THE UNTAPPED POTENTIAL OF 'REPURPOSED ENERGY'

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INTRODUCTION

There is reason for both increasing optimism and continued pessimism surrounding the potential for clean energy transition in the United States. First, the positives. The economics of wind and solar energy have consistently surpassed expectations, and costs continue to decline, making these technologies the lowest-cost option for electricity generation in most cases and financially preferable to continuing to run existing coal-fired power plants in nearly all cases (U.S. DOE 2023).

Energy storage technologies and advanced geothermal energy are making significant progress as well, reducing the concerns associated with the variability of wind and solar energy. The enactment of the Infrastructure Investment and Jobs Act of 2021 (IIJA) and the Inflation Reduction Act of 2022 (IRA) have already begun to steer hundreds of billions of dollars toward new and existing clean energy technologies, further reducing the cost of renewable energy projects and providing the foundation for a clean energy manufacturing renaissance in the United States. Because of these developments, more than 95% of new energy generation projects under development seeking to connect to regional electricity grids consist of wind, solar, and energy storage projects (Rand et al. 2024, 11).

Corporate demand for clean energy to power buildings and business operations coupled with state legislative clean energy standards (Illinois, Michigan, Minnesota, Massachusetts, California, New York, and many others have enacted aggressive decarbonization mandates for electric utilities) provide additional business and regulatory momentum for a clean energy transition (DSIRE Insight 2023). At the federal level, the Biden administration has committed the nation to achieving 100% carbon-free electricity by 2035 (Denholm n.d.; The White House 2021, 2024).

Based on these developments, a fully decarbonized electric grid would seem to be right around the corner, providing the basis for an increasingly decarbonized economy. But there are multiple hurdles standing in the way of this trajectory. This policy digest focuses on two of them: local opposition to new clean energy generation projects and inadequate electric transmission line expansion.

First, local opposition to new wind and solar plants has grown in recent years as communities push back against the significantly greater geographic "energy footprint" required for wind and solar plants to produce the same amount of electricity as a nuclear or fossil fuel plant. Fossil fuel companies, now financially threatened by the rise of carbon-free energy, have exacerbated the problem by funding misinformation campaigns and creating shadow groups that support local opposition to new clean energy projects.

As a result, conflicts have escalated, particularly in rural areas. Landowners and community members wishing to work with a developer to host a wind or solar project and reap the financial benefits find themselves at odds with longtime neighbors concerned about aesthetic impacts, decreased property values, the reduction of prime farmland, or unfounded health and safety concerns raised during misinformation campaigns.

In most of the United States, local governments—counties, townships, or cities—have the regulatory authority under state law to "site" and issue permits for

new wind and solar projects. Disputes over new projects have often resulted in political campaigns to replace the township, county, or other local government boards with new members that will vote against the project and, in some cases, enact new regulations to ban all wind and solar projects or restrict them to such an extent as to make them infeasible. The rise in restrictive zoning ordinances governing new wind and solar projects threatens to slow the clean energy transition significantly.

Second, as a nation, we have so far failed to adequately expand the existing U.S. electric transmission grid to accommodate new sources of renewable electricity as well as maintain grid reliability in the face of increasingly severe weather caused in part by climate change. A clean energy transition requires building new high-voltage, long-distance electric transmission lines. Some of these transmission lines must cross several states, because the best utility-scale wind and (to a lesser extent) solar energy resources are often located in less populated parts of the country not well served by the existing transmission grid.[1]

As scholars, policymakers, industry experts, and others have exhaustively documented, a combination of challenges has slowed much-needed electric transmission grid expansion, including ineffective siting, permitting, and eminent domain laws and policies at the state and federal level; local opposition to new transmission projects; and misaligned financial incentives. As a result, new clean energy generation projects wait in multi-year "interconnection queues" and pay increasingly high grid upgrade costs before they can connect to the grid and begin to provide low-cost, carbon-free electricity to electric utilities and their customers.

