IEc

Evaluation of the RE-Powering America's Land Initiative

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Prepared for:

U.S. Environmental Protection Agency
Office of Land and Emergency Management
Office of Communications, Partnerships and Analysis

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CHAPTER 1 | INTRODUCTION

The U.S. Environmental Protection Agency (EPA)'s Office of Land and Emergency Management (OLEM), Office of Communications, Partnerships and Analysis (OCPA) contracted with Industrial Economics, Inc. (IEc) to provide technical support for conducting an evaluation of EPA's RE-Powering America's Land Initiative (the Initiative). This report presents the findings and recommendations from this evaluation. The evaluation employs a combination of qualitative and quantitative data sources and methods. Qualitative sources and methods include: interviews, a literature review, and a timeline that maps the development of the Initiative to broader market, technology, and policy trends. Quantitative sources and methods include: program data (e.g., Tracking Matrix) and a cost matrix for estimating potential cost implications from siting renewables on contaminated sites rather than undisturbed lands.

BACKGROUND

Located within OCPA, the Initiative encourages renewable energy (RE) development on current and formerly contaminated lands, landfills, and mine sites (CLs), when such development is aligned with a community's vision for the site. The Initiative achieves these ends through a combination of tailored redevelopment tools, sharing of best practices and success stories, outreach and partnerships, and site-specific technical support from EPA and the Department of Energy's National Renewable Energy Laboratory (NREL).

In October 2014, the Initiative released the final version of its Action Plan 2.0, which articulates the Initiative's goals and objectives and the activities it expects to pursue over the next two years. In that plan, the Initiative noted its intention to embark on a staged evaluation of its activities, stating that such an evaluation would articulate outcomes, examine the mechanisms used by the Initiative, and explore metrics to measure effort and impact.

As a first step towards achieving that end, the Initiative conducted an evaluation scoping assessment, which was completed in April 2015.[1] The assessment included a new logic model for the Initiative; posed questions of interest to assess the Initiative's resources, tools, and knowledge products; and explored methods and data that would be used to answer such questions.

Based on the results of the scoping assessment, EPA identified several aspects of the Initiative to continue to evaluate. This evaluation effort will assist the Initiative to

[1] Industrial Economics, Inc. *RE-Powering America's Land Evaluation Scoping Assessment, Final Report*. April 16, 2015. http://www.epa.gov/renewableenergyland/rd_evaluation_scoping_assessment.htm.

improve the usefulness of technical support, outreach, and tools provided to communities, developers, and other stakeholders involved in the Initiative.

ORGANIZATION OF THIS DOCUMENT

The remainder of this document consists of three chapters:

- Chapter 2 presents our methodology for conducting the evaluation.
- Chapter 3 provides our findings for each evaluation question (Questions 1-5).
- Chapter 4 provides summary conclusions and recommendations for the Initiative based on our findings (Question 6).

The report has three appendices. Appendix A contains the interview guides for each group of stakeholders interviewed. Appendix B provides the annotated bibliography for the literature review. Appendix C summarizes our research on the cost components of wind and solar projects.

CHAPTER 2 | METHODOLOGY

This chapter summarizes our approach to conducting the evaluation. We begin by describing the questions that guided the evaluation, and then we discuss our data sources and methods. We conclude the chapter with a discussion about the strengths and limitations of the methodology.

EVALUATION QUESTIONS

Based on the results of the evaluation scoping assessment, and the Initiative's priorities, EPA selected six questions for this evaluation:

1. **What role has the RE-Powering Initiative played in moving the market towards greater consideration of RE projects on CLs?**
    a. How have technologies, policies, state efforts, and the economics of siting renewables changed over the past few years? What is the current state of the market?
    b. How has the RE-Powering Initiative helped to encourage or capitalize on these market changes?
2. **What are the current market and other barriers to siting RE projects on CLs? Is the RE-Powering Initiative addressing the most important barriers?**
    a. Are the barriers different in smaller vs. larger communities?
    b. Are the barriers different for different stakeholders (e.g., communities and developers)?
    c. Are the barriers different across sites based on the cleanup program (e.g., RCRA, Brownfields, or Superfund), the extent of contamination, and/or other site-specific factors?
    d. Which barriers do the Initiative's resources, tools, and knowledge products address?
3. **How useful are the EPA/NREL feasibility studies in raising awareness and informing decisions about RE projects on CLs?**
    a. How have different stakeholders (i.e., EPA regional staff, communities, and developers) used the feasibility studies?
    b. Did they find the studies useful (regardless of whether or not they developed a RE project)? Why or why not?
    c. What would make the studies more useful?
    d. What lessons can be drawn about whether/how the Initiative should continue to use feasibility studies?

4. **What are the avoided and/or additional development costs of developing RE projects on CLs rather than undisturbed lands?**
    a. What are the major cost components of mid- and large-scale solar PV and wind projects?[2]
    b. How might these costs change if projects are sited on CLs rather than undisturbed lands?
    c. Do developers derive a benefit from avoided costs when siting RE projects on CLs? If yes, under what circumstances?
    d. When do developers not derive a benefit from avoided costs – and/or when do they face additional costs – when siting RE projects on CLs?
5. **What is the process "roadmap" for the successful development of RE projects on CLs?**
    a. Where do possible barriers exist in the process?
    b. What are some possible solutions to these barriers (if known)?
    c. What role, if any, does or can EPA play in providing these solutions?
6. **Based on the findings for Questions 1-5, how can EPA improve the effectiveness of the RE-Powering Initiative?**

DATA SOURCES AND METHODS

This evaluation employs several qualitative and quantitative data sources and methods. Qualitative sources and methods include: interviews, literature review, and a timeline that maps the development of the Initiative to broader market, technology, and policy trends. Quantitative sources and methods include: program data (e.g., Tracking Matrix) and a cost matrix for estimating avoided or reduced development costs of RE projects on CLs rather than undisturbed lands. Exhibit 1 below summarizes the data sources and methods used for each evaluation question, and indicates whether each data source/method is "key" (indicated by a "1") or "supplemental" (indicated by a "2"). By "key," we mean the most important data source(s) or methods(s) to answer a particular evaluation question; by "supplemental," we mean other sources or methods of less importance (but still useful) for answering that question. As shown in the exhibit, we relied on multiple data sources and methods to address each evaluation question.

[2] The definitions of "mid-scale" and "large-scale" solar PV and wind vary in the literature. Throughout this report, we define these terms each time they are used for the information presented in a particular section.

EXHIBIT 1. EVALUATION QUESTIONS AND DATA SOURCES / METHODS

QUESTIONS	INTER-VIEWS	LIT REVIEW	COST MATRIX	PROCESS MAP	TIMELINE	PROGRAM DATA*
1. What role has the RE-Powering Initiative played in moving the market towards greater consideration of RE projects on CLs?	**1**	**1**			**1**	2
2. What are the current market and other barriers to siting RE projects on CLs? Is the RE-Powering Initiative addressing the most important barriers?	**1**	**1**		2	2	2
3. How useful are the EPA/NREL feasibility studies in raising awareness and informing decisions about RE projects on CLs?	**1**	2				2
4. What are the avoided and/or additional development costs of developing RE projects on CLs rather than undisturbed lands?	**1**	**1**	**1**			2
5. What is the process "roadmap" for the successful development of RE projects on CLs?	**1**			**1**		2
6. Based on the findings for Questions 1-5, how can EPA improve the effectiveness of the RE-Powering Initiative?	*Synthesis of data and results for the previous evaluation questions.*					

1 = key data source or method, 2 = supplemental data source or method

***Note:** IEc defines "program data" broadly to include: RE-Powering Tracking Matrix, EPA/NREL feasibility studies, and other site data.

Interviews

Our primary data collection tool for this evaluation was interviews with EPA staff and stakeholders from several different groups. Overall, we conducted 41 interviews with seven types of respondents: EPA Headquarters and regional staff (and NREL staff), experts, developers, community leaders (non-government), state government officials, local government officials, and site owners. Under the requirements of the Paperwork Reduction Act, we were limited to conducting up to nine interviews in each category with non-federal entities. (This limitation did not affect our interviews with EPA/NREL staff, who are all federal employees.) The number of respondents that we identified and were

able to interview varied across categories; for example, while we interviewed eight out of nine potential developers, we only identified and interviewed one site owner.

Each interview category was composed of the following (the number of interviews conducted in each group is in parentheses):

- **EPA/NREL staff (16)** include EPA Headquarters staff in the Office of Resource Conservation and Recovery (ORCR), Office of Brownfields and Land Revitalization (OBLR), Office of Superfund Remediation and Technology Innovation (OSRTI), Office of Underground Storage Tanks (OUST), and Office of Enforcement and Compliance Assurance (OECA), and regional staff who work on RE projects on CLs in all 10 EPA Regions (including the RE-Powering Response Team). These interviews focused on the process and barriers for developing RE projects on CLs, the usefulness of the RE-Powering/NREL feasibility studies, and recent policy and technology changes that influence the development of a market for RE projects on CLs. We also used the interviews to identify external (non-EPA) stakeholders – including developers, community leaders, and site owners – who could provide first-hand information about the process and the usefulness of the feasibility studies. In addition, we interviewed a program manager and analysts at NREL who participated in developing the feasibility studies; we inquired with NREL staff about the technical barriers identified, and the outcomes at sites that received feasibility studies.
- **Developers (8)** are companies that develop RE projects on CLs. Developers provided first-hand knowledge about the development process, the factors that influence their decision to pursue or not pursue a project, and the steps involved in siting a RE project on CLs. Developers also described differences in the process for developing RE projects on CLs vs. undisturbed lands. Interviews with developers also helped us to characterize a successful process for developing RE projects on CLs, and to identify barriers that may impede developers from undertaking or successfully completing the process.
- **Community leaders (non-government) (3)** include individuals whose communities considered, or actually implemented, a RE project on CL. The interviews explored the aspects of the feasibility studies (and/or other services) that were most and least useful in encouraging or informing the community's consideration of RE projects on CLs. We also inquired about the advantages and challenges they faced in the process, and the outcomes at the sites under discussion.
- **State government officials (4)** include representatives who had a role in siting RE projects on CLs in their state. We used these interviews to inquire about state-level policies, incentives, and other state-level drivers or barriers for siting RE projects on CLs, whether/how these opportunities and barriers vary across their state based on community size or by CL or remediation type, and situations in which they would not encourage RE on CLs. In addition, we asked the state government officials about the resources they draw upon in the process, including (if applicable) materials provided by the Initiative.

- **Local government officials (6)** include representatives whose community considered and/or installed a RE project on CLs. We inquired about the status of these particular projects; the role of municipal authorities with respect to project oversight and implementation; and local policies, permitting requirements, and/or other local factors that encourage or hinder the development of RE projects on CLs in their community. We also asked the local officials about the tools and resources that their municipality draws upon in the process.
- **Site owners (1)** include non-governmental entities (private or non-profit) that own CLs on which RE projects were considered or actually developed. The purpose of this interview was to understand situations in which RE projects present an economically viable use of CLs, and conversely, situations in which an alternative use of the land is more economically compelling. We used this interview to inquire about the factors that influenced the site owner's decision about how to use the land; the development process (for sites that actually developed a RE project); and the use/usefulness of RE-Powering resources, tools, and knowledge products from the perspective of a site owner.
- **Experts (3)** include individuals with academic credentials, specialized knowledge, and/or professional experience that qualify them to offer informed, insightful, and credible assessments of specific drivers and barriers for developing RE on CLs, and how costs might change if projects are sited on CLs rather than undisturbed lands. We tailored our questions for each expert interview based on the respondent's area of expertise, and to fill specific gaps in our knowledge.

We conducted the interviews in two phases. Phase 1 included interviews with EPA Headquarters and regional program staff (and NREL staff), and two developers. During the Phase 1 interviews, we asked interviewees to identify other organizations or individuals with whom they have interacted (e.g., project developers and community leaders). We then conducted the Phase 2 interviews on a rolling basis, by following up with Phase 1 "referrals."[3] Because we selected our interviewees based on referrals (and not through random selection), we cannot extrapolate our findings to the entire population of each stakeholder group; the results presented here apply to our specific interviewees alone, although insights developed from the interview findings may be useful to the Initiative more broadly. In addition, while we conducted interviews with a broad range of stakeholders, our respondents are not necessarily representative of their group; for example, the developers that we interviewed lean more heavily towards larger-scale solar projects as opposed to smaller-scale solar or wind.

[3] We note that this evaluation did not necessitate an Information Collection Request (ICR), as we used unique interview guides for each type of respondent, and we did not interview more than nine non-federal individuals in any group.

Literature Review

We conducted a literature review focusing on six broad topic areas relating to the overarching evaluation questions:

1. Current state of the RE market, including industry and policy trends;
2. Avoided or additional costs from siting RE projects on CLs;
3. Barriers and other considerations to siting RE projects on CLs, and possible solutions to those barriers;
4. Financing considerations beyond the cost impacts described in Topic No. 2 and the barriers identified in Topic No. 3;
5. Project case studies; and
6. Discussions in the literature of the RE-Powering America's Land Initiative and related efforts.

We conducted the literature review using several research databases, including Google Scholar and Scopus.[4] We employed a wide variety of search terms to reflect the nature of the questions posed in the evaluation methodology, such as:

- Terms that generally describe the literature review topics, including "renewable energy," "contaminated land," "siting considerations," "cost drivers," etc.; and
- Terms that specifically described potential issues that can influence or affect RE projects on CLs, including "brownfields redevelopment" and "liability."

The literature review included peer-reviewed journal articles, industry reports, government reports, and press pieces. IEc summarized the literature review findings in a memorandum and an annotated bibliography that we submitted to EPA in November 2015.[5] Each bibliographic entry contains a brief description of its relevance to this evaluation.

While the literature contained ample discussion of (1) RE siting considerations and (2) redevelopment of CLs, the literature infrequently discussed the specific context of siting RE projects on CLs. Similarly, while the literature broke out the cost components of solar and wind projects, we found relatively little analysis of differential costs or financing considerations of RE projects on CLs vs. undisturbed lands. However, the literature helped set the stage for further investigation regarding how specific costs and other factors might differ between CLs and undisturbed lands.

Cost Matrix

For determining the potential cost implications of siting RE projects on CLs vs. undisturbed lands, we drew from literature on the baseline cost components of RE projects and the extent to which site characteristics affect those cost components, by

[4] Scopus is an interdisciplinary database of peer-reviewed literature, including scientific journals, books, and conference proceedings.

[5] Industrial Economics, Inc. *Literature Review Methodology for RE-Powering America's Land Evaluation*. November 23, 2015.

system size and type. Developer and expert interviews then served to illuminate how those cost components might change, in either direction, when a project is sited on CLs instead of undisturbed lands. We summarized this information to answer Question 4 regarding the avoided and/or additional costs of siting RE projects on CLs as opposed to siting them on undisturbed lands.

Process Map

In order to develop a process map that provides a logical, step-by-step progression of an example development of RE projects on CLs, we drew upon completed developer and expert interviews. Information obtained from these interviews is synthesized in an attempt to derive as comprehensive and holistic a process map as possible (discussed in detail in the next chapter). This process map documents the process that successful sites underwent, and the accompanying discussion highlights the barriers experienced, and how they were or may be overcome.

The process map and accompanying discussion emphasize certain aspects of the project development process in order to best serve the needs of the overall program evaluation, and Question 5 in particular, including:

- Where and when in the process specific barriers arise, and actions that may ameliorate or obviate these barriers; and
- Points in the process where stakeholders may be able to use the Initiative's materials and tools to assist in project development and completion.

