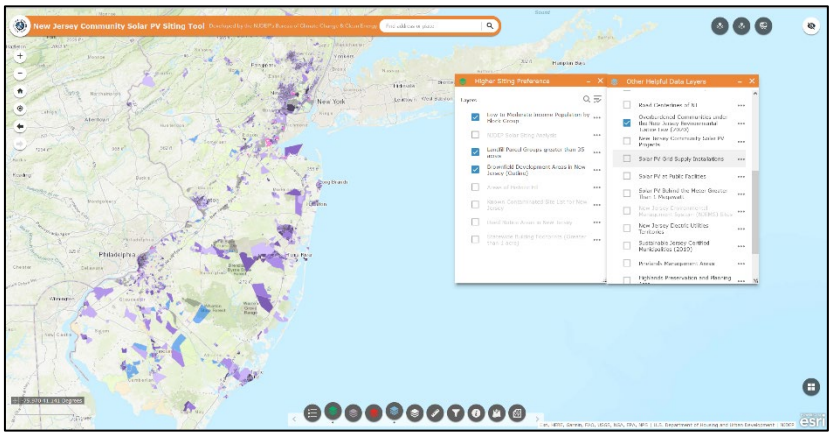
project development can all be integrated into the map as data layers. As state programs evolve and new data is collected, states can update their maps with additional information.

Example: New Jersey's Community Solar PV Siting Tool

The New Jersey Department of Environmental Protection's (NJDEP) Community Solar PV Siting Tool provides information on potential sites by integrating a suite of data layers. Like many GIS tools, it allows users to visualize the state's distribution of land uses, roads, and transmission lines. NJDEP's tool also includes layers to display where preferred land uses (brownfields, contaminated sites, landfills, and areas of historic fill) overlap with low- or moderate-income (LMI) communities and areas of high solar suitability, ensuring that developers can take advantage of federal tax credit adders for development on these sites (see: NJDEPBGIS 2024). Of note, New Jersey's siting tool also allows users to visualize new solar generation hosting capacity at specific points on the grid (EPA 2023b). This is an extremely powerful feature, as lack of transmission access can forestall brightfield projects.



New Jersey's Community Solar PV Siting Tool
Source: NJDEPBGIS 2024

4. **Offer direct technical assistance.** Municipalities and prospective developers will likely have state-specific questions throughout the brightfield planning and construction process. To address these as they arise, state energy and environmental agencies can create programs to provide direct technical assistance. This can be performed through dedicated staff or contractors. Outreach of this level signals strong state support for brightfield projects and can address developer uncertainty.

   Example: Massachusetts' Clean Energy Results Program

   The Clean Energy Results Program (CERP) is a collaborative effort between MassDEP and the Massachusetts Department of Energy Resources (DOER) to eliminate barriers to renewable energy project permitting (MassDEP 2012). The program's Clean Energy Support Teams provide technical support and can help municipalities and project proponents navigate permitting and environmental regulations and standards (MassDEP 2024a).

5. **Launch a "build-ready" program.** Despite state programs to address information gaps and provide technical assistance, developers may remain hesitant to undertake brightfields projects. "Build-ready" programs can address multiple barriers to brightfield development. These programs identify and assess sites for renewable energy potential and conduct pre-construction development activities including project design and permitting and securing interconnection and power purchase agreements to prepare them for renewable energy projects. Build-ready programs can also create community benefits packages, developed in consultation with the host community. Once state work is complete, the site can be auctioned off to developers, creating an evergreen funding source for future site acquisition and preparation.

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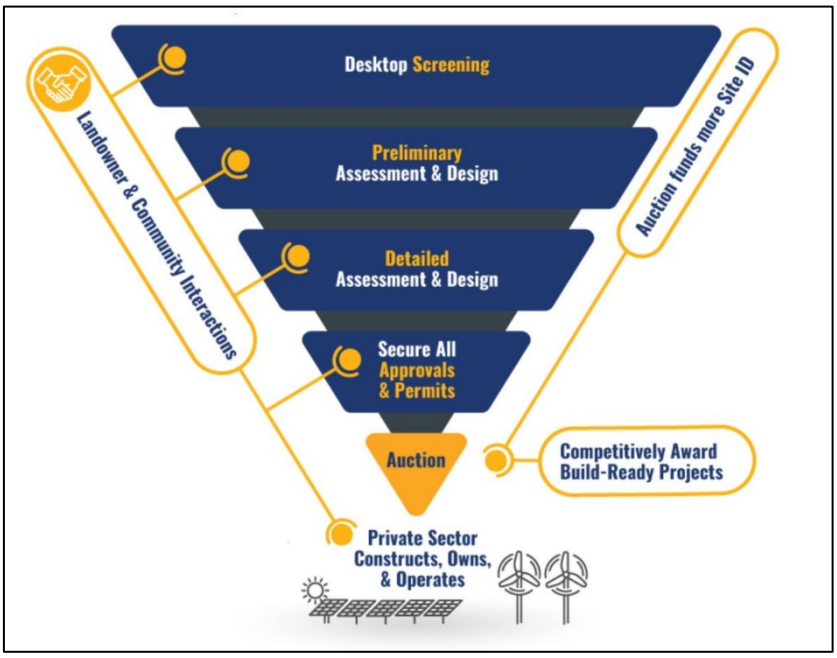
Example: New York's Clean Energy Resources Development and Incentive Program ("Build-Ready")