Addressing these twin barriers will require a concerted effort by developers and others to ensure that new clean energy projects benefit communities in tangible ways. This includes significant financial payments for landowners and communities, creating aesthetically pleasing projects that work with the landscape, training and hiring local workers for project development and construction, and listening to and responding to community needs.

This effort also includes being attentive to energy justice and "just transition" concerns, particularly when projects are proposed for communities that have borne the burden of prior fossil fuel infrastructure projects or will lose employment from retiring fossil fuel plants.

THE ROLE OF 'REPURPOSED ENERGY'

In addition to the financial support and community engagement efforts required to support a clean energy transition, there is a more targeted approach that can help overcome local opposition to clean energy projects and avoid lengthy interconnection queues. This approach focuses clean energy project development on lands that are distressed or underutilized in some way, allowing these projects to "repurpose" the land and thus provide additional benefits to communities and developers.

Repurposed energy sites can include closed landfills, closed coal mines, closed or closing fossil fuel-fired power plants, contaminated lands in rural or urban areas known as "brownfields," and marginal farmland. Such lands constitute as much as 10% of all contiguous U.S. lands, which can host a significant amount of new clean energy generation facilities.[2]

The list of repurposed energy projects under development is growing. For instance, the investor-owned utility Xcel Energy is retiring the largest coal plant in Minnesota and investing more than $1 billion in a nearly 800-MW solar plant and long-term battery storage facility to be located on the same site and surrounding marginal farmland. This siting takes advantage of the existing transmission interconnection rights associated with the coal plant and creates a new pollinator habitat.

Likewise, Amazon, the largest buyer of clean energy in the world, has begun to convert a 45-acre former coal mine in Maryland into a 300,000-panel solar farm, taking advantage of the site's access to power lines and public roads.

1 While distributed energy resources located closer to and within population centers as well as offshore wind can constitute a large part of the effort to move to a carbon-free electric grid, we cannot meet our decarbonization goals even close to on time without taking advantage of the far less costly onshore utility-scale wind and solar energy resources available that, for now, are dependent on large-scale transmission infrastructure.

2 See Denholm, et al. report on pages 50–53 for scenario estimates on how much land is needed to reach 100 percent carbon-free electricity by 2035.

In Kentucky, one of the largest coal mines in the eastern part of the state is the site of a $1 billion investment by Rivian, BrightNight, and the Nature Conservancy to develop the largest solar plant on a mine land to date (Becker and Li 2024; RMI 2024).

As discussed below, a strategy of repurposed energy can take advantage of existing federal, state, and local grants and other financial incentives for redeveloping different types of repurposed energy sites. This strategy can also take advantage of permitting reforms underway in some states that can be refined and expanded nationwide.

FEDERAL AND STATE INCENTIVES FOR REPURPOSED ENERGY

When it comes to repurposed energy projects, financial incentives for developers and communities are critical to overcome developer hesitancy and to bring money into communities. Such incentives have exploded in recent years due to IIJA and IRA. These landmark federal laws offer hundreds of billions of dollars of federal public investment in clean energy and climate solutions over at least the next decade directed at states, local governments, tribes, electric utilities, nonprofits, communities, developers, manufacturers, consumers, and others. These can take the form of tax credits, grants, or loans, and many of these incentives can be used for repurposed energy projects (Goldman Sachs 2023; National Governors Association 2024).

For instance, the IRA clean energy tax credit of 30% of the project's cost has a 10% bonus credit for zero-carbon energy generation projects like wind, solar, and battery plants located in "energy communities," which include communities with brownfield sites, closed coal plants, or closed coal mines. Likewise, the U.S. Department of Energy in 2024 awarded its first set of competitive grants under the $500 million IIJA Clean Energy on Mine Land Program (U.S. OCED n.d.).

The DOE's Loan Programs Office is charged under the IRA with administering $250 billion in funds to finance electric utility projects that result in the "remediation, repurposing, and redevelopment of eligible energy infrastructure sites," including retiring existing fossil fuel energy infrastructure, and replacing it with clean energy generation. This is only a partial list of new federal financial incentives that can be directed at repurposed energy sites.