Timeline of Program, Industry, and Policy Development

We developed a timeline of program, industry, and policy development trends as a key data source for Question 1 and a supplemental data source for Question 2, using information obtained through expert interviews and discussions with program staff, the literature review, and RE-Powering program data. This timeline emphasizes:

1. Market, policy, and technology changes related to developing RE on CLs;
2. Milestones in the development of the RE-Power Initiative; and
3. Trends in the number of RE projects sited on CLs.

Specifically, the timeline arrays the Initiative's milestones with:

1. Broader trends in the market and policy arena; and
2. The number of CLs with RE installations.

Program Data

We relied on program data as a supplemental data source for the six evaluation questions. Program data helped guide the interviews, including specific sites and/or materials (e.g., feasibility studies) to focus on during the interview discussions, and provided us with background information about the sites. We also used the number of sites in the Tracking Matrix when developing the timeline of industry, policy, and market development discussed in the next chapter.

STRENGTHS AND LIMITATIONS OF THE METHODOLOGY

The rest of this section describes the strengths and limitations of the sources and methods discussed above.

Strengths

- **Mixed-methods approach.** As discussed above, we used multiple data sources and methods to address each evaluation question. Discovering consistent themes across methods bolsters the strength of the evaluation findings. Conversely, if data sources and methods generate conflicting information, this helps identify areas of uncertainty and/or areas for future investigation. In addition to assessing the program's effectiveness, this combination of methods helped to identify barriers to siting RE projects on CLs.
- **Market intelligence.** We assessed the Initiative within its broader market, technology, and policy context. This provided a more meaningful and insightful evaluation than looking at the program in isolation, which was particularly important given the diverse and diffuse nature of program activities and stakeholders, and the rapidly changing technology and market landscape.
- **Program development opportunities.** This evaluation identifies priorities and barriers that different types of stakeholders face in developing RE projects on CLs. Specifically, the evaluation describes: (1) the general process for siting RE projects on CLs; (2) barriers encountered in each phase; (3) possible solutions to those barriers; and (4) EPA's role, if any, in providing identified solutions. In so doing, the evaluation identifies opportunities for the Initiative to address selected challenges and opportunities related to the development of RE projects on CLs.

Limitations

Given data limitations and requirements under the Paperwork Reduction Act, the evaluation methodology has some limitations, which we discuss below.

- **Limited evaluation scope.** The Initiative does not currently have a system that comprehensively tracks all stakeholders that have accessed the program's resources, and in what capacity. Therefore, we do not consider a comprehensive assessment of the effectiveness of the Initiative to be feasible at the present time. As such, our methodology focuses on specific topics that can be addressed through interviews, literature, and existing program data.
- **No comparison group**. Due to the lack of comprehensive information about who has accessed the program's resources and in what capacity, it was not possible to create a valid comparison group; doing so would have required the ability to clearly differentiate between participants and non-participants. In the absence of a comparison group, the evaluation instead relied on interviews (participant judgment/expert opinion), as well as program data and the literature. Thus, it was not possible to prove the direct causal impact of the Initiative on the development of RE projects on CLs.

- **Potential bias associated with purposive sampling.**[6] It was not possible to conduct a statistically valid sample of interviewees given the unknown size and scope of the population, the many types of interviewees that had to be included to address every evaluation question, and the requirements of the Paperwork Reduction Act. Therefore, the interviews were selected as a purposive sample, and were selected based on their diverse and informed perspectives. However, purposive sampling has the potential to introduce bias into the evaluation results. Also, because the sample was not statistically representative, results cannot be extrapolated or generalized to the population as a whole.
- **Potential under-representation of certain groups.** While we made efforts to obtain diverse perspectives in the interviews, two groups may be under-represented in the results. First, six of the eight developers interviewed for this study only install solar, one installs both solar and wind, and one only installs wind; therefore, the information that we collected from developers is weighted more heavily toward solar than wind. Second, we were only able to schedule and interview one site owner out of a potential of nine. While other interviewees provided their perspectives on the priorities and barriers facing site owners, we were unable to confirm these impressions directly with more than one site owner.

[6] A purposive sample is a non-probability sample that is selected based on characteristics of a population and the objective of the study. (http://sociology.about.com/od/Types-of-Samples/a/Purposive-Sample.htm)

CHAPTER 3 | FINDINGS

This chapter discusses our findings, organized by evaluation question.

QUESTION 1: WHAT ROLE HAS THE RE-POWERING INITIATIVE PLAYED IN MOVING THE MARKET TOWARDS GREATER CONSIDERATION OF RE PROJECTS ON CLS?

a. How have technologies, policies, state efforts, and the economics of siting renewables changed over the past few years? What is the current state of the market?

The market for RE projects has seen significant developments in recent years. Renewable energy – including hydropower, wind, solar, biogas, biomass, geothermal, and other renewables – accounted for 20 percent of the U.S. power fleet in 2015, with 222 GW installed capacity, a 57 percent increase over 2008 levels.[7] Hydroelectric facilities and pumped storage comprised nearly 102 GW – nearly half the total – but this figure has stayed roughly constant since 2008. On the other hand, wind and solar have nearly quadrupled in capacity since 2008, from 26 GW to 103 GW.[8]

Since 2006, EPA has documented an upward trend in the number of new RE projects on CLs, the amount of installed capacity, and the number of projects connected to the grid. The RE-Powering Tracking Matrix reports a cumulative total of 179 RE installations on 171 CLs, with total installed capacity of 1,124 MW.[9] With the exception of one 100-MW wind installation in Oregon, only seven projects with a total capacity of 7.5 MW were installed on CLs through 2005; and only two of the seven were individually larger than 1 MW. As of April 2016, medium to large-scale installations (1-10 MW) make up approximately half of the total number of installed projects; and larger systems (10+ MW) make up about 75 percent of total installed capacity. Approximately 85 percent of the projects are solar PV, while 56 percent of installed capacity is powered by wind. There is also a growing trend in reuse of former landfills as large PV developments: at least 96 former landfills have been turned into solar projects, of which at least 77 were completed between 2012 and April 2016. Developers noted that solar installations on former landfills represent a significant opportunity, as there are several viable sites with few other viable uses.

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[7] Bloomberg Finance L.P. (2016). *2016 Sustainable Energy in America Factbook.* Developed in partnership with The Business Council for Sustainable Energy.

[8] Ibid.

[9] RE-Powering America's Land Initiative: Project Tracking Matrix. April 2016. https://www.epa.gov/re-powering/re-powering-tracking-matrix.

The growth in RE projects has been driven by a number of market and policy factors, which we briefly explain below, and which are summarized in Exhibit 2. While many of the following factors apply to RE developments on undisturbed or contaminated sites, some are specific to CLs (noted in the discussion below). Significant market changes include improvements in manufacturing technologies and processes, and a corresponding decline in the cost of wind and solar power. Solar energy beats the retail electricity prices paid by homeowners in many states,[10] and the estimated levelized cost for wind ($80/MWh) is already cost-competitive with conventional coal ($96/MWh) and natural gas-fired combined cycle ($66/MWh).[11] Market adoption of renewables is expected to increase as renewable power achieves and maintains parity with conventional energy resources.

In addition, federal incentives and policy have played an important role in supporting the growth of RE projects, including projects sited on CLs. For example:

- **Federal tax credits for renewables**. The literature review and interviews identified the 30 percent Investment Tax Credit for solar (which was recently extended through 2019, with a gradual step down of the credits between 2019 and 2022) and the Production Tax Credit for wind (recently extended through December 2019) as important drivers for RE projects. The Modified Accelerated Cost Recovery System (MACRS) – which provides an accelerated five-year depreciation schedule for solar equipment – is an important incentive for solar projects. Interviewees explained that, in many cases, financial incentives can be the deciding factor in whether or not RE projects (especially solar projects) are profitable, and therefore, whether they get developed.
- **Federal incentives for Brownfields**. A smaller number of interviewees noted that federal tax incentives, including the Brownfields Expensing Tax Incentive and the New Markets Tax Credit, help reduce the costs for RE projects sited on Brownfields.
- **Presidential executive orders and memoranda**. Executive Order (EO) 13514 (2009) set sustainability targets for federal agencies, building on EO 13423 (2007). This was followed in 2013 by the President's Memorandum on Federal Leadership on Energy Management, which included provisions for RE on CLs. In March 2015, the Obama Administration issued EO 13693: "Planning for Federal Sustainability in the Next Decade." EO 13693 sets RE targets, but does not mention CLs.

State policies and incentives have also played an important role in the growth of RE, including RE on CLs. Increasingly, states and localities are implementing policies to encourage the development of RE projects on CLs. For example, Massachusetts now has expedited permitting processes for RE projects on CLs. New York State recently changed

[10] BCSE factbook, op. cit.

[11] Leibowicz, B. D. (2015). "Growth and competition in renewable energy industries: Insights from an integrated assessment model with strategic firms." Energy Economics **52**: 13-25.

how solar is regulated and valued, which should hasten project development cycles.[12] Strong state policies tend to trickle down to the local government level as well. Governments have also become less wary of siting RE projects on CLs, as more successful projects have been completed. Other examples of state policies that encourage RE projects include:

- **Renewable Portfolio Standards (RPS).** An RPS requires a state's electricity suppliers to obtain an increasing percentage of their generation from renewable sources, either directly or by purchasing renewable energy certificates (RECs). Twenty-nine states and the District of Columbia have adopted an RPS.[13] Interviewees in all categories reported that states with RPSs and/or other favorable policies for renewables are more attractive and conducive for developing RE projects.
- **Incentives for RE on CLs.** Interview respondents stated that incentives are a crucial driver for the successful development of RE projects on CLs. Community leaders and developers, in particular, highlighted that incentives are a critical balance to the often higher costs of RE projects on CLs (as compared to RE projects on undisturbed lands). Two community leaders noted that states without incentives are at a disadvantage in attracting RE projects, tying their hands in attracting and moving projects along. However, overall, stakeholders reported that states and local governments have taken stronger positions to encourage projects and put incentives in place. At least four states – California, Delaware, Massachusetts, and New Jersey – have policies encouraging RE on CLs.
- **Net metering.** Net metering policies allow customers to sell excess power back to the grid to offset customers' utility bills. Forty-one states and the District of Columbia have adopted mandatory net metering policies.[14] Many states are currently reviewing their net metering policies, due in part to concerns raised by utilities, which are typically required to purchase net energy at retail rates. For example, Massachusetts is currently reviewing its net metering policies as the state has reached its net metering cap, which has resulted in some RE projects not being able to move forward. Net metering policies can attract RE project developers who are considering developing projects on CLs to the state as net metering can offset the costs of siting RE projects on CLs.
- **Peak power pricing**. California has recently shifted to peak power pricing, based on usage and time of day. This policy supports solar as demand and generation generally align with solar power production.
- **Liability indemnification**. Developers continue to be concerned about liability issues at formerly contaminated sites. Liability concerns can often make it difficult to secure the needed financing for RE projects on CLs. California has

[12] New York State "DPS – Reforming the Energy Vision: About the Initiative." www3.dps.ny.gov. April 2016.

[13] DSIRE "Renewable Portfolio Standard Policies." www.dsireusa.org. October 2015.

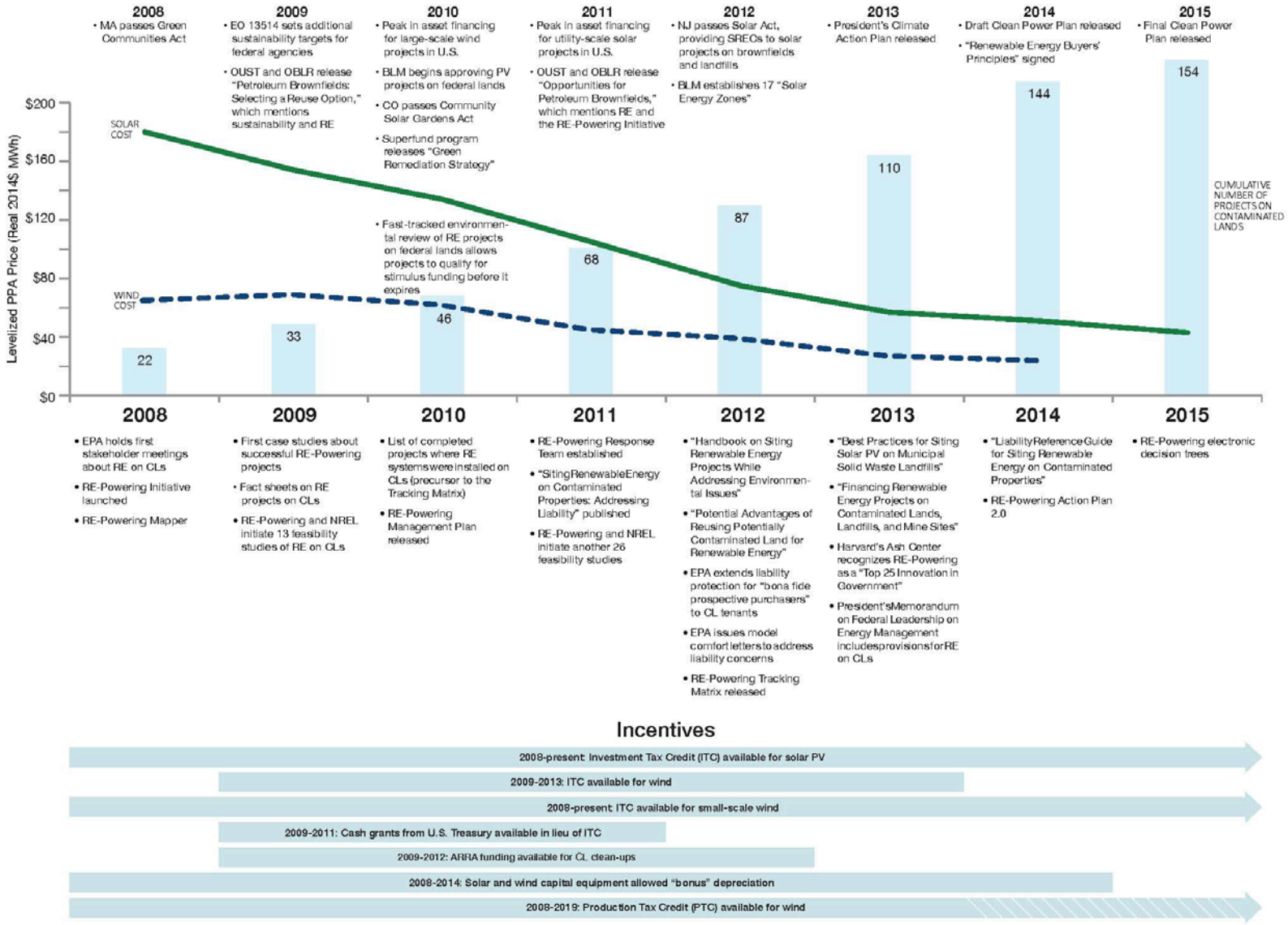
[14] DSIRE "Net Metering". www.dsireusa.org. January 2016.

enacted a policy that grants immunity to developers who meet certain requirements and do not exacerbate contamination at the site. This policy helps developers acquire insurance, and subsequently financing, for RE projects on CLs. Massachusetts has a covenant not to sue third-party developers and eligible projects for liability issues that may arise at CLs. Other states (e.g., Connecticut and Kentucky) have pursued ways to grant liability protection as well.