Launched in 2020, New York's Build-Ready program seeks to advance large-scale renewable energy development on underutilized sites (NYSERDA 2024a). Under the program, the New York State Energy Research and Development Authority (NYSERDA) identifies and acquires sites, reviews project siting feasibility, secures interconnection agreements, and executes the planning, design, and permitting process for renewable energy projects on priority sites including existing or abandoned commercial sites, brownfields, landfills, and former industrial sites (Colella and Senlet 2020). NYSERDA also works with the host community to design a customized benefits package, including PILOT payments, local financial support, utility bill discounts, and local workforce development (EPA 2023a; NYSERDA 2024a). NYSERDA offers 20-year renewable energy credit (REC) offtake agreements to developers, who acquire sites through auction, the proceeds of which are reinvested into the program (NYSERDA 2021; NYSERDA 2024b; Weaver 2022).



The Build-Ready Program Uses a "Multi-Tiered" Approach (EPA 2023a).
Source: Weaver 2022

Education and Outreach

Obstacles addressed: lack of information, engineering complexity, complicated regulatory framework, developer fear of liability.

Programs in this category provide brightfield developers, site owners, and communities with guidance to accelerate projects.

1. **Create and publish a guidebook.** State agencies can create a single, comprehensive resource to educate developers and communities about each step in a brightfield project. Successful programs publish these resources online, regularly update them, and provide guidebooks that address most questions a prospective developer or community member may have, from the basics of solar electricity generation to the finer points of construction, interconnection, and liability relief. Guidebooks can also assist local policymakers by incorporating information about such things as PILOT and community benefit agreements, and site identification.

   Example: Developing Renewable Energy and Energy Storage Facilities on Brownfields and Previously Coal Mined Lands in Virginia: A Handbook

   Enacted in 2021, Virginia's House Bill 1925 established the Virginia Brownfield and Coal Mine Renewable Energy and Grant Fund Program and directed the Virginia Department of Energy (Virginia Energy) to develop a handbook for developing renewable energy and energy storage facilities on brownfields and previously coal mined lands in the state (UVA 2024). The resulting handbook addresses such things as opportunities and

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challenges associated with project development on brownfields and mines, state and federal incentives and assistance programs, explanations of permitting and interconnection processes, local considerations (including community engagement), local policy options for encouraging brightfields, and strategies to preserve natural and historic resources during project development (see: Virginia Energy 2022).

2. **Create, publish, and maintain an online toolkit.** A variety of resources exist to assist communities, site owners, and developers interested in siting renewables on degraded lands. Federal programs and incentives are also available. Furthermore, states may have (or intend to create) state specific resources, guidance, incentives, and other programs to drive brightfield development. Navigating this information, however, can be difficult and time consuming. By putting all of these resources in one place as a dedicated online toolkit, state agencies can ensure that information is easy to locate and navigate. It is critical that the toolkit be proactively managed and updated to capture new resources and incentives.

   Example: Siting Clean Energy on Connecticut Brownfields

   The Connecticut Department of Energy and Environmental Protection (DEEP) maintains a webpage with resources related to siting clean energy on brownfields. Users can access FAQs, remediation program forms, guidance documents, maps, permits, and an index of state and federal incentives and resources. Importantly, the website's content is updated frequently (see: CT DEEP 2024a).

3. **Provide templates.** Projects on degraded lands require several forms, permits, and agreements. Agencies can provide templates to developers and communities to ease project planning and approval.

   Example: New York State Solar Guidebook: Municipal Solar Procurement Toolkit

   NYSERDA's Solar Guidebook includes a Municipal Solar Procurement Toolkit for local governments interested in leasing underutilized land for solar development. The chapter addresses project goal setting, site identification, and community engagement and provides a template Solar Lease Request for Proposal and a template Solar Land Lease Agreement. NYSERDA's toolkit also offers local policymakers a Model Law for Charter County Land Leases (see: NYSERDA 2024c).