States too have funding programs designed to remediate brownfield sites and are increasingly directing that money towards clean energy development on former mine sites, landfills, and other disturbed sites. For instance, Connecticut, Illinois, Maine, and West Virginia provide procurement preferences for renewable energy projects on former mine sites, landfills, or other brownfields. Massachusetts, Minnesota, New Jersey, New York, and other states offer tax credits, debt relief, or cleanup grants to support energy projects on landfills and other brownfields (U.S. EPA 2023).

Illinois, as part of its Climate and Equitable Jobs Act legislation in 2021, created a Coal-to-Solar Energy Storage Grant Program. It then selected five coal-plant sites that were already closed or in the process of closing to receive $280 million over a ten-year period to install energy storage facilities to better integrate solar energy into the grid. These state programs, coupled with agency technical support, data collection, and public outreach, can enhance and target the infusion of federal and state financial support for repurposed energy projects.

But money alone, even billions of dollars to support repurposed energy sites specifically or clean energy project development in general, will not on its own be sufficient to meet federal and state decarbonization goals. As described in the next section, local permitting restrictions are increasingly slowing or stopping wind and solar projects, threatening the ability of states and the federal government to meet their decarbonization goals and mandates.

TABLE 1: FINANCIAL INCENTIVES AND PROCUREMENT POLICIES FOR SELECTED REPURPOSED ENERGY PROJECTS (AS OF OCT. 2023)

State	Policy Type	Policy Name	Key Aspects of Policy	Web Link
Connecticut	Procurement Preference	Shared Clean Energy Facility (SCEF) Program	Continuing a 20% bid evaluation preference for landfill and brownfield renewable energy projects in Year 4 of policy implementation. Individual project sizes are 0.1–5 megawatts $(MW)_{AC}$	*Connecticut Shared Clean Energy Facility Program*
Connecticut	Procurement Preference	Non-Residential Tariffs Program (successor to renewable energy credit and virtual net metering programs)	There is a 20% bid evaluation preference for landfill and brownfield renewable energy projects during at least Year 1 of policy implementation.	*Connecticut Non-Residential Tariffs Program*
Illinois	Procurement Requirement	Brownfield Solar Requirement in Climate and Equitable Jobs Act	At least 3% of new solar renewable energy certificates from utility-scale projects must be obtained from brownfield sites and closed coal mines. Sites typically thought of as "landfills" are included in the policy's brownfield definition.	*Illinois Climate and Equitable Jobs Act*
Maine	Procurement Preference	Act to Promote Solar Energy Projects and Distributed Generation (DG) Resources	Brownfields, capped landfills, and certain other desirable sites are provided with favorable price adjustments in bid evaluations.	*Maine Solar Energy Projects and DG Resources Act*
Maryland	Direct Financial Incentive	Renewable Energy Development and Siting (REDS): Evaluations and Tax and Fee Exemptions	Tax exemptions for renewable energy projects on landfills, brownfields, Superfund sites, reclaimed mines, and some other site types.	*Maryland REDS Evaluations and Tax and Fee Exemptions*
Massachusetts	Direct Financial Incentive	Solar Massachusetts Renewable Target (SMART)	There are $0.04/kilowatt-hour (kWh) and $0.03/kWh adders for landfill and brownfield solar projects, respectively, beyond incentives available for other project types.	*Solar Massachusetts Renewable Target (SMART) Program*
Minnesota	Direct Financial Incentive	Closed Landfill Solar Redevelopment and Reuse Account	Established ongoing account to pay off debt of closed landfills being redeveloped for solar and funded prepayment of debt at pilot landfill site.	*Minnesota Closed Landfill Solar Redevelopment & Reuse Full Legislation* *Minnesota Closed Landfill Solar Redevelopment & Reuse Summary*
New Jersey	Direct Financial Incentive	Subsection (t) of Successor Solar Incentive Program	Higher solar renewable energy certificate prices for landfill and brownfield (and historic fill) projects than many other project types.	*New Jersey Successor Solar Incentive Program*
New Jersey	Direct Financial Incentive	Hazardous Discharge Site Remediation Fund	There is a specific renewable energy funding option, in which grants cover up to 75% of remedial action costs for renewable energy reuse.	*New Jersey Hazardous Discharge Site Remediation Fund*

TABLE 1: FINANCIAL INCENTIVES AND PROCUREMENT POLICIES FOR SELECTED REPURPOSED ENERGY PROJECTS (AS OF OCT. 2023) (CONT.)