In addition to the above factors, interviewees identified several areas that may increasingly influence the market for RE projects on CLs in the years to come:

- **Clean Power Plan.** The Clean Power Plan includes incentives for renewables, and potentially, for RE on CLs. The Plan's Clean Energy Incentive Program will reward states for making early investments in RE and energy efficiency, and places special emphasis on low-income communities. To the extent that blighted lands are disproportionately located in and around low-income communities, the program could provide an indirect incentive for RE projects on CLs.
- **Advantageous Procurement Models.** EPA interview respondents in several regions noted an uptick in the number of community solar projects. Some interviewees suggested that the Initiative could leverage this trend by encouraging communities to site their community solar projects on CLs instead of undisturbed lands. In addition, California's Community Choice Aggregation programs are increasingly considering green local power sources.
- **Partnership opportunities.** While several EPA interviewees noted their lack of direct control over specific project outcomes, some saw opportunities to partner with states (who provide incentives), local governments (who provide tax credits), and community organizations (e.g., schools, social service organizations, and community solar garden initiatives) to leverage EPA's influence. Stated one EPA interviewee: "The future is in finding which stakeholders to partner with."

EXHIBIT 2. TIMELINE OF PROGRAM AND MARKET DEVELOPMENT RELATED TO EPA'S RE-POWERING AMERICA'S LAND INITIATIVE



b. How has the RE-Powering Initiative helped to encourage or capitalize on these market changes?

The RE-Powering Initiative has helped to encourage and capitalize on these changes in a number of ways:

- **Raising awareness:** The Initiative has contributed to raising the market's awareness of the potential to develop RE projects on CLs. The Initiative has achieved this by disseminating information through its website, responding to questions from developers and communities, and convening/participating in conferences and meetings with government and industry stakeholders. Interviews with EPA regional staff cited an increase in awareness both within and outside EPA (however, a number of EPA personnel suggested there is still room to grow awareness within the Agency). As noted above, the RE-Powering Tracking Matrix shows a steady increase in the number and installed capacity of RE projects on CLs as the Initiative ramped up. Although this does not establish direct causality, it is consistent with what we would expect to find if the Initiative were helping to encourage or capitalize on market changes.[15] In addition, the literature review identified a number of publications that discuss RE on CLs, including several that mention the Initiative by name.[16]
- **Providing liability comfort:** The Initiative played a significant role in extending liability protection to lessees. Many interviewees within EPA cited the 2012 policy that extended liability protection for bona fide prospective purchasers to tenants – and included three model liability comfort letters – as a significant development in which RE-Powering played an important role. External interviewees often cited the comfort letters as an aid to easing financiers' concerns about liability.
- **Demonstrating feasibility:** The EPA/NREL feasibility studies have shown communities and developers the viability of developing RE projects on CLs. According to many interviewees, the feasibility studies have an important signaling effect by showing municipalities and developers that the federal government is serious about the viability of RE on CLs (see Question 3, below).

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[15] Conversely, if the number and installed capacity of RE projects on CLs were declining or flat-lining, it could call into question the Initiative's effectiveness in supporting the development of the market.

[16] The following literature references the RE-Powering America's Land Initiative: De Sousa, C. (2000). "Brownfield Redevelopment versus Greenfield Development: A Private Sector Perspective on the Costs and Risks Associated with Brownfield Redevelopment in the Greater Toronto Area." Journal of Environmental Planning and Management **43**: 831-853; Levitan, D. (2011). "Brown to Green: A New Use For Blighted Industrial Sites." Yale Environment360; Macknick, J., et al. (2013). Solar Development on Contaminated and Disturbed Lands; National Association of Local Government Environmental Professionals (2012). Cultivating Green Energy on Brownfields: A Nuts and Bolts Primer for Local Governments, National Association of Local Government Environmental Professionals; Streater, S. (2009). "Green shoots rise from brownfields." The Daily Climate; Trimarchi, P. (2013). "Structured Approach Can Help Solar Developers Fulfill Promise of Brownfields." Bloomberg; US Department of Energy (2012). Chapter 7: Solar Power Environmental Impacts and Siting Challenges, US Department of Energy; US Interior and Energy Departments (2011). US Public Lands Solar Policy: Wrong From The Start, Solar Done Right, US Interior and Energy Departments; and Whitbread-Abrutat, P. and N. Coppin (2012). "Renewables Revive Abandoned Mines." Renewable Energy World.com.

- **Screening for potential sites:** The Initiative's mapping tools and decision trees for solar and wind have helped EPA staff, communities, and developers screen for CLs that may be good candidates for RE projects. The Initiative has screened over 80,000 sites and identified untapped potential that greatly exceeds current installed capacity.
- **Providing project development support:** Many stakeholders reported that Initiative staff and EPA regional staff who work on RE-Powering projects were instrumental in providing support and resources throughout the project development process. For example, Initiative staff bring stakeholders together and provide an opportunity for open discussion. Initiative staff also serve as a credible resource for stakeholders, for example, for community leaders who are trying to educate the community on a prospective project.
- **Packaging and disseminating information:** The Initiative's website and guidance documents address questions and issues that might prevent projects from going forward. EPA personnel in multiple regions have referred inquirers to the RE-Powering website or to RE-Powering staff in OCPA.
- **Contributing to Presidential Memorandum:** The Initiative contributed language to President Obama's Memorandum on Federal Leadership on Energy Management, which includes provisions for RE on CLs.

QUESTION 2: WHAT ARE THE CURRENT MARKET AND OTHER BARRIERS TO SITING RE PROJECTS ON CLS? IS THE RE-POWERING INITIATIVE ADDRESSING THE MOST IMPORTANT BARRIERS?

Interviewees identified several current market and other barriers to siting RE projects on CLs. First, EPA staff identified some barriers internal to EPA, which we discuss separately. Next, we discuss the barriers identified by all external stakeholders, ordered by the frequency with which the interviewees identified each barrier. This discussion is followed by considerations of how these barriers may differ based on the size of the community, stakeholder group, and cleanup program (sub-questions (a) through (c)). We conclude our discussion for Question 2 by describing which barriers the Initiative's resources, tools, and knowledge products address (sub-question (d)).

In considering this information about barriers, EPA will need to explore which barriers are most directly within EPA's mission and which are less so. In the case of the former, this evaluation will explore solutions to address such barriers; and for those barriers less connected to EPA, solutions for the Initiative would be expected to take the form of partnerships with other agencies and organizations to address.

Barriers Internal to EPA

EPA personnel in multiple offices/regions identified several internal (within EPA) barriers to furthering the success of the Initiative:[17]

[17] We do not discuss these barriers in the remainder of this report, as they are internal to EPA and not applicable for the remaining stakeholders.

- **Lack of staffing and resources.** Many EPA interviewees noted that only two individuals at EPA Headquarters are dedicated to the Initiative. While these individuals were praised for their work, it was noted there is "only so much that two people can do." Staffing constraints extend to the regions, as well. While most regional interviewees were enthusiastic about RE-Powering, individuals in almost every group described their RE-Powering work as a "collateral job duty" and/or "catch as catch can." As an individual from one EPA region stated, "RE-Powering is essentially a volunteer program staffed on limited time and resources." Similarly, an individual from another region stated: "We have been constrained by resources – going the extra mile [for RE-Powering] is [what you do] on your own time; you volunteer." An interviewee at EPA Headquarters summarized the situation as follows: "In the end, we are limited by resources and bandwidth."
- **Limited awareness in some parts of EPA.** Although many interviewees stated that awareness of the RE-Powering concept has increased in recent years, they felt that additional education is needed to "spread the word" within EPA that RE projects on CLs can be done successfully, and how to do them. In particular, interviewees stated that convincing remedial project managers (RPMs) and attorneys that RE is an option for CLs – and should be pursued on top of site cleanup – can be challenging.
- **Agency culture.** Interviewees within the Agency cited three aspects of EPA's culture that they believe hinder the expansion and further success of the Initiative:
  - The Agency's primary focus is protecting human health and the environment. As a result, according to some interviewees, returning CLs to productive use receives relatively less senior management attention and support than site cleanup and remediation.[18] In addition, several respondents stated that EPA views itself as an enforcement agency and is reluctant to take steps that could weaken its enforcement discretion.
  - According to some EPA interviewees, managers at EPA Headquarters are reluctant to come out too strongly in pushing RE and the Initiative. Stated one interviewee: "There's a fear it will be seen as mission creep, and EPA will get beat up for it. This reticence holds the RE-Powering program back from marketing itself." Stated an interviewee from a different group: "As an agency, we haven't fully understood the power of supporting renewable energy." Yet another interviewee stated: "EPA has this age-old issue: We do innovative things, but we're not good at telling people about what we do. This is a chance to beat our chest to bring attention to the fact that we are doing this – and to help overcome the stigma of developing on CLs."
  - Due to the above factors, some interviewees stated that the Initiative receives less attention and visibility than it deserves and needs. One interviewee stated

[18] Some interviewees stated that annual performance agreements generally do not include commitments for RE projects on CLs, which could provide motivation to focus on these types of projects. However, one region includes a target number of RE feasibility studies in the annual performance agreement for one of its division directors.

that "RE-Powering is a silo within EPA," and went on to explain: "They are doing the best they can, but their impact is limited because they are a small office." Other interviewees opined that the Initiative's location within OCPA ("tucked away," as one respondent put it) is not ideal for raising the profile of RE projects on CLs across the Agency.

In addition to the barriers internal to EPA discussed above, EPA interviewees identified two additional external barriers that were not mentioned by external stakeholders. Specifically:

- **Renewable energy certificates (RECs).** An interviewee in one EPA region identified RECs as a major barrier to developing RE projects on CLs because, rather than developing new projects, RECs can be purchased from existing projects to meet renewables obligations.[19] The interviewee stated that the Initiative should "weigh in on this issue."
- **Financial assurance requirements.** One group of EPA interviewees from one EPA region stated that financial assurance has emerged as an issue in one state that is active with solar projects on closed landfills. Because the landfill does not have a Responsible Party, the state seeks financial assurance from developers to cover operation and maintenance (O&M) costs and decommissioning. These financial assurance requirements can reduce the economic attractiveness of the project to developers.

External Barriers

Exhibits 3 and 4 below display the barriers mentioned by external stakeholders (i.e., government officials, developers, and community leaders) and EPA staff. The charts display the frequencies with which these barriers were mentioned by external stakeholders and EPA staff, respectively.

We compared responses for external interviewees to EPA interviewees, arrayed by the frequency with which they identified the barriers. While EPA staff and external stakeholders identified a common list of barriers to siting RE projects on CLs, Exhibits 3 and 4 below show that the most commonly cited barriers differ between the two groups. EPA staff appear to be more concerned with reuse options at the site, acceptance by the community/stakeholders, and lack of EPA staffing and resources; these are the three most commonly referenced barriers among EPA interviewees. On the other hand, external stakeholders most commonly cite liability concerns, and financial concerns, including insufficient financial incentives or lack of economic feasibility/higher costs of RE projects on CLs. Liability concerns and better reuse options are among the most cited barriers for both EPA staff and external stakeholders.

[19] Relatedly, a group of the country's largest corporations (including Bloomberg, Facebook, Intel, Proctor & Gamble, and Walmart) – working with the World Wildlife Fund and the World Resources Institute – issued their "Renewable Energy Buyers' Principles" in July 2014. One of the principles is "Access to bundled renewable energy products – energy and Renewable Energy Credits." The Principles states: "Unbundled RECs do not deliver the same value and impact as directly procured renewable energy from a specific project or facility." http://buyersprinciples.org/principles/.

Our EPA staff interviews included both staff in EPA's headquarters offices and EPA regional offices; Exhibit 4 below separates the frequencies staff in headquarters and regional offices mention each barrier. Among EPA staff, there is one barrier for which there is consensus across headquarters offices and regions: better reuse options at the site. This barrier was cited by almost all of the headquarters office interviewees (five out of six), and half of the regional office interviewees (five out of ten). Community/stakeholder acceptance appears to be a greater concern among regional staff, as the majority of regional interviewees cited this barrier (seven out of ten), while it was mentioned by only one headquarters staff. Liability concerns also appear to be of greater concern to regional staff, as the majority (six out of ten) cited this barrier, while only one headquarters staff mentioned this barrier.[20]

[20] We note that this question was asked in an open format, in which respondents were asked to report barriers to the process. Therefore, a respondent may not have mentioned a particular barrier, even though they might agree it is a barrier to the process. These frequencies represent a conservative estimate of the number of interviewees for whom each item is considered a barrier.