4. **Host training sessions.** Inviting prospective developers and local policymakers to educational meetings can be an effective way to overcome information gaps. Successful sessions will address state program particulars and ensure ample time to field questions. Recordings and presentation materials, along with other educational resources, should be made available and easily accessible after the session.

   Example: MassDEP Past Training - Site Cleanup Resource Material

   MassDEP's series of training sessions and related educational materials on site cleanup and renewable energy development on contaminated lands is published online on a single webpage (see: MassDEP 2024b).

Liability Relief

Obstacles addressed: developer fear of liability.

State cleanup programs generally provide some level of liability protection for new lessees/owners who are not responsible for past contamination. Further, states will often provide property specific liability protection to entities pursuing beneficial reuse on degraded lands. However, the perceived threat of liability continues to create a barrier to brightfield development. Programs in this category advertise and enhance state liability protections to ease the concerns of project developers and financers.

1. **Increase awareness of the existing state liability regime.** Educational resources are vital for encouraging developers to site renewable energy projects on degraded lands. Many states have liability provisions that would protect renewable energy projects in most circumstances, yet awareness of these provisions may be lacking. States can publish and distribute guidance documents on the subject simply to alert developers of the legal protections already in place.

   Example: Massachusetts – Managing Chapter 21E Liability

   Massachusetts has published a guidance document explaining, in clear terms, the liability relief provisions most relevant to renewable energy development on contaminated properties (see: MassDEP 2017).

2. **Create specific liability relief provisions.** States can expand existing liability protections to include tenants, current operators, and lessees of a contaminated site who did not contribute to the contamination, as these would be more likely to apply to renewable energy developers. Because statutes typically do not include language addressing renewable energy generation directly, policymakers could add liability protections expressly for brightfield developers.

   Example: New Jersey's Solar Act of 2012

   New Jersey's Solar Act of 2012 (Senate Bill 1925) includes language creating an explicit liability exemption under the state's Spill Compensation and Control Act for persons who operate a solar facility located on a brownfield, area of historic fill, or landfill.

3. **Waive state voluntary cleanup program fees.** State voluntary cleanup programs (VCPs) allow independent developers who are remediating or redeveloping low risk contaminated properties to receive benefits like liability protection, tax relief, and technical assistance. VCPs often require that developers seeking to participate pay an application fee. To encourage participation and improve access to VCP liability protections, states could pass legislation creating a VCP fee waiver for renewable energy developers.

   Example: Maryland Senate Bill 20-281

   Enacted in 2020, Senate Bill 281 encourages projects on degraded lands by directing the Maryland Department of the Environment to waive VCP application fees for brightfields developers.

Streamlined Permitting and Environmental Review

Obstacles addressed: delayed permitting approvals and lengthy environmental site assessments.

Policies in this category reform state permitting and environmental review processes, giving special attention to renewable projects on degraded lands. These measures reduce delays, create predictable timelines, and decrease financial risk.

1. **Create a one-stop shop for permitting and environmental review.** In states where the state has principal or contingent[2] jurisdiction over siting, policymakers can create a dedicated state office responsible for coordinating and facilitating renewable energy project permitting and review. This office would also serve as the single point of contact for a developer and would conduct all necessary consultation between state

[2] Contingent jurisdiction typically depends on project size, with larger projects permitted at the state level (Enterline, et al. 2024).

agencies. This arrangement can address the regulatory complexity that confronts prospective brightfield developers and can yield significant improvements in efficiency, consistency, and predictability.

Example: New Jersey's Office of Permitting and Project Navigation

In New Jersey, all major renewable energy projects must go through the Office of Permitting and Project Navigation (OPPN) (Enterline, et al. 2024). OPPN coordinates the permitting process, environmental justice reviews, and all federal and state environmental reviews. Prospective developers can reach out to OPPN to receive informal review on prospective projects before they invest any time or money (NJDEP 2024b). At the outset of the process, OPPN establishes "a permitting team of representatives from applicable Department programs that may be involved in permitting or approving the solar project" and sets a pre-application meeting with those representatives and the prospective developer. This meeting is used to inform developers of permitting requirements and to ensure that the proposal does not suffer from fatal flaws and is ready to proceed to permitting (NJDEP 2024a).

2. **Set project approval deadlines.** To prevent permitting delays, policymakers can set project approval deadlines. This would create predictable timelines for developers and could accelerate renewable energy deployment at large. To encourage brightfield development specifically, a shorter deadline for approval of projects on degraded lands could be set.