State	Policy Type	Policy Name	Key Aspects of Policy	Web Link
New Jersey	Procurement Preference	Community Solar Energy Pilot Program	Evaluation criteria include strong preferences for contaminated sites and certain other desirable site types. In the program's second year, 10 awarded projects totaling 41 MW_{DC} in total capacity were on landfill and brownfield sites. The program is geared towards environmental justice access; at least 51% of this capacity is dedicated to LMI communities.	*New Jersey Community Solar Program*
New York	Direct Financial Incentive	NY-Sun MW Block Program	Brownfield and landfill ground-mounted solar projects up to 7.5 MW in much of the state are eligible for additional incentives per watt of installed capacity.	*New York Doing Solar Business* (click on "Available Incentives")
New York	Direct Financial Incentive	Build-Ready Program	As part of this program, renewable energy credit offtake agreements can be bundled with renewable projects developed on under-utilized sites for auction to private buyers. Those offtake agreements are a form of incentive, creating valuable revenue certainty for potential buyers.	*NYSERDA Build-Ready Program*
New York	Direct Financial Incentive	Brownfield Cleanup Program	Under the recent 10-year re-authorization of this program, the renewable energy brownfield redevelopments are eligible for enhanced tax credits.	*New York Brownfield Cleanup Program*
Rhode Island	Direct Financial Incentive	Renewable Energy Fund: Brownfields Solar PV Program	Grants for solar PV, or solar PV combined with energy storage, projects on brownfields, with cumulative awarded capacity exceeding 40 MW.	*Rhode Island Renewable Energy Fund*
Vermont	Direct Financial Incentive	Net Metering System Rules	Adders and subtractors to net metering compensation rates reward landfills, brownfields, certain mines, and other preferred site types.	*Vermont Net Metering System Rules*
West Virginia	Procurement Preference	Renewable Energy Facilities Program	Preferential utility cost recovery to encourage development of up to 400 MW of solar on former mining sites, closed landfills, brownfields, hazardous waste sites, and certain other preferred sites.	*West Virginia Renewable Energy Facilities Program Legislation*

Source: EPA "Examples of State Policies Supporting Renewable Energy Development on Landfills, Formerly Contaminated Lands, and Mines: U.S. Environmental Protection Agency (EPA) RE-Powering America's Land Initiative (RE-Powering)" (Oct. 2023)

Local permitting restrictions are increasingly slowing or stopping wind and solar projects, threatening the ability of states and the federal government to meet their decarbonization goals and mandates.

TABLE 2: STREAMLINED PERMITTING AND ENVIRONMENTAL REVIEW FOR SELECTED REPURPOSED ENERGY PROJECTS (AS OF OCT. 2023)

State	Policy Type	Policy Name	Key Aspects of Policy	Web Link
Massachusetts	Streamlined Permitting and Environmental Review	Expedited Review of Renewable Energy Projects	Various policies to accelerate review steps and timelines for qualifying renewable energy projects.	*Massachusetts Clean Energy Results Program* *Massachusetts Siting Clean Energy at Closed Landfills*
New Jersey	Streamlined Permitting	Statute allowing solar on a closed landfill as an approved use regardless of the zoning, allowing projects to bypass variance processes and go right to the local planning board for site plan review and approval.		TBD
New York	Streamlined Environmental Review	Expedited State Environmental Quality Review Act (SEQRA) Review	Certain brownfield and closed landfill solar projects can qualify as Type II actions, not requiring further environmental review under SEQRA.	*New York State Solar Guidebook*
New York	Streamlined Permitting	Expedited Review by Office of Renewable Energy Siting	Large-scale brownfield and landfill projects (and other previously developed commercial and industrial sites) receive expedited review by this office.	*New York State Office of Renewable Energy Siting*
Virginia	Streamlined Permitting and Environmental Review	Renewable Energy Permits by Rule (PBR)	Renewable energy projects can obtain expedited permits by agreeing to operating and construction requirements; this program also involves inter-agency coordination of reviews.	*Virginia Permits by Rule*