EXHIBIT 3. SUMMARY OF BARRIERS BY STAKEHOLDER GROUP

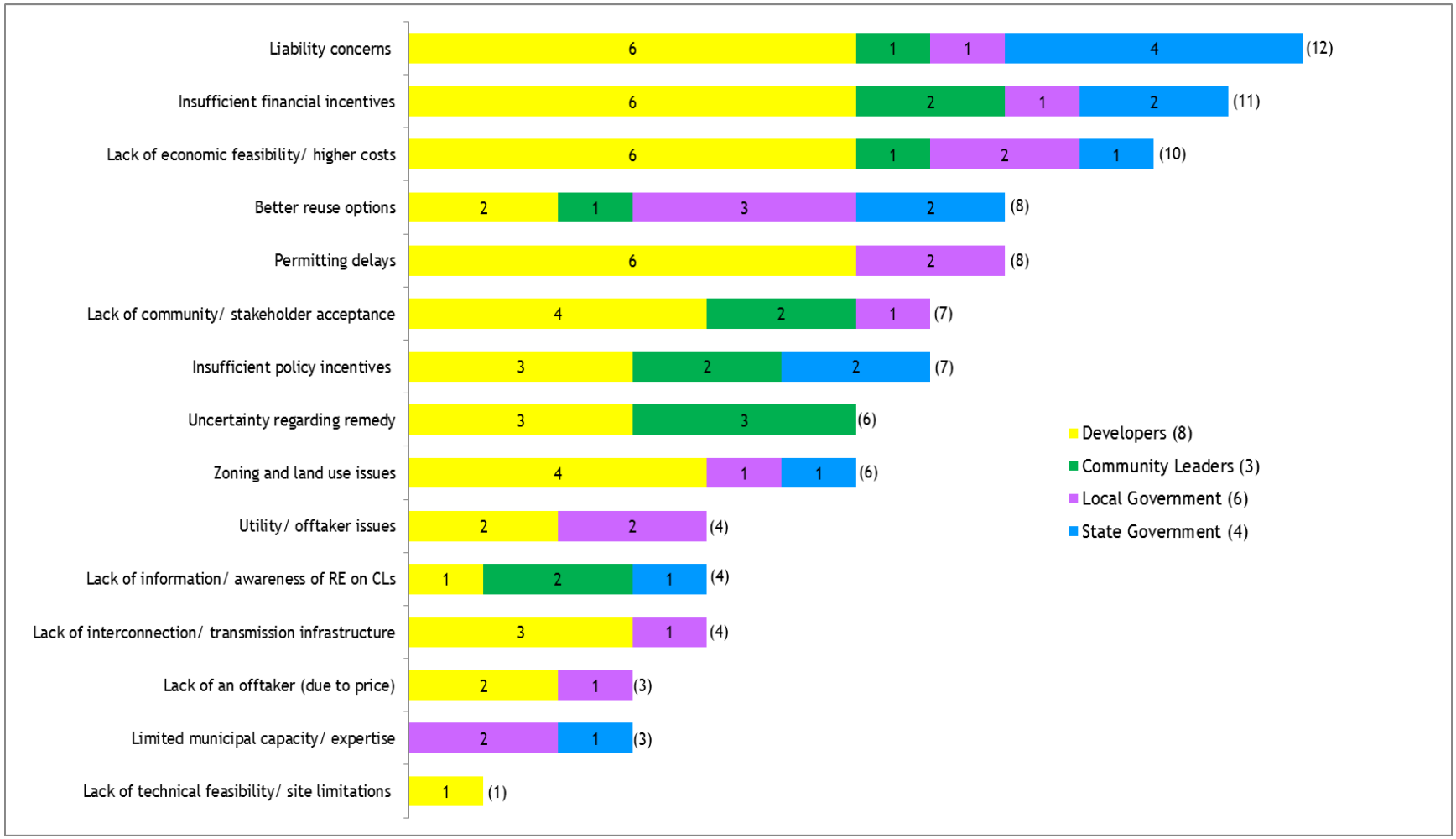
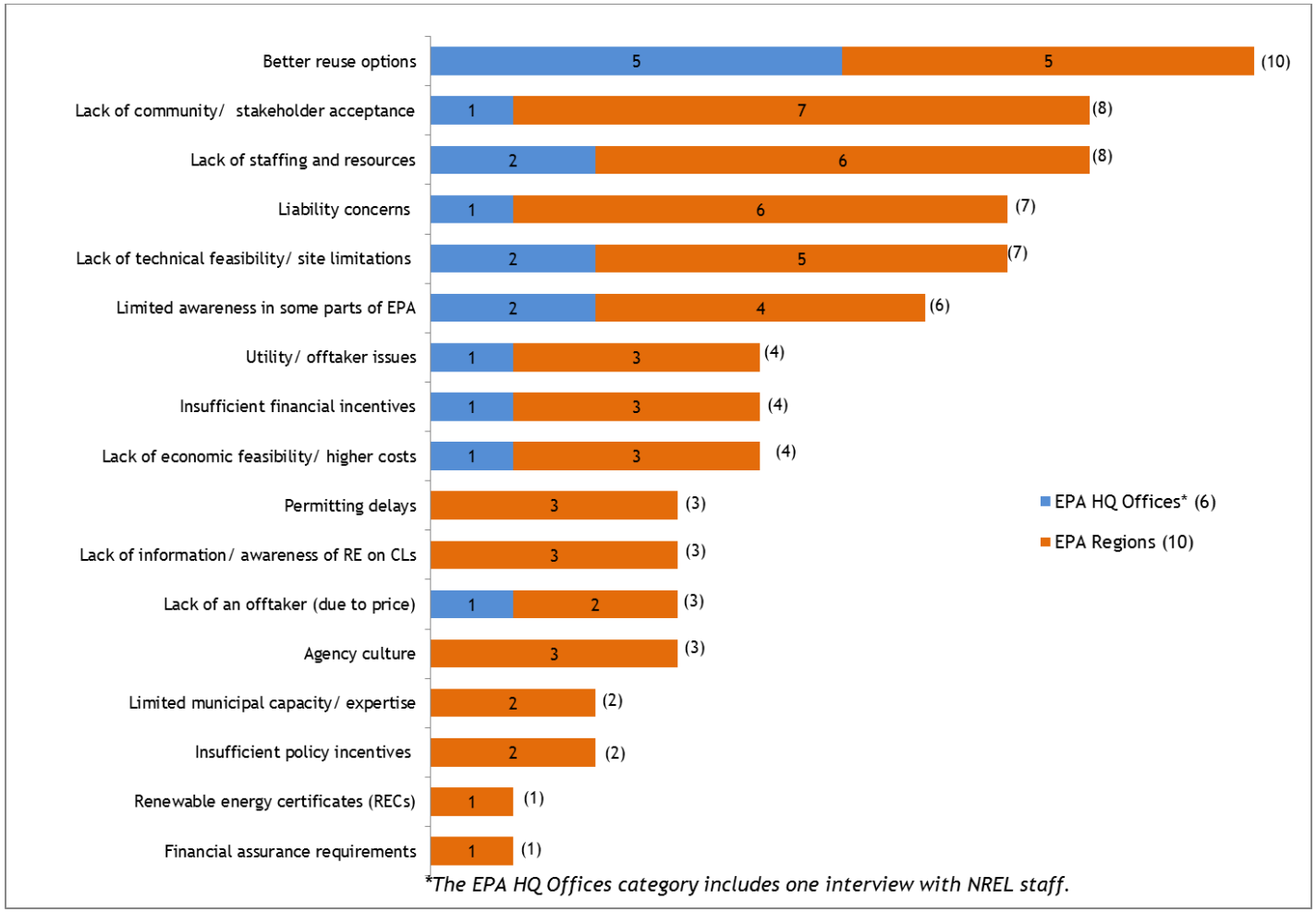


EXHIBIT 4. SUMMARY OF EPA BARRIERS



Both interviewees within and outside of EPA identified the following external barriers to siting RE projects on CLs. The following barriers are ordered by the overall frequency with which they were identified by external stakeholders (i.e., government officials, developers, and community leaders).

- **Liability concerns.** Almost every interview group identified liability concerns as a key barrier. Despite significant efforts to address this barrier, some developers continue to fear they will be held liable for contamination; moreover, financiers are reluctant to finance projects on CLs due to perceived liability risk. A few interviewees referenced EPA's No No-Action Assurance Policy as a major barrier that dissuades private RE developers from pursuing projects on CLs. (Please see discussion in Evaluation Question 2d below for more details).
- **Insufficient financial incentives.** Most interviewees reported that financial incentives are required for many RE projects on CLs to be economically viable. Several interviewees noted that for their projects, a lack of financial incentives was a major barrier to the project moving forward. In the past several years, a few states have provided incentives specific to RE projects on CLs, but this varies by state. Interviewees noted that the 30 percent federal ITC for solar makes a substantial difference; it was recently extended through 2019, with a gradual step down of the credit between 2019 and 2022. One local government official noted that a lack of federal and state funds to address remediation and monitoring costs was a significant barrier to developing RE projects on CLs in their municipality. While many local governments face budgetary pressures, those with access to state and/or federal incentives may be able to overcome financial constraints to developing RE projects more readily than those without access to incentives.
- **Lack of economic feasibility/higher costs.** Most private developers seek a profit, and they require a sufficient profit margin to offset the perceived or actual risks/costs of siting RE projects on CLs. In addition, most developers interviewed for this study reported that RE projects on CLs have higher costs than RE projects on undisturbed lands (see further discussion of this issue in Question 4, below). For example, RE projects on CLs often face higher permitting and capital costs associated with limitations on disturbing the site remedy. Obtaining sufficient financing for RE systems can also be difficult since they are generally long-term assets with low annual yields (e.g., 20-year power purchasing agreement (PPA) agreement and five-year financing terms). In addition, banks/financiers tend to prefer even payments, but revenue streams from solar arrays vary across the year, which can create cash flow issues.
- **Better reuse options.** The majority of interviewees also highlighted the difficulty of moving a project forward when there are more profitable or desirable reuse options at a site, either from the perspective of the site owner, or the community/local government. Community groups can be vocal as to how CLs should be reused, particularly when there is a more profitable or desirable reuse option at the site, and developers often have limited ability to influence the reuse decision. According to some government officials, RE projects do not tend to

create significant numbers of jobs or provide direct services to a community, nor generate substantial tax revenue, which can make it difficult to garner community support for RE projects on CLs. If there are competing demands for the land, such as housing or community projects (e.g., parks), RE would less likely be pursued.

- **Permitting delays.** One reason that RE projects on CLs can be more expensive than RE projects on undisturbed lands is that the development process, in particular the permitting stage, can take substantial time to complete and often faces significant delays. The delays in the permitting process are a result of both the number of permits needed, and the time required to obtain each permit. Delays may also occur as a result of changes required in zoning regulations.
- **Lack of community/stakeholder acceptance.** Absence of community or other stakeholder acceptance makes it very difficult to move projects forward. As noted above, community opposition can come as a result of the feasibility of a more desirable reuse option at a site, or from opposition to the RE project specifically. One community leader noted that their project did not move forward for two primary reasons: (1) the community wanted a recreation center on the site (which was located in a residential area), and (2) some members of the community had concerns about the health impacts of a solar array in their community (e.g., radiation issues).
- **Insufficient policy incentives.** While some states like Massachusetts have policies that override municipal zoning regulations to encourage the development of solar projects on CLs, this is not common practice throughout the country. In some instances, policies associated with the use of RE on a utility's grid constrain the siting of RE projects on CLs; for example, some states have a cap on net metering. Examples of more conducive policies include: requirements for a certain proportion of RE projects to be sited on CLs, flexible zoning regulations, and expedited permitting options for RE projects on CLs.
- **Uncertainty regarding remedy.** As noted above, developers in particular are concerned about liability issues at CLs. As part of the project development process, developers are often looking for clear and complete information about the contamination that occurred at the site, a full record of the cleanup activities and cleanup status, and closure reports/records of decision regarding approved reuse options. Lack of information or incomplete information is a significant barrier to developing a project – it can either significantly delay a project while the developer researches the missing information, or it can halt a project completely, because there may be too much uncertainty associated with the project.
- **Zoning and land use issues.** In some cases, local or state governments either do not have an existing regulatory framework for RE projects on CLs, or the framework is relatively new. Untangling the regulatory and zoning requirements can be a daunting challenge for developers, and can even be a deterrent.
- **Utility/offtaker issues.** Many interviewees identified issues associated with working with utilities as a significant challenge. Utilities may not be willing to

purchase power from a RE project, particularly if they have already met their RPS requirements, or if they are in states without an RPS. Utility investment projects generally have a long lead time; as a result, new RE projects may not fit into their plans, especially if they would require new/upgraded infrastructure. In addition, utilities may require costly interconnection studies.

- **Lack of information/awareness of cleanup processes and RE development.** Some interviewees noted that successfully developing RE projects on CLs requires an in-depth understanding of a complicated process (e.g., understanding the required steps, permits, and infrastructure). Lack of awareness about the process can limit a developer's willingness to move forward with a project, or constrain a government's or community's acceptance of the project. In addition, even with complete characterization and remediation records, some stakeholders feel there are too many "unknowns" about CLs, which can deter their participation.
- **Lack of interconnection/transmission infrastructure.** Sites should ideally be located near existing infrastructure and close to users who will buy the power. Long distances to transmission lines and lack of proximity to substations can be a barrier. Conversely, proximity to existing infrastructure can make a site more viable. Another aspect of site location is whether the site is in a land-scarce or land-abundant area. If undisturbed land is plentiful and cheap, developing on undisturbed land may be more economically appealing than developing the same project on a CL. Conversely, if land is scarce and costly, projects on CLs may be relatively more attractive (particularly in land-scarce areas with municipally-owned landfills/brownfields that governments want to put to good use).
- **Lack of an offtaker (due to price).** In some cases, projects could not move forward because of a lack of a willing offtaker to purchase the energy generated by the project, or a PPA could not be reached with the existing offtaker.
- **Limited municipal capacity/expertise.** While the level of awareness and interest in RE projects on CLs has increased, this has not necessarily translated to increased action. Interviewees noted that time, technical knowledge, and resources are required to see projects through to completion. However, some municipalities do not have these resources. This barrier most directly affects municipally-owned projects on CLs.
- **Lack of technical feasibility/site limitations.** If a site does not have sufficient renewable resources, if renewable generation would be too intermittent, and/or if the land is not well-suited for an RE installation, the project will not go forward.

a. Are the barriers different in smaller vs. larger communities?

Overall, the size of the community does not seem to be a major factor in the success of RE projects on CLs, with the following exceptions:

- Population size (i.e., the market) needs to be large enough to consume the power generated by the project. This can be a function of both the community size and

how much of the community's total power consumption comes from the project rather than other sources.

- Communities with low population density, located away from major urban areas, are more challenging because it is more difficult and expensive to transmit the power to customers.
- Smaller/rural communities may have more challenges with capacity, resources, and technical expertise (see above) than larger/urban communities.
- In larger population areas (primarily urban centers), there are often higher opportunity costs for land and more potential uses for the site, which may reduce the relative attractiveness of developing RE projects on CLs.
- One interviewee noted that projects can be more challenging to develop when located in densely populated, low-income urban areas with prior contamination and distrust of government.

Developers in particular noted that while they sometimes consider the size of the community, the *nature* of the community is more important. In particular, does the RE project comport with the community's desired use for the site? Does the community have sufficient information to feel comfortable about the project? Is there support for and acceptance of the project in general? Often, educational events are needed to raise awareness in smaller communities about the projects' safety and financial implications for the community. One community leader also stated that having few examples of successful small-scale installed capacity projects made it difficult to achieve buy-in from her small community.

b. Are the barriers different for different stakeholders (e.g., communities and developers)?

Each stakeholder group interviewed has its own priorities and faces different challenges during project development. For example, developers are concerned with minimizing their risk and maximizing their economic return. Communities are more concerned with returning blighted lands to productive use, generating tax revenues, creating jobs, and/or advancing social and environmental aims. Therefore, a project that barely breaks even may be attractive to a municipality, but not to a private developer. In addition, capacity issues (e.g., lack of financial resources, time, and/or specialized technical expertise) may disproportionately affect municipal governments compared to developers. Exhibit 5 below summarizes the different priorities and barriers for each stakeholder group.

EXHIBIT 5. SUMMARY OF BARRIERS BY STAKEHOLDER GROUP

STAKEHOLDER GROUP	PRIORITIES	PRIMARY BARRIERS
Developers	• Minimize risk and liability • Maximize economic return	• Liability concerns • Lack of economic feasibility/ higher costs • Zoning and land use issues • Lack of interconnection/ transmission infrastructure • Permitting delays • Insufficient financial incentives
Government Officials	• Generate tax revenue • Create jobs • Find productive use for CLs	• Better reuse options • Limited municipal capacity/ technical expertise • Lack of community/ stakeholder acceptance
Site Owners	• Maximize return on land	• Better reuse options • Lack of an offtaker (due to price)
Community Groups	• Return blighted site to productive use • Advance social/economic aims	• Lack of community/ stakeholder acceptance • Uncertainty regarding remedy • Better reuse options • Insufficient policy incentives

c. Are the barriers different across sites based on the cleanup program (e.g., RCRA, Brownfields, or Superfund), the extent of contamination, and/or other site-specific factors?

In general, interviewees reported that the type of cleanup program and extent of contamination do not significantly affect the types of barriers they face (however, as discussed below, landfills may pose fewer barriers than other types of sites). For example, developers conduct due diligence to review cleanup and remediation records regardless of the cleanup program that administered the remedy. The primary difference appears to be whether or not the cleanup was administered/managed by EPA (or a municipality) or by a site owner. If a site owner completed the capping and closing of a landfill, for example, the developer works with the site owner to review those records. If, on the other hand, the site was managed under Superfund, developers work with EPA to review the site cleanup records. Permitting process requirements can also vary based on who has jurisdiction over the site. However, interviewees did not report these differences affecting the severity or type of barriers they face in the development process.

While the type of cleanup program does not, in general, seem to have a significant impact on barriers, interviewees did observe the following differences across cleanup programs:

- **Superfund:** Superfund sites may have stigma and/or complex contamination issues that do not affect other types of sites. On the other hand, some developers reported that Superfund sites can be more attractive because site liability has already been assigned and addressed by the time the developer gets involved, so

attracting financing and insurance is easier compared to sites with unresolved liability issues.