   Example: New York's Accelerated Renewable Energy Growth and Community Benefit Act of 2020

   Prior to 2020, it took up to ten years for renewable energy projects in New York to reach the construction stage. Enacted in 2020, the Accelerated Renewable Energy Growth and Community Benefit Act (Assembly Bill 9508) requires New York's central permitting office (the Office of Renewable Energy Siting) to issue final permitting decisions for projects on pre-approved brownfield sites within six months, one year for all other projects (Arnold and Beck 2023; Enterline, et al. 2024).

3. **Allow permitting by rule.** Rather than addressing permit applications on a case-by-case basis, state agencies can adopt permit by rule. Under this arrangement, the agency would set up-front requirements for approval that must be satisfied by the developer before they submit an application. Because developers agree to meet permit requirements upfront, brightfield project applications receive expedited review.

   Example: Virginia DEQ's Renewable Energy Permit by Rule

   Virginia's Department of Environmental Quality (DEQ) utilizes permitting by rule for small (≥150 megawatt (MW)) renewable energy projects, including projects located on sites verified by DEQ's Brownfields program as previously disturbed (Virginia DEQ n.d.; Virginia Energy 2022). Under the program, the DEQ coordinates application review with three other agencies and applicants receive a final decision within 90 days (Virginia Energy 2022; Enterline, et al. 2024).

4. **Define renewable energy generation as a permitted use.** Local zoning ordinances may not include renewable energy generation as an approved use on degraded lands. This requires that project developers obtain a zoning variance, thereby protracting the approval process. State policymakers can clarify, in statute, that renewable energy development on degraded land is a permissible use regardless of local zoning.

   Example: New Jersey – Landfill and Closed Resource Extraction Operation Exemption from Local Zoning

   New Jersey State Statute §40:55D-66.16 explicitly defines solar, solar PV, and wind energy generation facilities as permitted uses on the site of any landfill or closed resource extraction operation.

Policymakers specifically interested in encouraging renewable energy development on mine lands can consider specifying renewable energy generation as an eligible post reclamation use.

Example: West Virginia – Renewable and Alternative Energy as Post-Mine Land Uses

West Virginia State Code §22-3-10(a)(3) includes renewable and alternative energy projects as eligible post-mine land uses.

5. **Expedite state environmental review.** State environmental review policies, often mimicking National Environmental Policy Act (NEPA) requirements, can create hurdles for deploying renewable energy projects on degraded lands. Like NEPA, state policies include categorical exemptions for projects that typically have little to no significant environmental impact, allowing these projects to circumvent the often arduous creation and review of an environmental impact statement (EIS). Policymakers can adopt an exemption for projects constructed on degraded sites, removing a costly and time-consuming hurdle for brightfields projects.

   Example: New York – Brightfields Type II Exemption

   Major projects in New York are subject to the State Environmental Quality Review (SEQR) Act for approval (NYSDEC n.d.c). Most actions subject to SEQR are Type I actions, meaning they are more likely to have a significant adverse environmental impact, requiring environmental review, often including the preparation and review of an EIS (NYSDEC 2020; NYSERDA 2023). Actions with no significant environmental impact are granted a Type II designation and require no further processing under SEQR (NYSERDA 2023). In 2018, the New York State Department of Environmental Conservation (NYSDEC) adopted amendments to SEQR's Type II designation to include solar energy arrays installed on disturbed sites (see: NYSDEC 2018).

Shared Renewables Policy Reform

Obstacles addressed: elevated cost, market uncertainty.

Shared renewables policies – including community solar and virtual net metering – allow multiple customers to reap the benefits of a single project. Because they are a distributed form of electricity generation, many states have placed size and distance limits on shared renewable energy projects. These restrictions can preclude the possibility of installing shared renewables on degraded lands. Policies in this category leave restrictions intact for greenfield projects but provide exceptions for brightfields.

1. **Provide exemptions from project size caps.** Shared renewables are typically located near where electricity is used, eliminating the need for interconnection to high voltage transmission lines. Shared renewables are instead connected to distribution lines, limiting them to a generation capacity of approximately 20 MW (Johnson Phillips and Bergan 2020). State policy frequently sets project size caps for shared facilities much lower than this threshold, however. To be economically viable, brightfield projects must maximize the generation potential of degraded lands (Popkin and Krishnan 2021). Because generation caps can prevent shared renewables on degraded lands from being cost effective, states could exempt brightfield projects from such caps.

