

Are You Considering Renewable Energy or Energy-Efficient Approaches in Your Brownfields Redevelopment?

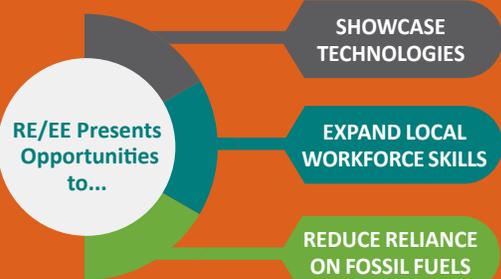


You have many options for including renewable energy (RE) or energy efficiency (EE) as part of your brownfields redevelopment project.

Including RE or EE elements in your redevelopment project creates an opportunity to showcase new technologies and approaches, and build local workforce skills and experience. Assessing, cleaning up and redeveloping a brownfield helps transform the site from an eyesore or safety concern into a property that provides environmental and economic benefits back to your community.

Adding RE on your brownfield and/or incorporating EE technologies can save on energy costs for building owners and tenants. Improvements in RE technology and performance make RE power less expensive than conventional utility power in many markets. By reducing energy consumption, EE technologies reduce operating expenses and often result in a rapid return on investment.

Both RE and EE technologies reduce the need for fossil fuels, which leads to less pollution and better health. These technologies also support job creation, as nearly five jobs are created (on average) for each \$1 million spent on RE and EE as compared to fossil fuels.¹



¹ Garrett-Peltier, Heidi. "Green versus brown: Comparing the employment impacts of energy efficiency, renewable energy, and fossil fuels using an input-output model." *Economic Modelling* 61 (2017): 439-447.

For more RE or EE benefits, check out EPA's [Re-Powering Benefits Matrix](#).

Brownfields offer significant advantages over other undeveloped sites for RE development and EE technologies such as:

- existing infrastructure;
- reduced land costs and tax incentives; and
- community support through land revitalization efforts and open space protection.

Source: [EPA's RE-Powering America's Land Initiative](#)

Getting Started

Many Options

Including a RE or EE component can be done in ways large and small at brownfields of all shapes and sizes. For example:

- An entire site may be reused for RE generation.
- Part of a site may be reused for RE generation.
- The site reuse may include some EE technologies.
- The site remediation may include RE and/or EE approaches.



How the BUILD ACT Includes New Emphasis on Use of RE/EE

In March 2018, Congress passed the Brownfields Utilization, Investment and Local Development (BUILD) Act, which amended the Brownfields provisions of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The BUILD Act included a ranking criterion focusing on RE or EE projects. This criterion is considered by EPA when evaluating brownfields grant applications.

When to Begin

The best time to consider RE and/or EE technologies is early in your brownfield revitalization planning process because this is the time when you have the most flexibility. These documents can be especially helpful:

- A general reuse plan, which describes whether the site will be used for industrial, commercial, residential, mixed-use, recreational or greenspace purposes, will help you identify initial possibilities for RE and/or EE.
- A site conceptual design – with potential building footprints and other developable v. non-developable areas – will help identify location and size options for RE production and EE measures.
- A [Phase I or Phase II environmental site assessment](#) will give you an understanding of site conditions and allow you to appropriately design and implement RE or EE plans.

The earlier you plan to incorporate RE production and EE construction as part of your brownfield redevelopment, the better equipped you are to qualify for incentives, leverage resources, navigate permitting requirements and gain community support. Also, it is a good idea to consult with RE and EE experts early in the process to ensure you have adequately determined site and other project development needs, properly costed equipment needs and established realistic timelines.

Are RE and EE Right for Your Brownfield? Questions to Ask

Consider the following questions when thinking about how to incorporate RE and/or EE into your brownfields redevelopment.

1. In terms of project scale, what are you trying to achieve?
 - Fully or partially power the reuse of an individual site?
 - Improve power resilience by including battery storage or a micro-grid?
 - Be a large megawatt producer (e.g., via a large solar array or many wind turbines), primarily or exclusively for exporting power to the grid?
2. How can EE reduce ongoing power requirements and costs on-site and/or reduce the size of back-up power needed on-site?
3. Do you need a system designed to continue to operate during grid outages to support the immediate site and local critical power needs (water treatment, hospital, community) outside of utility systems or to be designed as totally off-grid (with no utility connection whatsoever)?
4. Do you want to store energy through a battery to smooth out your energy demand needs from the utility and, thereby, reduce your power costs?
5. Which of your planned site reuses could include RE or EE?
 - Are existing resources and infrastructure available? Is there infrastructure that can be reused; adequate exposure to harness solar, wind, geothermal or biomass resources; and viable transportation routes for bringing RE equipment to the site?
 - Where will new infrastructure or energy connections be needed onsite?
 - Where does it make sense to locate buildings or structures, geothermal wells or geothermal piping, wind turbines, solar panels and biomass generation, and energy storage facilities for the highest energy production and lowest cost?
 - What is the extent of the depth and volume of excavated soils for cleanup or redevelopment that may support RE or EE options?
6. Do the benefits of RE/EE on your site outweigh the costs enough to support the investment?



While many RE and EE technologies can involve high initial cost outlays, those investments often have low ongoing operation and maintenance costs and result in electricity cost savings and higher property values later.

Remember: Positive project financials/economics are vital to the success of renewable energy site development!

What RE or EE Can Look Like on a Brownfield Site

RE Production – Entire Site:

- Solar farm for a brownfield site with shade-free space that isn't a wetland or other area prohibited for development (e.g., without land use restrictions or institutional controls).
- Wind generation for a large, wide-open brownfield site near a grid connection and with good site access (wind turbine components are large and heavy and typically require specialized transportation to each site).
- Bioenergy power production for a brownfield site with the ability to secure a large, replenishable source of organic waste matter (biomass or biogas), often from on-site or nearby locations and with sufficient on-site storage capacity.
- A geothermal power plant may be an option for a brownfield site located near a strong geothermal reservoir. Parts of California and Nevada have these types of reservoirs.