- **Landfills**. Former landfills have emerged as a site type with fewer barriers, as they often require simpler, more straightforward cleanup efforts. In addition, developers reported that site history and closure information is often easier to access at landfill sites – making the reuse permitting process smoother. There are also often fewer issues with site location (i.e., landfills are often relatively close to power customers), and fewer infrastructure and interconnection issues. Finally, some developers reported that since the number of successful installations of RE projects on landfills is growing, a more standardized approach to developing RE projects on landfills is emerging.
- **Brownfields**. Brownfields sites may be easier to work on than Superfund sites, as they generally have less stigma and less complex contamination. The Brownfields program actively promotes reusing the land and supports the reuse of brownfields before developing on undisturbed properties. However, the program does not promote one reuse option over another; that decision is left to the community.
- **RCRA Corrective Action.** EPA has authorized 43 states and territories to manage the RCRA Corrective Action Program, and many Corrective Action sites are state-lead sites. This limits EPA's direct control over site outcomes. Also, because many RCRA Corrective Action sites are still operational, RE production needs to be coordinated with existing uses, which can complicate efforts to develop RE projects on these sites.
- **Underground Storage Tanks**. Some EPA interviewees commented that leaking underground storage tanks (primarily, gas stations) are generally "less dangerous" and "easier to deal with" than other contaminated properties. They also tend to be located in easily accessible areas, which could facilitate project construction and interconnection to the power grid. However, these sites are generally small, which limits reuse options to some extent.
- **Tribal lands**. Interviewees in one EPA region stated that tribal lands pose unique challenges for siting RE projects on CLs, including: limited access to the power grid, difficulty identifying business partners, and limited federal grant funding.

d. Which barriers do the Initiative's resources, tools, and knowledge products address?

We received different feedback on the Initiative's resources, tools, and knowledge products from EPA staff compared to external stakeholders. Many EPA staff had used the Initiative's resources, tools, and knowledge products and found them to be useful. In contrast, external stakeholders expressed much less familiarity with the Initiative's offerings, and many had not used them.[21] Among the external stakeholders who had used

[21] In keeping with the requirements of the Paperwork Reduction Act and the approved interview guides, we did not ask every interview respondent about every resource, tool, and knowledge product. As such, it is possible that some respondents may have been aware of a particular resource, tool, or knowledge product even if they did not mention it during the interview.

the Initiative's offerings, many suggested they were somewhat helpful at a high level (e.g., to conduct a preliminary site screening), but lacked sufficient granularity to meet their specific needs.

Given the diverse feedback that we received, the discussion below distinguishes between EPA respondents and external respondents. In the discussion that follows, we describe the primary barriers that the Initiative addresses; the resources, tools, and knowledge products that address each barrier are shown in parentheses.

- **Liability concerns (guidance, policy, and model comfort letters):** The Initiative, working in collaboration with OECA, has worked to address liability issues associated with acquiring or operating on contaminated sites. Such work has included the development of new guidance documents, model comfort letters, and an extension of liability protection from bona fide prospective purchasers to tenants. Interviewees within EPA identified the 2012 policy extending liability protection from bona fide prospective purchasers to tenants as a significant milestone, although no external interviewees mentioned this policy specifically. EPA respondents identified the model comfort letters as helpful for promoting reuse of CLs for long-term lessees. Most external interviewees, developers in particular, stated that assurances from EPA on liability issues are helpful, although they did not always cite the comfort letters by name.

  Opinions varied as to how much the liability comfort letters have provided sufficient comfort to private developers to undertake projects. A few EPA interviewees noted that, due to EPA's No No-Action Assurance Policy, the comfort letters leave open the possibility that prospective purchasers/tenants could be held liable in the future. One EPA interviewee felt strongly that RE-Powering should be "more direct and aggressive" in addressing this issue; another knowledgeable interviewee indicated that the policy should stand, but suggested that the comfort letter could be "less scary" and more reassuring. A developer stated that the liability comfort letters provided "some" comfort, while others noted that, especially in lease agreements, the letters do not provide enough clarity for financiers about the specific circumstances in which EPA would or would not hold developers liable and what financiers can expect in future costs (e.g., costs for testing soil).

  Some EPA interviewees also felt that the Initiative could explore "safe harbor" provisions under CERCLA, and help to further clarify EPA's position on when a developer is or is not potentially liable. One interviewee stated that developers are on a "learning curve" and need to understand that even though EPA cannot guarantee never to take enforcement action, the reality is that the Agency would not prioritize the pursuit of enforcement against a developer unless the developer disturbs the site remedy or causes new contamination on the property. A developer who specializes in RE projects on CLs suggested that the Initiative could engage separately with financiers to explain how liability works and help them become more comfortable with financing these types of projects.

While liability was a concern overall, one particular aspect of liability that interviewees commented on was concerns about disturbing the site remedy. Some developers mentioned that one reason that project development takes more time for RE projects on CLs is the additional engineering feasibility and design required; and a large component of that additional work stems from concerns about disturbing the site remedy, for example, piercing the landfill cap. The Initiative's website currently provides guidance on siting RE projects on sites that are still operational. However, several interviewees within EPA suggested that the Initiative could be more vocal about institutional controls (ICs) when working with developers at Superfund sites – specifically: defining ICs, explaining their implications for developers, and helping developers understand how these restrictions impact the design of their projects. In addition, developers did not mention having awareness of, or having used, this guidance; they are looking for resources from EPA on maintaining the integrity of the site remedy.

- **Insufficient financial and policy incentives (access to information on incentives):** As noted above, incentives were widely cited as a determining factor in whether projects are economically feasible. A number of interview respondents within EPA cited the Database for State Incentives for Renewables and Efficiency (DSIRE) as a good starting point for finding information about incentives. Though DSIRE is not a RE-Powering tool per se, these interviewees suggested making sure that the Initiative refers interested parties to DSIRE, and ensuring the information in the database is current. Although ensuring the currency of the information in DSIRE may go beyond EPA's role, the Initiative could help to identify and share relevant information from the database with interested stakeholders.[22] We note that although interviewees within EPA believe this tool is a good starting point, no external interviewees mentioned this resource. In fact, most interviewees outside of EPA stated that they would appreciate EPA's assistance in helping to identify financial incentives.
- **Lack of community/stakeholder acceptance and better reuse options (public meetings, fact sheets, case studies, outreach, guidance documents).** The Initiative aims to promote RE on CLs, when such development is aligned with the community's vision for the site. To this end, EPA regional staff have participated in public meetings for a small number of sites to share information and answer questions. Community leaders and government officials noted how helpful EPA's participation in these meetings can be, particularly for lending credibility to the project.

  The fact sheets and guidance documents on the Initiative's website are intended to provide information that will help communities make informed decisions about whether/how to proceed with RE developments. However, EPA staff in one

[22] Some interviewees mentioned they would like to be able to search DSIRE for state programs and incentives that are specific to CLs. However, one interviewee cautioned that many incentives are local and "only locals would know about some of them"; therefore, this individual felt it was important to supplement the national database with local information.

region expressed a need for more information showing how RE on CLs can be a beneficial land use for communities. They requested the Initiative develop a fact sheet explaining that (a) renewable energy is safe and (b) EPA will continue monitoring the site to ensure the remedy remains intact. One community leader echoed this request, as they had a project in a residential area in which the community was concerned about the health and safety implications of a solar installation. The interviewees noted that at least one state already has this type of fact sheet, but indicated it would carry greater weight coming from EPA.

- **Lack of information/awareness of RE on CLs (outreach at conferences, case studies, and Siting Handbook).** While the level of awareness within and outside of EPA has increased in recent years (see findings for Question 1), several EPA interviewees indicated that more effort is needed to ensure that EPA cleanup staff, state RPMs, and the private sector understand that developing RE projects on CLs is a viable proposition. Several EPA interviewees cited the Initiative's participation in industry conferences as an important tool for raising awareness. Several EPA respondents also expressed interest in exchanging knowledge and best practices across regions.

  Several interviewees expressed the need to document and disseminate success stories showing the viability of RE projects on CLs, though few mentioned the case studies on the Initiative's website. This feedback suggests that interviewees, even within the Agency, may not be aware of the existing case studies. Respondents who were aware of the existing case studies indicated that additional success stories should be disseminated to further raise awareness of the RE-Powering concept within EPA and in the market. These case studies are also crucial for government officials to garner support from their communities for these projects; interviewees reported the need for more case studies, covering both successful and unsuccessful projects. Finally, some interviewees stated that case studies focusing on smaller projects in smaller communities would also be helpful.

  Few interviewees indicated they had used the Siting Handbook; only two developers mentioned this tool specifically. One developer stated the Handbook was too high level to be helpful; the other developer stated that it was very helpful to "convince lay folks that solar on landfills is a good idea."

- **Lack of technical feasibility, including difficulty identifying feasible sites (RE-Powering screening dataset, RE-Mapper, and decision trees, feasibility studies).** EPA personnel identified the RE-Powering Screening Dataset and RE-Mapper as being informative and useful for identifying sites on which developing an RE project may be technically feasible. However, they indicated the dataset could be more user-friendly (in terms of downloading and filtering key information) and more comprehensive (e.g., adding the distance from a site to the nearest transmission line, and ensuring the full universe of both federal and state-lead sites is included). EPA staff in one region identified the wind maps as a useful tool for honing in on potential sites, but noted this would need to be followed by site-specific wind monitoring. The same interviewee noted that, in a

few cases, the wind potential was not as strong as initially indicated in the Mapper, but suggested this was due more to the unpredictability and intermittency of wind than any innate problem with the Mapper. Another respondent from EPA stated that the Mapper is a valuable, but underutilized, resource. Several EPA interview respondents indicated that the decision trees for solar and wind are useful. However, they indicated that government officials and state RPMs would require training and/or a simplified version of the tools in order to use them. EPA interviewees in one region also requested the Initiative develop a decision tree for biomass, which raises a different set of considerations than assessing the potential for wind or solar.

External to EPA, several developers indicated they had used the mapping tools. One developer indicated that its company has used the tools "frequently" for high-level research to screen for potential sites. Another developer stated that the Initiative's databases were initially useful for identifying "leads," but have become less important to the company as it has gained experience with RE projects on CLs. On the other hand, several other developers noted that the Mapper does not have sufficient information about sites to be as useful as it could be. For example, information on site owner type, cleanup status, and other factors that would determine a project's likelihood of success would be helpful. The Mapper provides high-level information as a first-level screening tool – but often, more detailed information is needed for a full site assessment. Two developers also stated that the Mapper's information on site locations and acreage was, in their experience, often inaccurate. Some developers also suggested refinements to the dataset – e.g., requiring less "culling and paring" to find pertinent information. Developers did not provide specific feedback on the decision trees.

Feedback from other external stakeholders was mixed. A local government official noted that the mapping tools were helpful for looking at multiple, "credible" sites that EPA had already screened, but only cover a limited number of sites and could be expanded to include more geographic areas.[23] A state government official commented that the decision trees are a good roadmap for developing RE projects on CLs; local government officials did not provide feedback on the decision trees. One community leader interviewed used the mapping tools to become more aware about the topic of RE projects on CLs. None of the three community leaders we interviewed offered specific comments about the decision trees.

Stakeholder feedback on the feasibility studies is addressed under Question 3.

- **Limited municipal capacity/expertise (website, tools and guidance documents, RE-Powering Response Team).** The government officials and community leaders we interviewed noted how difficult it can be to move projects forward in the absence of sufficient financial or staffing resources (including

[23] One expert mentioned that the NREL solar radiation database that lists zip code and latitude/longitude details for solar potential is a key resource for determining the feasibility of a site.

expertise). They noted that the availability of EPA staff to answer questions and provide support is a critical resource. From EPA's perspective, many regional staff reported getting questions from municipal officials and developers about specific sites and projects. Frequently, EPA staff refer questioners to the RE-Powering website and/or specific resources, tools, and knowledge products. However, some EPA staff and municipal officials do not have the time or technical knowledge needed to move the process forward on their own. One region suggested the Initiative create a roster of experts who regional EPA staff can contact with questions. Interviewees from another region stated that once they determine that a site may be feasible for developing a RE project, they would like to refer the interested party to experts who can advise on next steps.

Based on our interview findings, it appears that the Initiative is not directly addressing uncertainty about site remedy (although the Initiative's website links to available program information), permitting delays, lack of interconnection/transmission infrastructure, utility/offtaker issues, zoning and land use issues, lack of economic feasibility, concerns about RECs, or financial assurance requirements.

Finally, we note that several interviewees reported receiving very helpful support and resources from EPA staff in other offices (e.g., Superfund staff, regional staff, etc.). Support through the permitting process is particularly helpful, as is facilitating stakeholder interactions during the development process.

QUESTION 3: HOW USEFUL ARE THE EPA/NREL FEASIBILITY STUDIES IN RAISING AWARENESS AND INFORMING DECISIONS ABOUT RE PROJECTS ON CLS?

a. How have different stakeholders (i.e., EPA regional staff, communities, and developers) used the feasibiliity studies?

Overall, interviewees reported that the EPA/NREL feasibility studies are a good first step, as a high-level tool to raise awareness and communicate that RE projects on CLs are a real possibility. Each stakeholder group uses the studies for somewhat different purposes:

- *EPA Regional Staff:* EPA regional staff have used the feasibility studies for "getting the word out" to communities and developers that RE projects on CLs are a real possibility. According to one EPA interviewee, "When they [EPA/NREL] started doing feasibility studies, the RE-Powering concept hadn't crossed people's minds; now, people see this as a real possibility." Overall, respondents noted that the feasibility studies have had a "signaling effect" – showing the market that the federal government takes the RE-Powering concept seriously and believes such projects can be viable.
- *Developers:* Developers all reported that regardless of whether or not a feasibility study exists for a site, they will conduct their own, more in-depth feasibility analysis before committing to a site. EPA regional staff and one expert stated that the feasibility studies have attracted developers to particular sites or communities, or have given them impetus to look more carefully at particular sites. However,

the developers interviewed stated they generally identify sites based on their internal research, or when municipalities issue RFPs.[24]

- *Community Leaders:* Community leaders primarily use the feasibility studies to raise awareness about, and to garner support for, their projects. They also use the studies to help compare redevelopment options for sites.
- *Government Officials:* The state and local government officials we interviewed echoed the sentiments of the community leaders in that they use feasibility studies to communicate with the public about potential projects. According to some EPA regional staff, the main function of the feasibility studies is to engage municipalities by showing the feasibility and potential benefits of projects to the municipality. Some EPA interviewees also noted that the studies filled a capacity gap by helping local government officials screen sites for RE potential – which, according to the interviewees, these officials could not have done on their own. In addition, one EPA interviewee stated that communities like to compare the EPA/NREL feasibility study to the private developers' own feasibility studies. On the basis of the EPA/NREL studies, some municipalities have issued requests for proposals (RFPs) to engage developers; a smaller number have seen projects through to completion.

b. Did they find the studies useful (regardless of whether or not they developed a RE project)? Why or why not?

Opinions about the usefulness of the studies vary across stakeholder groups:

- *EPA Staff:* EPA staff in most regions found the studies informative and useful;[25] and at least two regions have signed their own inter-agency cooperative agreements with NREL to conduct feasibility studies. Although many sites that received a feasibility study have not gone forward for various reasons,[26] the studies have in some cases prompted municipalities to consider other sites that might be feasible. In other cases, finding that one type of RE technology was not feasible at a site prompted EPA or municipalities to consider other RE technologies that might be more viable. In addition, interviewees identified two ancillary uses of the feasibility studies: First, lessons learned from the feasibility studies helped inform the development of the decision tree for solar. Second, some

[24] That said, we note that the results of feasibility studies may be included in RFPs; therefore, they may indirectly help attract developers to CLs.

[25] EPA regional personnel in one region were not aware of any feasibility studies conducted in their region.

[26] Reasons why projects have not proceeded include: sites had less technical potential than initially expected; an alternative location was found to develop the project; the economics of the project were not positive (or were not positive enough compared to other options); utilities raised concerns about the project; the electrical infrastructure surrounding the site would require significant upgrades; the town or property owner decided to use the land for a different purpose; and local regulations/requirements changed in a manner that prevented a project from moving forward. In addition, EPA and NREL staff indicated they do not systematically track the results of feasibility studies and may not be aware of all projects that have been developed.