   Example: Maryland House Bill 23-908

   Enacted in 2023, Maryland's House Bill 908 created a permanent community solar program. While the bill limits community solar systems to five MW, it includes an exemption for projects constructed on preferred sites, including brownfields and properties previously zoned for industrial use.

2. **Provide exemptions from geographic restrictions.** Some states place geographic restrictions on virtual net metering. Typically, these require that subscribers be located in the same utility service territory as the shared renewable energy project, with other states setting tighter restrictions (Johnson Phillips 2022). Degraded lands (AMLs in particular), can be located far away from load centers and may be ineligible for virtual net metering as result. To allow shared renewable energy facilities on degraded lands to participate in virtual net metering, policymakers can ease or eliminate geographic restrictions for brightfield projects.

   Example: Minnesota House File 23-2310

   As originally adopted, Minnesota's community solar program required that "that subscribers be based in the same or an adjacent county as the project" which "caused a permitting rush in a ring of counties surrounding the Twin Cities metro area." This created congestion at local substations and interconnection delays for new projects. The restriction also limited the viability of projects serving more rural counties in the state (Jossi 2023). Enacted in 2023, Minnesota House File 2310 eased the geographic restriction on shared solar facilities, allowing subscribers to be located anywhere in Xcel Energy's service territory.

Procurement Preferences

Obstacles addressed: elevated cost, market uncertainty.

States and utilities are increasingly investing in and procuring renewable energy resources. Policy measures in this category create a state policy requirement or preference for renewable energy projects sited on degraded lands. This creates demand for brightfield projects and can serve as an impetus for development that may not otherwise occur.

1. **Include siting as criterion for procurement decisions.** Utility procurement decisions are typically reviewed and/or approved by a state utility commission. This review can be informed by use of a scoring rubric, incorporating multiple criteria. Policymakers can signal support for brightfields projects by incorporating siting as a criterion. To signal strong state support, siting on degraded lands can be provided additional weight, relative to other criteria.

   Example: New Jersey's Community Solar Energy Pilot Program

   New Jersey's Clean Energy Act of 2018 (Assembly Bill 3723) directed the New Jersey Board of Public Utilities (BPU) to establish a Community Solar Energy Pilot Program. The bill directs BPU to include "standards to limit the land use impact of a solar energy project" and authorizes the Board to "restrict qualified solar energy projects to those located on brownfields, landfills, areas designated in need of redevelopment, in underserved communities, or on commercial rooftops." BPU finalized regulations for its community solar pilot program in 2019. Projects were to be evaluated and selected using an "evaluation rubric" which scored applications on a variety of items including preferred siting locations (landfills, brownfields, areas of historic fill, rooftops, parking lots, and parking decks), which were given priority and a significant weight – up to 25 points of the minimum 30 points necessary for an application to be considered for participation (NJBPU 2019a).

2. **Create bid evaluation preferences.** States can direct utilities to conduct renewable energy procurement through a competitive bidding process. These programs can be designed to encourage siting on degraded lands by providing brightfield projects favorable bid preferences. Under this arrangement, a utility will solicit project proposals, where each proposal includes a bid for the price of energy and/or the RECs a project will generate. Projects with the lowest bid prices are selected for procurement until a defined generation capacity cap is

reached. Bid preferences function by reducing the bid price under which brightfield projects are evaluated, increasing the likelihood that they will be selected. When/if the project is chosen, the developer will receive payment in an amount equal to their original bid. To successfully promote brightfield development, preferences for projects on degraded lands must be provided enough weight to make their prices competitive with bids for greenfield projects.

Example: Connecticut's Statewide Shared Clean Energy Facility (SCEF) Program

Enacted in 2018, Connecticut's Senate Bill 9 directed DEEP to develop the Shared Clean Energy Facilities (SCEF) program, which directs the state's two primary electric utilities to procure shared renewable energy projects through an annual competitive bidding process (Gillett, et al. 2023). Utilities rank bids according to purchase price (determined by the energy and RECs a project will sell the utility) and select the lowest cost bids until the program's annual capacity cap is reached (CT DEEP 2024c). Projects on landfills and brownfields are eligible for a 20% bid preference (CT DEEP 2024b).

3. **Establish a procurement target.** Policymakers can create a brightfields carve-out in existing clean or renewable energy standards or they can set a separate procurement target. Because these strategies guarantee demand for projects on degraded lands, they can induce brightfield development.