Source: EPA "Examples of State Policies Supporting Renewable Energy Development on Landfills, Formerly Contaminated Lands, and Mines: U.S. Environmental Protection Agency (EPA) RE-Powering America's Land Initiative (RE-Powering)" (Oct. 2023)

CLEAN ENERGY PERMITTING AND SITING REFORM

In almost all states (Texas is the main exception),[3] new wind and solar projects must obtain either local zoning or siting approval, a state certificate of need or other approval, or both. As wind and solar projects have increased in size and number throughout the United States, many local governments have enacted more burdensome permitting requirements.

This has resulted in counties and townships enacting restrictive setback requirements, moratoria, and permanent bans on renewable energy projects in response to local opposition, often arising from concerns over land values, environmental and aesthetic impacts, failure to engage the community sufficiently, or misinformation campaigns funded by fossil fuel interests (Eisenson 2023).

Some states have responded with preemptive legislation to override local restrictions and bans. For instance, Michigan, Maryland, New York, and a few other states have enacted legislation in recent years to allow for state agency siting approval for wind and solar projects over a certain size. Illinois left siting authority with local governments but created statewide standards that local governments cannot exceed, thus curbing local veto power. Florida law provides that solar projects are a permitted use on all agricultural land regardless of more restrictive local zoning laws. These states join several other states, including Minnesota and Wisconsin, that have long had statewide standards or

3 There is no statewide siting process for renewable energy projects in Texas, and fewer local governments restrict the ability of private property owners to use their land for energy development projects.

statewide siting authority for both fossil fuel and renewable energy generation plants over a certain size (Enterline and Valainis 2024).

But state preemption of local authority alone is likely insufficient to address resistance to new clean energy plants and does not ensure that the permitting process, whether at the state or local level, will result in timely approval of new projects. Instead, both state and local governments must engage in additional efforts to expedite and streamline existing permitting processes for at least some categories of clean energy projects.

Project developers, clean energy advocates, and governmental entities that favor clean energy development can use repurposed energy projects as a vehicle to help overcome these remaining permitting barriers. Policymakers can design streamlined or expedited permitting processes based on a repurposed energy project's additional community benefits.

With repurposed energy, the argument that wind and solar plants are destroying prime farmland, displacing other valuable economic development, or adversely impacting existing land uses is lessened significantly. This provides an opportunity for developers and governmental entities to direct resources to those projects, which, if done well, can help build community support for those projects specifically and clean energy development more generally.

For instance, states with existing voluntary cleanup programs for brownfield properties (ASTSWMO Brownfields Focus Group 2021; Crawford n.d.; U.S. EPA 2024) can create separate divisions within their programs to prioritize clean energy development on brownfields. States that do not already have technical assistance or liability assurances for brownfield development should adopt and pilot them for repurposed energy projects. They can then determine whether to expand these supports to other types of brownfield developments. States that do not have statewide permitting or statewide standards for any wind or solar projects can pilot these for repurposed energy projects.

States can also provide expedited permitting, local government coordination, and other assistance for repurposed energy projects, like New York does with its "Build-Ready" program to encourage developers to site renewable energy projects on brownfields pre-approved for development (New York State Energy Research and Development Authority n.d.; U.S. EPA 2023). Both state and local governments can impose faster agency permitting deadlines on repurposed energy projects; create categorical exclusions from state environmental review for those projects; and provide funding, technical support, and mapping information for repurposed energy projects.