EPA regions have developed a closer working relationship with NREL (whose expertise they value) through their collaboration on the studies.

- *Developers:* For four of the eight developers interviewed, feasibility studies were not available for their sites. The other four developers reported that the feasibility studies were generally not helpful. Specifically, according to these developers, the feasibility studies were outdated because of the time it takes from initiation to completion of a study. They contained high-level, generic information, but lacked the detail needed from the developers' perspective (e.g., site history, risk, usable acreage). However, one developer stated that the feasibility studies can be useful for gaining community support for projects.
- *Community Leaders:* In contrast to the developers' perspective, the community leaders we interviewed all reviewed feasibility studies for their sites; and two of the three found them useful to raise awareness and garner community support for their projects, and to compare redevelopment options. They noted that while the studies helped them determine if sites had potential, additional detailed research was needed beyond what was included in the studies to make a final decision about moving forward.
- *Government Officials:* The state and local government officials interviewed echoed the sentiments of the community leaders that the feasibility studies are helpful for communicating with the public, and for providing a high-level "stamp of approval" for projects. Having information that originated from EPA also lends credibility to the discussion. However, they also noted that the studies lack the level of detailed, site-specific information they need to fully assess if they should proceed with a project. Government officials also noted that EPA regional and local/state staff and resources often have more useful information on specific sites, such as site background information.

c. What would make the studies more useful?

Interviewees offered the following suggestions to make the studies more useful:

- **Shorten the studies.** Both EPA interview respondents and external interviewees suggested reducing the length of the studies. One region took the EPA/NREL studies and shortened them from 50 pages to 15-20 pages to make the content more digestible for municipalities. The same region currently conducts its own simplified feasibility studies, rather than the full feasibility studies with NREL. While the region's studies are not "investment grade," they do assess conditions at and around the site to assess technical feasibility, and they include rough estimates of system costs. Community leaders and government officials noted that shortened feasibility studies would help them communicate with legislators and community members about the viability of the project; the greater detail is not needed for that purpose. An EPA interviewee suggested conducting more, but shorter, studies – for example, three "light" studies instead of one "big" study. This same individual commented that the study's "signaling effect" will be the same regardless of whether the study is 20 or 50 pages. One developer stated the feasibility studies

were "too academic" and too detailed. One interviewee cautioned EPA to consider whether or not the expense of these studies is worth this more limited role as a high-level tool (as opposed to a more detailed study); there may be a simpler screening tool that could serve a similar purpose.

- **Focus on crucial information.** While shortening the overall length of the studies, interviewees requested that EPA/NREL focus on providing information with the greatest value to stakeholders. For example, some needed details are missing: developers are most concerned about useable acreage, level of risk, contamination characterization, and local market conditions. Government officials are most interested in information such as potential financing streams, site remediation status and activities, environmental assessment costs, and legal costs associated with the site. Community leaders need clear, concise communication pieces, including cases involving different types/sizes of projects. Community leaders suggested that EPA make this information public and accessible online, as they see this as an important step in addressing community resistance. However, it is our understanding that EPA posts all feasibility studies online already – even though some community leaders seem not to be aware of this fact.
- **Identify the end-user upfront.** Interviewees who have been involved in a number of feasibility studies suggested the studies be targeted to sites that have a serious end-user. Government officials and developers in particular are concerned about the availability of an offtaker as a major component of a project's feasibility. Some individuals who have requested feasibility studies in the past did not have decision-making authority, and were not able to move projects forward after the studies were conducted.
- **Look for opportunities to bridge the gap between the feasibility study and next steps.** EPA staff in a number of regions emphasized that once they deliver a feasibility study to a municipality, the matter is largely out of EPA's hands. While EPA and NREL staff sometimes respond to technical questions, EPA regional staff do not have the time (or, in some cases, the technical knowledge) required to provide the level of assistance that some local government officials require to take the next step in the process. One region with a very active state program connects local government officials with the state agency; however, this is not an option in every state. In many regions, EPA staff refers local government officials to the RE-Powering website, but officials may lack the time and expertise required to identify and use the relevant information. Connecting study recipients with state agencies, community groups, or experts at EPA Headquarters could help projects move forward.
- **Supplement NREL's knowledge with local expertise.** Interviewees identified four areas where local expertise would be useful: (1) identifying local financial incentives that can make the project economically feasible; (2) drawing on local engineering expertise to augment NREL's knowledge; (3) involving local experts who can help shape local policy, and (4) including more details about surrounding infrastructure and interconnection possibilities.

d. What lessons can be drawn about whether/how the Initiative should continue to use feasibility studies?

We address this topic under Question 6, below.

QUESTION 4: WHAT ARE THE AVOIDED AND/OR ADDITIONAL DEVELOPMENT COSTS OF DEVELOPING RE PROJECTS ON CLS RATHER THAN UNDISTURBED LANDS?

There are several steps to answering this evaluation question, as indicated in the sub-questions below: (a) identify the major cost components of solar PV and wind projects; (b) understand how these costs might change if projects are sited on CLs rather than undisturbed lands; and (c) and (d) identify the circumstances in which developers do – and do not – derive a benefit from avoided costs (and/or face higher costs).

a. What are the major cost components of mid- and large-scale solar PV and wind projects?

As shown in Exhibit C-1 (located in Appendix C), IEc identified cost components for three size categories of solar PV projects: small commercial solar (defined as less than 250 kW), large commercial solar (greater than 250 kW), and utility-scale solar (figures are based on a 25-MW system in the southwestern U.S.). In all three size categories, non-hardware "soft costs" (e.g., customer acquisition, installation labor, permitting, etc.) account for more than half of the cost of solar PV systems. Installation labor, transaction costs, supply chain costs, and installer/developer profit account for a significant portion of small and large commercial solar. Construction equipment, labor, and civil engineering/grading account for a large portion of utility-scale solar costs.

As shown in Exhibit C-2 (located in Appendix C), we categorize wind costs as follows: total capital costs for an 83-meter tower with total project size of 200 MW; total installation costs for a 31-meter Guyed Tower 10-kW land-based wind system; and total installation costs for a 31-meter Lattice Tower 10-kW land-based wind system. For the 83-meter tower with 200 MW, turbine costs account for 68 percent of total costs, financial costs account for nine percent, and balance of system costs account for 23 percent. For both of the 10-kW systems, the turbine and tower collectively account for between 58 percent and 67 percent of total costs. The foundation accounts for 16 percent of the total cost of the Lattice Tower system, but less than five percent of the cost of the Guyed Tower system.

b. How might these costs change if projects are sited on CLs rather than undisturbed lands?

We used the interviews and, to some extent, the literature to identify cost implications of siting RE projects on CLs rather than undisturbed lands. We note that interviewees were very hesitant to provide specific estimates of cost differences, as each site is unique, and providing a general cost difference is very difficult. As such, the findings for this question should be interpreted as factors to consider, rather than definitive conclusions. One expert and developer reported that, overall, developers can expect a 10-20 percent *increase* in costs for solar projects on CLs. On the other hand, it is important to note that these costs can be offset by other factors – including access to cheaper land, the ability to take

advantage of existing infrastructure, and financial incentives – which can confer cost *savings*. We also note that the developers interviewed were primarily solar developers;[27] six of the eight only install solar, one installs both solar and wind, and one only installs wind. Therefore, our findings below are weighted towards solar projects.

Below, we discuss general differences in costs between CLs and undisturbed lands as gleaned from the interviews.

Positive (cost saving) factors:

- The ability to buy or lease inexpensive land can confer significant cost savings.
- A primary difference between siting RE projects on CLs as opposed to undisturbed lands is the potential to obtain incentives. While there are sometimes incentives for RE projects in general, there may be additional incentives for RE projects on CLs. Incentives are often crucial for making these projects work financially, because of the higher overall project costs.
- Grid connection costs can be reduced by leveraging existing infrastructure. Even if upgrading or replacing a distribution line is required, the necessary infrastructure and utility easements are likely already in place for CLs. According to interviewees and the literature, smaller-sized, utility-scale RE projects (i.e., fewer than 6 MW) can interconnect on the distribution rather than transmission system, reducing their technical and administrative/legal costs.[28]
- It may be possible to avoid certain permitting costs when selecting pre-zoned sites on CLs (however, see below regarding possible cost increases related to permitting).
- RE often poses lower risk of exposing humans to contamination than residential or certain commercial purposes, so compliance in states with variable cleanup standards can be less costly than in states with uniform standards.
- Interviewees often pointed out additional benefits that are more challenging to monetize, but are nonetheless important to consider, including: returning a blighted site to a productive use, building goodwill in a community, and meeting goals for both RE capacity and site remediation.

Negative (cost increasing) factors:

- Siting RE projects on CLs rather than undisturbed lands often entails additional costs for site screening, feasibility studies, and characterization of contamination. These steps are critical, particularly from the developers' perspective (as they are required to secure financing), and can be time consuming and costly. There can also be greater uncertainty about the feasibility of a project on a CL.

[27] The developers also work on a range of project sizes: two do utility-scale installations, four do commercial-scale, and two do both commercial and utility-scale installations.

[28] Howland, Charles B. "Brightfields: Sustainable Opportunities for Renewable Energy Projects on Environmentally Impaired Lands." *Natural Resources & Environment*. American Bar Association Section of Environment, Energy, and Resources. Volume 29, No. 2, Fall 2014.

- Regulatory requirements relating to environmental remediation can substantially add to project timing and costs. One developer estimated that about 80 percent of the permitting process for RE projects on CLs is the same as for undisturbed lands, with the remaining 20 percent different at CLs (with variations by site and state/regional requirements). In addition, permitting fees can be up to three times higher for projects on CLs compared to undisturbed lands.
- Design/engineering, construction equipment and labor, and installation labor costs can be 10-20 percent higher for RE projects on CLs compared to undisturbed lands. On the other hand, interviewees did not report a change in interconnection costs or customer acquisition costs.
- Transmission costs may be higher or lower depending on the site. If the area is remote, transmission costs could be higher (in addition to other infrastructure-related costs, such as road-building and temporary housing construction).
- Lending costs may be higher for CLs than for undisturbed sites. Financiers and lenders often require a higher interest rate or rate of return to compensate for the perceived or actual risk of siting projects on CLs.

c. Do developers derive a benefit from avoided costs when siting RE projects on CLs? If yes, under what circumstances?

Our developer and expert interviews highlight the following cost avoidance benefits when siting RE projects on CLs rather than undisturbed lands:

- CLs may be less expensive to purchase or lease than undisturbed lands. In addition, site owners of CLs are often motivated to find a profitable use for the site, and few options generally exist at these sites.
- Government agencies involved with CLs are often anxious to find a viable reuse option, and will sometimes actively help facilitate project development.
- Access to existing infrastructure may reduce interconnection costs.
- Proximity of the property to end users reduces transmission costs, and helps ensure an offtaker for the power.
- Financial incentives that encourage development on CLs are crucial for making projects on CLs economically viable, particularly in parts of the country where renewables are not otherwise cost-competitive with conventional fuels.

d. When do developers not derive a benefit from avoided costs – and/or when do they face additional costs – when siting RE projects on CLs?

The developers interviewed identified the following costs of siting RE projects on CLs:

- Additional due diligence is required upfront. This often means more time to review the site history and contamination characterization. It can also involve extra time and effort to change zoning codes or reuse agreements.

- Review, permitting, and monitoring the remedy entail additional costs. Review and permitting may require greater scrutiny, and/or involvement by more agencies, than projects on undisturbed lands.
- Projects on CLs may take longer to complete the development process; the longer the process is extended, the less financially rewarding the project becomes. These projects often require more time for structural planning and design to maintain the structural integrity of the remedy. Moreover, longer project times can also result in loss of offtakers, as negotiated terms may expire.
- RE projects on CLs require higher capital and labor costs to ensure remedy integrity – for example, building ballasts to support solar installation on landfills so that the cap is not pierced.
- Risk and uncertainty associated with liability concerns can cancel out the cost avoidance benefits listed in part (c), due to higher interest rates for the project (i.e., financing is more expensive to compensate for higher perceived risk).

QUESTION 5: WHAT IS THE PROCESS "ROADMAP" FOR THE SUCCESSFUL DEVELOPMENT OF RE PROJECTS ON CLS?

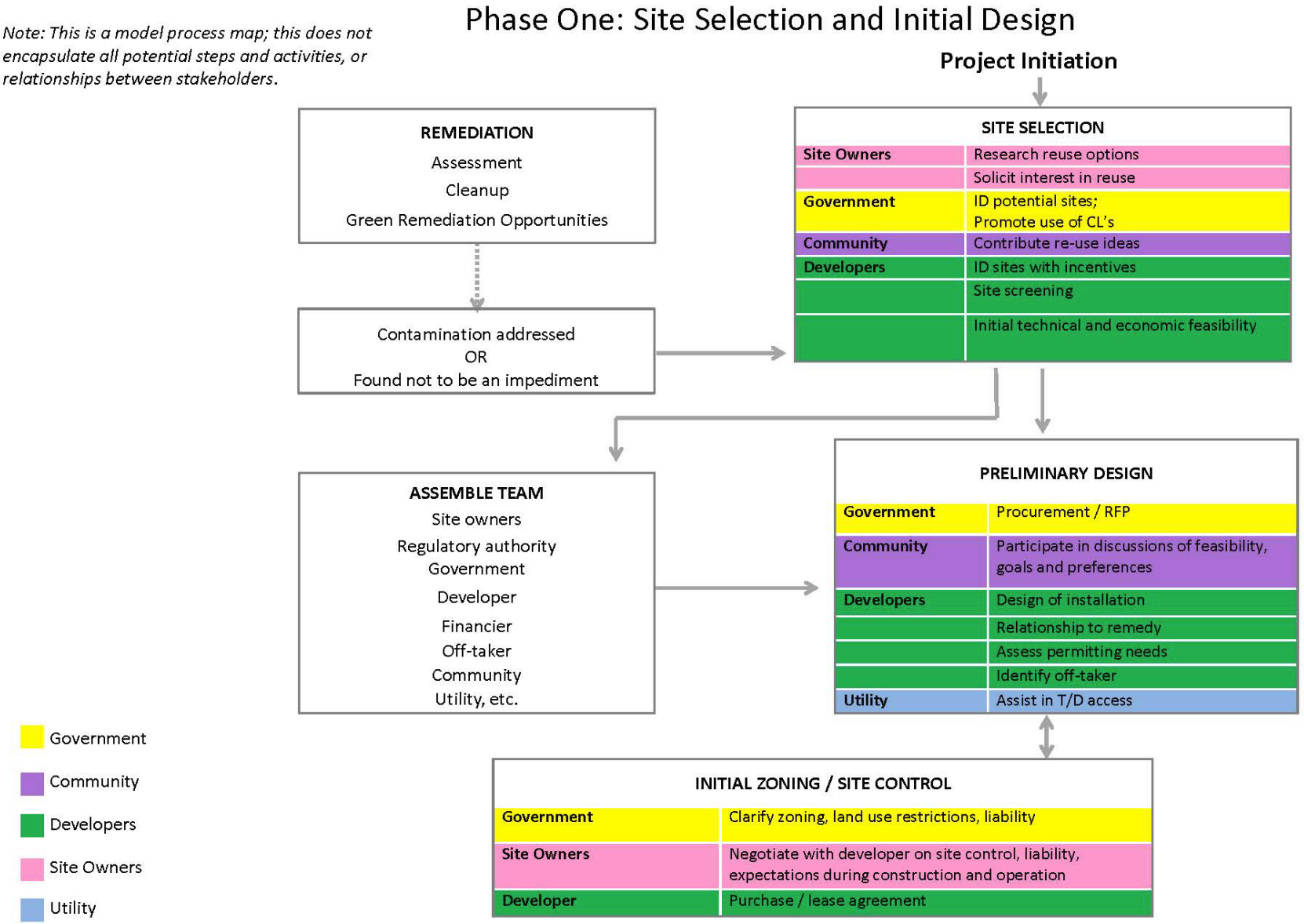
Based on our literature search and interviews, we developed a process map for the successful development of a RE project on CLs (Exhibit 6). The diagram and discussion that follows consolidate the findings discussed below, focusing on the following: (1) the general process for siting RE projects on CLs, by phase; (2) barriers encountered in each phase; (3) possible solutions to barriers; and (4) EPA's role, if any, in addressing barriers and providing solutions. In our discussions with interviewees, it became clear that:

- The process for developing these types of projects is not identical across projects; in fact, the process can vary substantially from project to project. For example, if one project is on a closed landfill near an urban center, and the other is a Superfund site in a rural area, the steps for design and development of the project would vary significantly. However, we have identified the general "phases" of RE project development on CLs, and discuss each of these phases below.
- The process is often non-linear: within phases, some steps are iterative and contain feedback mechanisms. For example, in the design and development phase, developers seek financing while they work out the interconnection agreement with utilities.
- The process and barriers encountered can vary for each stakeholder group. Therefore, we discuss the general process and barriers below by stakeholder group. Phases 2 and 3 also display the key milestones from the previous phase that must be reached to move the project forward; if the barriers related to those milestones are not addressed, the project may not be successful.