Example: Illinois' Future Energy Jobs Act

Enacted in 2016, Illinois' Future Energy Jobs Act (Senate Bill 2814) updated and increased the state's RPS. As part of these amendments, the Act set a 2% carve-out for brownfield site solar PV projects and directed the Illinois Power Agency to open a procurement to secure 15-year contracts for the associated RECs by the end of 2017. In 2021, Illinois' Climate and Equitable Jobs Act (Senate Bill 2408) increased this carve-out to 3% and amended the definition of brownfields to include former coal mines.

Direct Financial Incentives

Obstacles addressed: elevated cost.

Possibly the strongest way to encourage the reuse of degraded lands for renewable energy is to provide brightfield projects with financial incentives. Effective incentive policies address the cost advantage greenfields projects possess by subsidizing brightfield projects or by disincentivizing conventional siting.

1. **Provide upfront capacity-based incentives.** Issuing funds prior to development can address the brightfield cost premium and reduce developers' aversion to degraded lands. Under this program, states pay an upfront lump sum to developers which is determined by the nameplate capacity of the project and subject to certain conditions, as set by policy.

Example: Rhode Island's Renewable Energy Fund (REF)

Rhode Island's REF, administered by Commerce RI, provides grant money to clean energy projects in the state. RI Commerce, in conjunction with the Rhode Island Office of Energy Resources (OER), initiated the Brownfields Solar PV program within the REF in 2018 to award grants specifically to brightfield projects (RI OER 2018). OER allocates proceeds from the Regional Greenhouse Gas Initiative (RGGI) to fund the program and grants are paid to the developer upfront to address the initial cost of constructing a brightfield project (RI OER 2021; RI Commerce 2024). Successful applicants receive $1.00/watt for projects using a direct ownership model with a maximum grant of $250,000 per project, and $0.75/watt for third party-owned systems, up to $175,000 per project (EPA 2023a).

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2. **Provide grants to address specific costs.** Policymakers can appropriate funds to create a brightfield grant program. Policy establishing these programs can specify that grants be used only to cover specific project expenses. Ideally, grants would be used to abate the most burdensome hurdles that exist in a particular state.

   Example: New Jersey's Hazardous Discharge Site Remediation Fund

   New Jersey's Hazardous Discharge Site Remediation Fund, jointly administered by the state's Department of Environmental Protection and Economic Development Authority, was created in 1993 to provide funding for cleanup at underutilized and contaminated sites (NJEDA 2021). The program issues matching grants to public entities (municipalities, counties, authorized redevelopment entities) worth up to 75% of the costs of remedial action for renewable energy projects on contaminated property (NJEDA 2024).

3. **Provide additional tax relief.** States can provide tax abatements, exemptions, or credits to incentivize renewable energy projects on degraded lands. States with existing brownfield or renewable energy tax relief programs could expand these to include adders for brightfield projects. By reducing the taxes levied on a project, these incentives can make brightfields competitive with greenfields.

   Example: New York's Brownfield Cleanup Program Tax Credit

   New York's Brownfield Cleanup Program incentivizes private-sector remediation of urban brownfields (NYSDEC n.d.a). In 2022, New York reauthorized and amended its Brownfield Cleanup Program to incentivize renewable energy projects on brownfields, providing an additional 5% tangible property tax credit on top of the 10% baseline credit to participating projects (NYSDEC n.d.b).

4. **Apply multipliers.** Rather than compensating developers up front, many state programs pay renewable projects in return for the energy they send to the grid. REC, net metering, and feed-in tariff provisions can be modified to encourage siting on degraded lands.

   Typically, all projects receive RECs of equivalent value. Multipliers allow states to compensate different project types at different levels, as fits state policy goals. Under this scheme, the base rate of a REC is multiplied by a numerical factor, set by policy, to determine the credit's final value. To steer siting towards degraded lands, a higher factor can be assigned to brightfields projects.

   Example: New Jersey's Solar Transition Program

   Anticipating the expiration of the state's original Solar REC (SREC) program, New Jersey's BPU approved the Solar Transition Incentive Program in 2019. The program introduced Transition Renewable Energy Certificates (TRECs) as a substitute for SRECs (NJBPU 2019b). To provide revenue predictability, TRECs had a flat compensation rate of $152/megawatt hour (MWh) (NJBPU 2020). Most projects, however, did not receive the full $152 rate. Instead, TREC's were 'factorized': projects were assigned a decimal factor determined by their type that was multiplied against the base rate to calculate their actual compensation. Projects on landfills, brownfields, and areas of historic fill were one of three project types to receive full 1.0 factors. In contrast, conventional ground-mounted projects were subject to a 0.6 factor, or approximately $91/MWh (NJBPU 2019b).