RE Production – Partial Site:

- New or rehabilitated buildings can include solar panels on the roof, walls or elsewhere on the property. Solar panels are compatible with most types of land reuses, such as residential, commercial, industrial and mixed use. South-facing orientation improves energy collection.
- Parking lots can include solar canopies, also with electric vehicle charging stations.
- Solar farms can be co-located on agricultural land where sheep graze on grass to reduce the need for mowing and pollinator-friendly plants are grown to attract bees.

EE as Part of Cleanup Remedy:

- Install onsite RE systems to meet the project's electricity demand, including powering cleanup equipment such as groundwater extraction systems.
- Equip field machinery with clean-emission technology for exhaust systems.
- Use energy-efficient field equipment.

EE in New buildings, Renovations, or Retrofits After Development:

- Replace and upgrade lighting and HVAC systems.
- Install new energy-efficient appliances and windows.
- Incorporate building systems that automatically control heating, ventilation, air conditioning and lighting.
- Consider geothermal heat pump (also called ground source heat pump) technologies that can transition the facility away from fossil fuels and also increase overall heating and cooling efficiency. Because these technologies use the earth as a source of heat in the winter and a sink for excess heat in the summer, geothermal heat pumps systems work best when there are fairly well-balanced heating and cooling loads.



Solar



Wind



Bioenergy

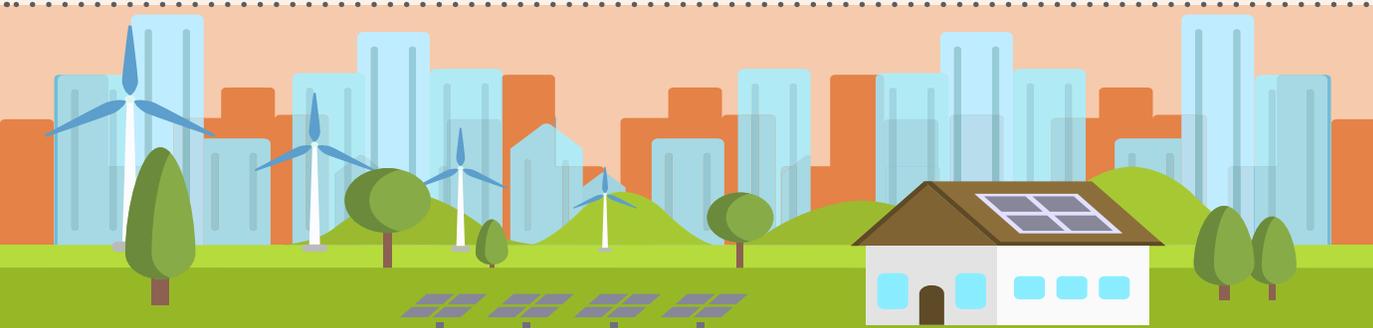


Geothermal



Energy Efficiency

Be sure to check out [EPA's Clean Energy Programs](#). This site also includes information on state, local and tribal climate and energy programs.



Find more information on incorporating RE and EE site remediation at
EPA Greener Cleanups <https://www.epa.gov/greenercleanups>;

CLU-IN <https://clu-in.org/conf/itrc/gsr/>; and

ASTM Standard Guide for Greener Cleanups <https://www.astm.org/Standards/E2893.htm>

Consider Federal and State Involvement

Permits

You may need federal, state and municipal permit approvals for land use entitlements, mitigation and compliance activities, construction, operation, and decommissioning. Contact these agencies early in the development process to confirm the approvals or permitting process.

- Federal agencies involved will depend on project-specific factors but may include the U.S. EPA, U.S. Army Corps of Engineers, Federal Aviation Administration, Federal Energy Regulatory Commission, the U.S. Fish and Wildlife Service and the U.S. Bureau of Land Management.
- State and local agencies involved may include environmental permitting and land use, utilities and transmission access, and water rights agencies.

Funding and Incentives

Federal incentives, depending on the technology and year of installation, include the [Renewable Electricity Production Tax Credit \(PTC\)](#), the [Investment Tax Credit \(ITC\)](#), the [Residential Energy Credit](#), and the [Modified Accelerated Cost-Recovery System \(MACRS\)](#).

- Federal grant and loan programs may be available from agencies including the U.S. Department of Agriculture, the U.S. Department of Energy and the U.S. Department of the Interior.
- Qualified Opportunity Fund investments in Opportunity Zones may be able to support RE and EE redevelopment projects.
- States often have some financial incentives available to support or subsidize the installation of RE.



Examples

Many EPA Brownfields grantees and targeted brownfields assessment recipients have included or are exploring RE or EE in their redevelopment projects. Check out these stories!



[Anniston, AL](#)
[Burlington, VT](#)
[Great Falls, MT](#)
[Griswold, CT](#)
[Indianapolis, IN](#)
[Lakewood, CO](#)
[Lincoln, NH](#)
[Philadelphia, PA](#)
[Poplar, MT](#)
[Portland, OR](#)
[San Juan County, CO](#)
[Tacoma, WA](#)



[Boston, MA](#)
[Hiram, ME](#)
[Philadelphia, PA](#)
[Ranson and Charles Town, WV](#)
[Richmond, VT](#)
[Richmond, VA](#)
[Willimantic, CT](#)



[Crescent Mills, CA](#)



[Ambler, PA](#)
[Fairborn, OH](#)