Exhibit 7, below the process map, summarizes the actions for each stakeholder in each of the first two phases of the development process.

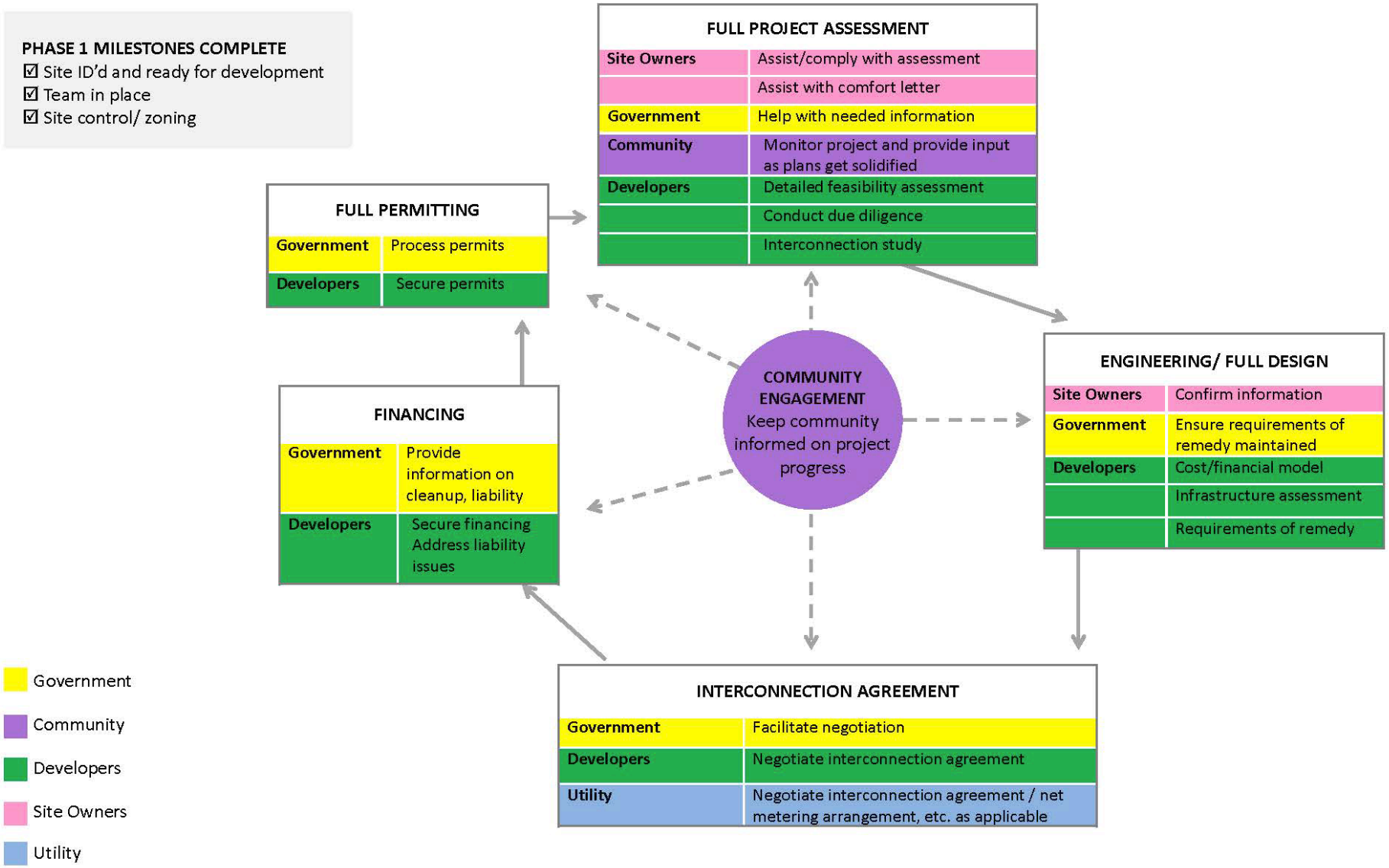
EXHIBIT 6. PROCESS MAP

Note: This is a model process map; this does not encapsulate all potential steps and activities, or relationships between stakeholders.



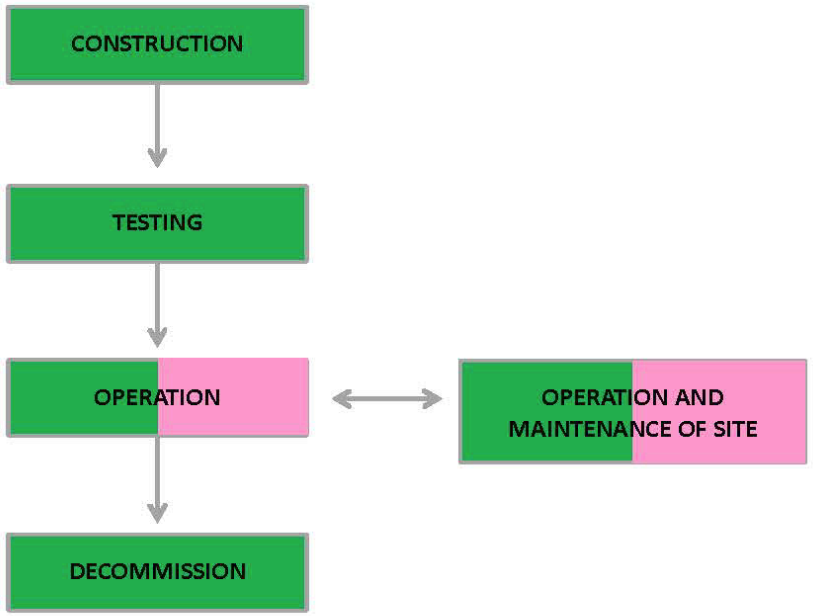
Phase Two: Project Development

PHASE 1 MILESTONES COMPLETE
☑ Site ID'd and ready for development
☑ Team in place
☑ Site control/ zoning



Phase 3: Construction and Operation

PHASE 2 MILESTONES COMPLETE
- ☑ Engineering/ full study complete
- ☑ Interconnection agreement reached
- ☑ Financing secured
- ☑ Permits secured



Developers

Site Owners

EXHIBIT 7. SUMMARY OF STAKEHOLDER ACTIONS BY PHASE

STAKE-HOLDER	PHASE 1: SITE SELECTION AND INITIAL DESIGN			PHASE 2: PROJECT DEVELOPMENT				
	SITE SELECTION	PRELIMINARY DESIGN	INITIAL ZONING/ SITE CONTROL	FULL PROJECT ASSESSMENT	ENGINEERING/ FULL DESIGN	INTERCONNECTION AGREEMENT	FINANCING	FULL PERMITTING
Site Owners	• Research reuse options for site (to maximize returns) • Solicit interest from developers or municipalities • Provide support as needed during remediation (or conduct/pay for)		• Negotiate with developer on site control, liability, expectations during construction and operations • Reach purchase/ lease agreement with developer	• Assist/ comply with assessment, as needed • Assist with comfort letter	• Confirm infrastructure/ engineering on site			
Government	• Identify potential site(s) • Promote use of CLs • Review environmental assessment, contamination characterization and clean-up/ remediation, as appropriate	• Communicate with public • Solicit RFPs from developers • Provide needed info on contamination and cleanup to developers • Offer technical assistance, as resources allow	• Clarify zoning, land use restrictions, liability at site	• Provide info / support where needed and available	• Ensure requirements of remedy maintained	• Facilitate negotiation for interconnection agreement	• Provide information as needed for financiers	• Process permits
				• Monitor project progress; coordinate and participate in public meetings, as appropriate				
Community Leaders	• Contribute ideas for reuse at site(s)	• Participate in discussions of feasibility, goals and preferences • Research incentive options to attract developers		• Monitor project as plans get solidified • Provide input				
				• Communicate status with public • Keep informed on project progress				

STAKE-HOLDER	PHASE 1: SITE SELECTION AND INITIAL DESIGN			PHASE 2: PROJECT DEVELOPMENT				
	SITE SELECTION	PRELIMINARY DESIGN	INITIAL ZONING/ SITE CONTROL	FULL PROJECT ASSESSMENT	ENGINEERING/ FULL DESIGN	INTERCONNECTION AGREEMENT	FINANCING	FULL PERMITTING
Developers	• Identify sites with incentives or where remediation status not an impediment • Gather and review publicly available info on site history and cleanup activities • Conduct initial technical and economic feasibility analyses	• Conduct preliminary design of installation, including relationship to remedy • Conduct initial feasibility studies, study interconnection possibilities, determine appropriate incentives • Assess permitting needs • Identify offtaker; begin determining potential transmission/ distribution access	• Gain site control / access • Negotiate purchase/ lease agreement (including liability arrangements)	• Conduct full feasibility assessment, due diligence, and have inter-connection study completed	• Conduct cost/financial model and infrastructure assessment	• Negotiate interconnection agreement	• Understand, indemnify, and/or mitigate any liability release • Secure financing	• Identify and secure required permits

a. Where do possible barriers exist in the process?

Please see the discussion in Question 2 above for a full discussion of the barriers stakeholders face in siting RE projects on CLs. Here, we identify the primary barriers in the first two phases of the development process:

Site Selection and Initial Design

- Technically feasible sites can be difficult to identify, including finding ownership and characterizing contamination.
- Uncertainty about the extent of contamination or cleanup status/remedy can delay or halt a project. Multiple developers indicated they will not develop on a site where remediation is ongoing; this is partly due to liability concerns, and partly due to the risk that an installation will need to be moved as a result of new issues discovered during the cleanup process.
- If there are more profitable or desirable options for reuse at the site, it can be difficult to garner community or government support for the project.
- Limited municipal capacity and expertise can mean that there are not enough resources to complete the early stages of a project in a timely manner (e.g., coordinate with team members, process permits, or research reuse options), which can result in developers moving on to different projects.
- A lack of information or awareness of how RE projects on CLs work can cause issues in both financing and properly understanding the cleanup requirements. If a project is financed by external parties (rather than on the corporate balance sheet), convincing financiers that the risk is tolerable can be a challenge. The potentially high costs and time delays associated with proper remediation and compliance with state and federal regulations can make a project untenable.
- A lack of sufficient financial and policy incentives to offset the higher costs of projects can limit project feasibility.
- In some cases, changes to land reuse permits or zoning are required; these can cause delays or even halt the project completely (i.e., if not approved).

Project Development:

- Utilities may not be willing to buy the power (at all, or at a favorable rate), and/or may require expensive interconnection studies.
- Concerns about preserving the integrity of the landfill cap (or other remedy) can complicate project design and construction.
- Prolonged development cycles can have financing implications: The ability to obtain funding for a two- to three-year development cycle (rather than one year) requires financiers to take a longer-term outlook.
- Developers (and, indirectly, financiers) are highly concerned with liability transfers; if an agreement cannot be reached in the leasing process that satisfies both parties, projects can be stunted.

- Environmental reviews and permitting can add significant time to the process, extending the development cycle by up to several years. This barrier may be more or less significant depending on the state and/or municipality in which a project is being developed.

b. What are some possible solutions to these barriers (if known)?

As shown in Exhibit 8, potential ways to address these barriers include:

EXHIBIT 8. POTENTIAL SOLUTIONS TO BARRIERS

BARRIER	WAYS TO ADDRESS BARRIERS
Phase One: Site Selection and Initial Design	
Lack of technical feasibility (includes difficulty identifying feasible sites)	Utilize databases, websites, screening tools, etc. to identify potential sites. Include information about site ownership, history of contamination and cleanup at the site, and infrastructure.
Uncertainty regarding remedy	Find full information on remediation activities at the site, and the history of cleanup. Get assurances from responsible agency of completed cleanup.
Better reuse options Lack of community/ stakeholder acceptance	Identify complete benefits of the RE project, and work with the community to facilitate their understanding of the full suite of options and their implications for the community.
Limited municipal capacity/expertise	Seek federal or state support and expertise.
Lack of information/ awareness of RE on CLs	Cost/timing remediation: Identify potential funding sources, including state and federal, to assist with costs of remediation – or work early on to find responsible party. Concerns re: risk: Seek information and assurances from appropriate agency as to the cleanup activities and site status. Find case studies or examples of similar sites with completed RE projects.
Insufficient financial or policy incentives	Seek federal or state support in identifying incentives early on in the process.
Zoning and land use issues	Engage appropriate agencies early on to determine if zoning or permitting changes are needed (e.g., changing the reuse agreement for the site) and if the project will be feasible.
Phase Two: Project Development	
Utility/offtaker issues	Find a utility or third-party purchaser who commits to buying the power. PPAs with utilities are helpful for raising external financial capital because they provide a guaranteed revenue stream.
Liability concerns	Remedy integrity: Seek expertise in remediation and engineering to maintain the integrity of the remedy.
	Financing delays/issues: Help financiers understand process and engage them early on, to witness each step as it is completed.
	Limitations on liability: As much as possible, obtain assurances from environmental agencies and property owners that the developers will not be held liable for previous contamination at the site.
Permitting delays	Engage and coordinate with all relevant permitting authorities, environmental agencies, and stakeholders whose approval is required for the project, early in the process. Facilitate interaction and coordination between EPA and state agencies.

c. What role, if any, does or can EPA play in providing these solutions?