   Traditional net metering programs credit renewable energy producers at the retail rate for the electricity they send back to the grid.[3] To encourage siting on degraded lands, states can modify their net metering policy to

[3] This is becoming less common as states revisit and amend their net metering programs.

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provide additional compensation for brightfield projects. States can also create a penalty for projects sited on greenfields.

Example: Vermont's Rule 5.100

Through a rulemaking process in 2017, Vermont's Public Utility Commission (PUC) amended the state's net metering program to incentivize development on "preferred sites" including existing buildings, parking lots, brownfields, and landfills. Rule 5.100 provided positive and negative "siting adjusters" to modify projects' base compensation rates. The Rule provides a + $0.01 multiplier for 15-150 kilowatt (kW) facilities on preferred sites. Facilities between 15 and 150 kW on non-preferred sites, however, are subject to a - $0.03 multiplier (VT PUC 2017). Under the rule, solar facilities between 150 and 500 kW must be sited on preferred locations to participate in net metering (Town of Norwich 2019).

States with existing feed-in tariffs, or those amending their net metering programs in favor of fixed price tariffs can also incorporate brightfield incentives. Similar to the above examples, states can provide projects on degraded lands higher levels of compensation.

Example: The Solar Massachusetts Renewable Target (SMART) Program

The SMART Program compensates participating solar facilities per kWh of energy they produce at a fixed 10- to 20-year rate (depending on project size). On top of the base rate, projects on landfills receive a $0.04/kWH multiplier and brownfield projects receive an extra $0.03/kWh. SMART includes a penalty for projects on greenfields (225 CMR 20.00).

5. **Reform existing renewable energy incentive programs.** States with existing incentive programs can elect to adopt more rigid qualifications for eligibility to require that projects be sited on preferred sites. While such a policy could have powerful siting outcomes, it could obstruct renewable deployment if designed improperly. A careful analysis of state policy goals, market conditions, and siting opportunities within a state is crucial to effective policy design.

   Example: Rhode Island House Bill 23-5853

   Enacted in 2023, House Bill 5853 amended the Rhode Island's net metering and Renewable Energy Growth programs. According to the Rhode Island Department of Environmental Management (DEM), solar development has had a significant impact on Rhode Island's forest cover (Lhowe 2022). The amendments made by House Bill 5853 make projects in core forests (with the exception of previously degraded lands within these forests) ineligible for net metering and create new protections for the state's core forests under the Renewable Energy Growth program.

Best Practices

Brightfields programs vary between states. Despite this heterogeneity, a set of best practices has emerged among states with high levels of deployment.

1. **Create a calculated definition of degraded lands.** This report groups several types of sites – brownfields, landfills, superfund sites, hazardous waste sites, AMLs, gravel pits, quarries, areas of historic fill, and former industrial sites – under the term. State policy often incorporates only a subset of these categories. By omitting some site types, a state could inadvertently limit the scope of its program, requiring that a particular state's definition is deliberate. Specifically, states should address all sites common within their borders. Program components should then be tailored to a state's most promising sites to maximize locations available for renewable energy development.

2. **Build upon existing programs.** Policymakers should undertake an inventory of renewable energy or land reuse initiatives within the state before designing a brightfield program. Numerous states have stalwart brownfield programs and proven renewable energy incentive programs. While these may not encourage brightfield development directly, they can be adapted to do so. Rather than creating new programs, including brightfields within existing policies can be an effective strategy to expedite program development.

3. **Set realistic timelines and policy expectations.** States with the most projects have implemented their programs over the course of several years. Because of the development timeline inherent to renewable energy projects, it can be at least three years until a program sees results. Timelines may be longer if a program requires enabling legislation, or if large scale projects (20 MW+) are prioritized (EPA 2023c).

4. **Adopt multiple policies.** States with successful brightfield programs have multiple policies that reinforce one another. Within this toolkit, programs in the first three categories (Site Identification and Development Support, Education and Outreach, and Liability Relief) address fundamental obstacles to siting renewables on degraded lands. They also prime states for success when the measures in the final four categories (Streamlined Permitting and Environmental Review, Shared Renewables Policy Reform, Procurement Preferences, and Direct Financial Incentives) are adopted. For example, policymakers adopting a program to provide procurement preferences without addressing information deficits through education and outreach may not realize desired policy outcomes.

5. **Structure policies to achieve complementary objectives.** Policymakers should be on the lookout for synergies with other policy goals. For instance, policymakers in a state with a policy goal to provide affordable electricity to environmental justice communities could establish a brownfield procurement preference within a community solar program, given that brownfields are often geographically situated near these communities (EPA 2022b).