REPURPOSED ENERGY PROJECTS CAN BYPASS INTERCONNECTION QUEUES

Locating new wind, solar, and battery projects on retiring fossil fuel plant sites provides valuable access to electric grid interconnection rights. Developers, regulators, and other experts agree that one of the biggest barriers to decarbonizing the electric grid and maintaining overall grid reliability is the cumbersome process for new generation plants to connect to the electric grid. New generation projects, over 95% of which are wind, solar, and battery storage, cannot provide power to the grid because they are waiting in, multi-year "interconnection queues" to determine the level of grid upgrades needed and how upgrade costs should be allocated.

The Federal Energy Regulatory Commission ("FERC") and other regulators are working on "queue reform" policies to address the problem (U.S. FERC 2023, 2024). In the meantime, developers can often avoid interconnection queues by locating the project on a retiring fossil fuel plant site with existing interconnection rights. When an electric utility retires a coal plant but retains its ownership of the connecting transmission line, it often has priority rights to use the capacity of that line for new projects on the same site.

Thus, locating new clean energy projects on closing fossil fuel plant sites allows those new projects to "skip the line" and provide carbon-free power to the grid within a matter of months (Castillo et al. 2024; Siegner and Engel 2024; U.S. FERC 2023; Wilson 2023; *Xcel Energy Servs. v. Fed. Energy Regulatory Comm'n*, 41 F.4th 548 (D.C. Cir. 2022)).

REPURPOSED ENERGY CAN CHANGE THE NARRATIVE

Within the climate movement, government actors, advocates, and others often focus on the dire consequences of climate change. There are good reasons for this. Urgent action is necessary, and complacency is potentially catastrophic. However, this message used alone can be counterproductive and lead to despair, helplessness, depression, and denial.

Accordingly, multiple messaging efforts are needed to address climate change, including optimism and enthusiasm around deploying new clean energy technologies, jobs, and economic development that can transform our landscapes and society for the better. We must make this message a central component of our contemporary culture, particularly in those communities that are most likely to host clean energy projects.

Repurposed energy projects can support this effort, particularly if developers and advocates can communicate success stories associated with renewable energy projects that feature local landowners and neighbors who have directly benefited from the placement of clean energy on their lands or in their communities. Success stories can focus on how income from solar and wind projects has allowed farmers to keep land in their families by leasing marginal farmland. Likewise, solar and wind developer payments to communities have funded local infrastructure like parks, community centers, and schools and lowered electricity bills.

Repurposed energy projects can remediate and cap contaminated lands, thus reducing land pollution and providing the localized air pollution and climate benefits associated with replacing fossil fuel infrastructure. Such efforts can build on existing community preferences for projects on repurposed energy sites. A 2024 survey by Lawrence Berkeley National Laboratory found significantly more local support for large solar projects built on former landfills, industrial sites, retiring coal plants, and unproductive farmland than on land that did not have these characteristics (Rand et al. 2024a, 77).

CONCLUSION

The ability to transition to a carbon-free electric grid to support a decarbonized economy is within our grasp. Early challenges associated with technology developments and cost-effectiveness have been met far sooner than expected. However, local resistance to new projects, opposition to a clean energy transition by powerful fossil fuel interests, and delays in connecting new clean energy projects to the electric grid remain significant barriers.

A campaign of "repurposed energy" can play a role in addressing these concerns. Such projects can better respond to community concerns, capitalize on existing electric grid interconnection rights, and allow states and local governments to experiment with expedited siting and permitting processes that could eventually be expanded to all renewable energy projects.

TABLE 3: RECOMMENDATIONS FOR A REPURPOSED ENERGY REGIME

Regulations & Permitting	▪ Streamline and expedite permitting for repurposed energy projects. ▪ Establish separate clean energy permitting divisions within state brownfields offices. ▪ Expand priority for repurposed energy projects in interconnection queues.
Communication & Outreach	▪ Track and publicize repurposed energy success stories through community-driven communications plans. ▪ Create clean energy funding and outreach programs to inform communities of the specific benefits (monetized) that will flow from projects and over what time period. ▪ Hire and support community clean energy coordinators.

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NOTE

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