6. **Carefully consider capacity.** Financial, human, and other resources are key to successful policy implementation. New incentives must be crafted with a dedicated source of funding in mind and program implementation must be feasible under the scope, expertise, and capacity of state implementing agencies. While impressive, initiatives like the Build-Ready program in New York may not be replicable in all states due to the program's substantial staffing and funding requirements.

   To maximize success, policymakers should encourage interagency cooperation. Because brightfield projects are both land reuse and energy generation, they fall under the purview of energy, environmental, and economic

agencies simultaneously. The EPA Re-Powering Initiative has observed that "states with the most completed projects have formal, ongoing coordination mechanisms between at least their energy and environmental agencies and sometimes also including their economic development agencies" (EPA 2023c. p. 10).

7. **Engage all interested parties.** Early, frequent, and clear communication with communities, implementing agencies, site owners, potential developers, environmental and other advocacy groups, utilities, and others is key to program success. Involving community members affected by land reuse is particularly important for promoting just outcomes, as they may have complicated relationships with degraded lands. Communities should be consulted early in the process to ensure that their perspectives are incorporated throughout – from policy design to project completion. Early, meaningful, and consistent engagement can minimize pushback and produce broadly favorable outcomes that ensure that impacted communities benefit from brightfield projects.

State Profile: Massachusetts

"A Solar Array at a Landfill in Lexington, Massachusetts."
Credit: Renova Partners/Brightfields Development
Source: Energy News Network

Massachusetts has actively pursued solar energy deployment for almost two decades. Incidentally, the state has an unusually high number of municipally-owned landfills with sufficient acreage to support solar installations. Accordingly, Massachusetts modified its programs early on to encourage siting solar on landfills and other degraded properties. Massachusetts has since installed more brightfield projects than any other state (EPA 2023b).

Launched in 2011, the Clean Energy Results Program (CERP), is a collaborative effort between MassDEP and the DOER to eliminate barriers to renewable energy project permitting (MassDEP 2012). The program's Clean Energy Support Teams provide technical support and can help municipalities and project proponents navigate permitting and environmental regulations and standards (MassDEP 2024a). The two agencies maintain extensive siting aids and educational materials. MassDEP published a list of contaminated lands with the intent to promote brightfields projects. The database includes more than 1000 records, providing developers access to site data related to renewable energy project development potential (see: MassDEP 2018). MassDEP's series of training sessions and related educational materials on site cleanup and renewable energy development on contaminated lands is published online (see: MassDEP 2024b). DOER published a comprehensive "Guide to Developing Solar Photovoltaics at Massachusetts Landfills" that walks developers through each step of the brightfield process (see: MassDOER 2012).

Massachusetts addresses developer concern about liability. Massachusetts General Law, Chapter 21E provides several statutory liability protections, and MassDEP has published a guidance document explaining, in clear terms, the liability relief provisions most relevant to renewable energy developers (see: MassDEP 2017).

In 2014, the DOER replaced the state's expired SREC-I program with SREC-II. This new incentive expanded on its predecessor by incentivizing siting on degraded lands. Previously, all projects earned an SREC-I for every MWh of energy produced (MassCEC 2023). Under SREC-II, multipliers between 0.5 and 1.0 determined how many credits a project would receive. Solar projects on landfills and brownfields were provided a 0.8 multiplier. While not the

highest incentive available, this was higher than the award given to other large, ground mounted units. Furthermore, landfill and brownfield projects were not subject to the SREC-II capacity cap (EPA 2022a).

When SREC-II reached its capacity goal, DOER developed the SMART program to replace it. SMART compensates participating solar facilities per kWh of energy they produce at a fixed 10- to 20-year rate (depending on project size). On top of the base rate, projects on landfills receive a $0.04/kWH multiplier and brownfield projects receive an extra $0.03/kWh. SMART includes a penalty for projects on greenfields (225 CMR 20.00).

Conclusion

Brightfields present a unique opportunity for states to reconcile land preservation with renewable energy deployment. Realizing this potential will require concerted effort and cooperation between state legislatures, state agencies, affected communities, utilities, developers, and other interested parties. The challenges associated with degraded lands have dissuaded development in the past, but outcomes in states with successful programs confirm that reusing these lands for renewable energy is a worthwhile policy goal with multiple benefits. This review suggests that there are numerous pathways for states to incorporate brightfields into their broader land reuse and renewable energy goals. By creating new and/or amending existing policies and programs, states can facilitate brightfields development at scale.

East Otis, Massachusetts.
"The 600 kW Unit Powers Our Entire Manufacturing Complex with Clean, Renewable Energy."
Source: Williams Stone Company

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