EPA provides support and resources to address several of these barriers. Exhibit 9 below summarizes the primary barriers in the process, highlighting which stakeholders are involved, where EPA currently provides support, and areas where EPA can enhance the effectiveness of the Initiative's resources, tools, and knowledge products (also see the findings for Question 2(d)). We also note that there are several barriers discussed in previous sections of this report that are not within the Initiative's scope to address; these include:

- Lack of economic feasibility/higher costs
- Lack of an offtaker (due to price)
- Lack of interconnection/transmission infrastructure
- Renewable energy certificates (RECs)
- Financial assurance requirements

In general, different stakeholders are looking for different levels of support. Specifically:

- *Community Leaders*: Community leaders are looking for support in communicating with their constituents. Project examples and case studies, especially those highlighting smaller projects, and both successful and unsuccessful projects, would be particularly helpful. They are seeking opportunities to raise awareness in their communities, and would welcome support summarizing and disseminating information about RE projects, their safety, and their impact on communities. In addition, community leaders would like to see:
  - More information on regulatory requirements and challenges, solar projects on small-scale brownfields, and lessons learned during remediation and permitting.
  - A summary of incentives and disincentives for RE reuse options.
  - Historic data on landfills.
  - Tools to address feasibility on multiple sites.
  - A capacity building program alongside existing tools that would provide training for those involved in the project on how to address feasibility and project development.
- *Government Officials*: Government officials highly value their partnerships with EPA, whose expertise and support lend credibility and help foster community acceptance. They have similar needs as community leaders for communication materials and support for engaging the community (see above). In addition, they would appreciate:
  - More information on long-term and short-term liability, and how they relate to RE sites.

  - Clarification of uncertainties associated with projects that can create more confusion or risk.
  - More coordination between EPA regional offices and local government offices to get more localized information on sites.
  - Best practices used by successful projects, and current technology options.
  - Access to or information about funding sources for remediation costs.

- *Developers*: Developers' primary concern is the technical and financial feasibility of projects. Developers are looking for support that helps them address the uncertainties of liability, risk, remediation, and feasibility. Developers stated that they could use more support with the following:
  - Central database of incentives and sites that have already been approved for redevelopment (e.g., top ten sites). Include information on state policies regarding renewables and CL reuse.
  - More complete information on the history of contamination and cleanup activities at the site, structural integrity of closure, and subsurface conditions.
  - A clear understanding of the permitting and approval process, including milestones.
  - A clear, supportive presence from EPA throughout the process to appease nervous financiers (in addition to the comfort letters). Help financiers understand liability and risk from the Agency's perspective.
  - Assistance in identifying and inviting third-party buyers or utilities.
  - A larger RE-Powering presence at the local/regional level.

EXHIBIT 9. SUMMARY OF EPA ROLE IN ADDRESSING BARRIERS

	BARRIER	STAKEHOLDERS Government Community Developers Site Owners Utility	WAYS TO ADDRESS BARRIERS	EPA ROLE	EPA ACTIONS ORANGE = CURRENT RED = FUTURE OPPORTUNITIES
Phase One: Site Selection and Initial Design	Lack of technical feasibility (includes difficulty identifying technically feasible sites)		Utilize databases, websites, screening tools, etc. to identify potential sites. Include information about site ownership, history of contamination and cleanup at the site, and infrastructure.	• Summarize and/or facilitate access to key site data in a streamlined digestible format • Periodically review EPA's knowledge products to ensure accuracy and completeness • Broadly disseminate knowledge products to facilitate their use	• Screening tools • Mapping tools • Decision trees • Feasibility studies (full-length) • Provide short screening-level feasibility studies (including ownership) • Indicate viability of site in screening tools
	Uncertainty regarding remedy		Find full information on remediation activities at the site, and the history of cleanup. Get assurances from responsible agency of completed cleanup.	• Clarify site cleanup status (e.g., stage of remediation) • Provide or facilitate access to complete site history and cleanup information.	• Links to available program information • Easy access to complete site history records • Provide information on cleanup activities
	Better reuse options Lack of community/ stakeholder acceptance		Identify complete benefits of the RE project, and work with the community to facilitate their understanding of the full suite of options and their implications for the community.	• Communicate benefits of RE on CLs • Provide technical information on RE options, risks associated with RE and impacts • Provide contacts and referrals for information on other end uses	• Stakeholder facilitation • Community engagement/ outreach • Conference presence • Public meetings • Fact Sheets • Case studies • Continued / Additional Outreach • Community Network • Case studies/ examples of successful and unsuccessful projects • Webinars for communities • Info on safety and EPA role

	BARRIER	STAKEHOLDERS Government Community Developers Site Owners Utility	WAYS TO ADDRESS BARRIERS	EPA ROLE	EPA ACTIONS ORANGE = CURRENT RED = FUTURE OPPORTUNITIES
Phase One: Site Selection and Initial Design	Limited municipal capacity/ expertise		Seek federal or state support and expertise.	• Communicate opportunities, to the extent that they exist, for Federal/State support and expertise • Facilitate and/or provide training • Enhance networks	• Feasibility studies • Website • Tools/guidance documents • RE-Powering Response Team • Create roster of experts • Identify funding sources • Identify training resources
	Lack of information/ awareness of RE on CLs		Cost/timing remediation: Identify potential funding sources, including state and federal, to assist with costs of remediation – or work early on to find responsible party.	• Share examples of successful projects and strategies • Identify and communicate potential state and federal funding sources	• Participation in conferences • Case studies • Help identify funding sources
			Concerns re: risk: Seek information and assurances from appropriate agency as to the cleanup activities and site status. Find case studies or examples of similar sites with completed RE projects.	• Clarify liability status (e.g., if site liability has been assigned) • Provide liability comfort letters • Share examples of successful projects and strategies	• Comfort letters • Financing Fact Sheet • Provide additional information of cleanup activities • Case studies
	Insufficient financial/ policy incentives		Seek federal or state support in identifying incentives early on in the process.	• Communicate opportunities, to the extent that they exist, for incentives for RE on CLs • Provide contacts, and facilitate federal and state support, to identify project incentives	• DSIRE (DOE) • Financial Fact Sheet • Actively highlight and match incentives to particular projects
	Zoning and land use issues		Engage appropriate agencies early on to determine if zoning or permitting changes are needed (e.g., changing the reuse agreement for the site) and if the project will be feasible.	• Provide or facilitate access to information about zoning and permitting processes and best practices • Coordinate with EPA program offices and regions to support municipalities and communities	• None • Provide support for municipalities • Research and disseminate best practices • Assist communities to be renewable ready

	BARRIER	STAKEHOLDERS Government Community Developers Site Owners Utility	GLOBAL SOLUTION	EPA ROLE	EPA ACTIONS ORANGE= RE-POWERING CURRENT SUPPORT (CONTINUE) RED= RE-POWERING SUPPORT OPPORTUNITIES
Phase Two: Project Development	Utility/offtaker issues		Educate communities and other stakeholders on the need for off-takers and utility interconnection	• Facilitate consideration of the issues and processes associated with connecting renewable generation to customers	• None • Facilitate utility involvement as a partner for RE on CLs • Improve site screening with respect to regulatory context and proximity to transmission and distribution
	Liability concerns		Remedy integrity: Seek expertise in remediation and engineering to maintain the integrity of the remedy.	• Provide information and examples of best practices in protecting site remedy and maintaining ICs	• Website guidance • Provide info on best practices to protect site remedy and maintain ICs
			Financing delays/issues: Help financiers understand process and engage them early on, to witness each step as it is completed.	• Directly engage financiers to address their questions and concerns about liability issues	• Comfort letters • Clarify language • Share information about financial resources
			Limitations on liability: As much as possible, obtain assurances from environmental agencies and property owners that the developers will not be held liable for previous contamination at the site.	• Provide liability comfort letters • Continue to clarify and communicate EPA's position on when developers may or may not be potentially liable • Clarify liability status for specific sites (e.g., if site liability has been assigned) • Explore safe harbor provisions under CERCLA • Distinguish Federal and State liability issues	• Guidance documents • Model comfort letters • EPA Policy • Extension of liability protection • Liability guidance • Engage with developers/ financiers, as requested
	Permitting delays		Engage and coordinate with all relevant permitting authorities, environmental agencies, and stakeholders whose approval is required for the project, early in the process. Facilitate interaction and coordination between EPA and state agencies.	• Clarify the permitting process and milestones, including EPA/state roles, to help avoid unexpected delays/costs • Research and communicate permitting best practices (e.g., unified permit)	• None • Clearly defined permitting process (milestones)

CHAPTER 4 | CONCLUSIONS AND RECOMMENDATIONS

Chapter 4 summarizes the main conclusions for Questions 1-5, and provides recommendations to improve the effectiveness of the Initiative (Question 6).

CONCLUSIONS

Based on the findings for Questions 1-5, we provide the following summary conclusions:

- **The Initiative has helped move the market toward greater consideration of RE projects on CLs by raising awareness, extending liability comfort, and providing tools and resources.** Since 2006, the number and size of RE projects on CLs has increased, reaching a total of 179 installations with 1.1 GW of cumulative installed capacity in early 2016. The Initiative has capitalized on this upward trend by: raising awareness through outreach efforts (conferences and presentations), demonstrating feasibility (EPA/NREL feasibility studies), and providing liability comfort (EPA's 2012 policy extended liability protection to tenants as well as purchasers). The Initiative has also facilitated development of the market for RE projects on CLs by providing tools to screen for potential sites, offering project development support, packaging and disseminating information, and identifying and contributing to incentives and policies. There continue to be opportunities for EPA to conduct more outreach to raise awareness and comfort with the RE-Powering concept and to seek partnerships to leverage EPA's influence.
- **Several barriers to developing RE projects on CLs still exist; the Initiative addresses many of these barriers, to varying degrees.** Liability concerns still top the list of barriers identified by interviewees, despite the Initiative's significant work in this area. Interviewees suggested that EPA could do more to clarify its stance on liability for developers as well as financiers. Another frequently cited barrier was economic infeasibility and lack of adequate financial incentives for projects. While it is beyond the Initiative's purview or ability to influence the economics of specific projects, the Initiative refers stakeholders to DOE's incentives database (DSIRE) and provides a financing fact sheet. Developers identified permitting delays as another major barrier, which the Initiative does not currently address. More broadly, the evaluation finds that interviewees have limited familiarity with the Initiative's resources, tools, and knowledge products and have not used them extensively. Those who have used them stated they were helpful at a high level, but lacked sufficient granularity to meet their needs. In particular, developers stated that information about site contamination history,

cleanup activities and status, and closure reports/records of decision was important, but difficult to obtain.

- **The feasibility studies are seen as a good first step and have a signaling effect by demonstrating federal interest and commitment to RE on CLs.** Different stakeholder groups use the feasibility studies for somewhat different purposes. EPA regional staff use the studies for communicating the federal government's seriousness about RE on CLs to developers and communities. State/local government officials and community leaders use the studies to assess site options, communicate with the public, and garner support for RE projects on CLs. Developers all reported that regardless of whether a feasibility study exists for a site, they will conduct their own, more in-depth feasibility analysis. EPA, government, and community respondents generally reported finding the studies useful, although they noted that additional research was required to reach a final decision about how to proceed. Half of the developers interviewed have not used feasibility studies; the others indicated that the studies provided high-level generic information, but lacked the detail needed from the developers' perspective (e.g., site history, risk, usable acreage). Overall, stakeholders suggested focusing the studies on the most crucial details while reducing their overall length. Interviewees also suggested the Initiative could explore ways to facilitate the use of the study results: identify end-users upfront, and work with them after studies are completed to translate the findings into next steps.
- **RE projects on CLs tend to cost more than projects developed on undisturbed lands; however, some of the benefits associated with RE development on CLs are difficult to quantify, and may afford cost savings.** Siting RE projects on CLs rather than undisturbed lands can entail additional costs for site screening, feasibility studies, and characterization of contamination. Regulatory requirements relating to environmental remediation can substantially add to project timing and costs; and design/engineering, construction equipment and labor, and installation labor costs can be higher for RE projects on CLs compared to undisturbed lands. While most interviewees were reluctant to provide specific estimates of cost differences, they generally indicated that RE projects tend to cost more on CLs. One developer/expert reported that, overall, developers can expect a 10-20 percent *increase* in costs for solar projects sited on CLs. On the other hand, several positive factors exist – including access to affordable land, the ability to take advantage of existing infrastructure, and financial incentives – that can offset higher costs and may confer cost *savings*. Incentives are often a crucial determinant of whether projects are financially viable.
- **Interviews and other information allow for a structured presentation of the development process and barriers.** The process map identifies three general phases of project development, with associated steps and milestones. Overall, the process map highlights the complexity of the steps and the interplay between a variety of stakeholders needed to successfully develop RE projects on CLs. Using the process map, the evaluation identifies barriers that can arise in the

development process, ways to address them, and the role that EPA does or could play in addressing barriers. The mapping exercise helped inform recommendations in Question 6, below.

RECOMMENDATIONS – QUESTION 6: BASED ON THE FINDINGS FOR QUESTIONS 1-5, HOW CAN EPA IMPROVE THE EFFECTIVENESS OF THE RE-POWERING INITIATIVE?

Our findings and conclusions suggest several areas in which the Initiative could focus its efforts to improve effectiveness. In considering such findings, EPA will need to explore which fall most directly within EPA's mission and decide which activities EPA would like to pursue and which activities the Agency might partner with other agencies and organizations to address:

- **Conduct outreach to promote the RE-Powering concept and the Initiative's resources, tools, and knowledge products.** While awareness of the potential for RE projects on CLs has increased in recent years, many interviewees are unfamiliar with the Initiative's resources, tools, and knowledge products and/or have not used them extensively. This finding is particularly notable given that we interviewed individuals who are interested and active in this space. The interview findings indicate that some of the information sought by interview subjects (e.g., success stories) currently exists, but they are not aware of it. RE-Powering should continue to raise the profile of its resources, tools, and knowledge products to facilitate their use. Furthermore, many EPA cleanup staff, state RPMs, and private developers are still unfamiliar or uncomfortable with the RE-Powering concept. The Initiative should continue to disseminate success stories, lessons, and best practices within and outside of EPA to raise stakeholder awareness and comfort.
- **Refine resources, tools, and knowledge products to help stakeholders address barriers effectively.** Interview respondents outside of EPA who have used the Initiative's resources, tools, and knowledge products indicated they are helpful at a high level, but lack the specific information and granularity they are seeking. Interviewees provided a number of suggestions to enhance the Initiative's resources, tools, and knowledge products, including information about site ownership, contamination history, cleanup status, and infrastructure. In addition, several suggestions focused on making the tools more user-friendly and packaging relevant information (e.g., site location, cleanup status, RE potential, and available incentives) in an easily sortable and digestible format. Finally, some interviewees stated that information contained in existing databases or feasibility studies was outdated or inaccurate. The Initiative should periodically review its resources, tools, and knowledge products to ensure they are accurate and complete.
- **Develop a strategy for the feasibility studies.** Interview results suggest that the feasibility studies are most useful as an outreach tool, for signaling EPA/NREL's seriousness about RE projects on CLs, and for showing local government officials that EPA/NREL consider the sites feasible. Whether/how the Initiative should continue to use feasibility studies depends on what it wants to achieve:

- If the Initiative wants to generate additional technical/financial knowledge about what makes RE projects feasible, packaging and disseminating lessons learned from previous studies may be more efficient than investing in new studies. The decision tree for solar is one example of a tool that incorporates lessons from previous feasibility studies. If the Initiative chooses to continue funding studies for this purpose, it could consider targeting specific knowledge gaps (e.g., issues related to the feasibility of biomass).
- If the Initiative wants to capitalize on the "signaling effect" and use the studies primarily as a way to continue to raise awareness, the feedback suggests this goal might be accomplished with a larger number of shorter studies.
- If the goal is to encourage more projects to move beyond the feasibility-study stage, RE-Powering may want to do the following: On the front end, ensure the feasibility study has a committed end-user with the decision-making authority (or connections) required to move the project forward, if the study determines it is feasible. On the back end, follow up with municipalities that receive the feasibility studies[29] and identify contacts that can provide follow-up assistance to help local governments issue an RFP, select a developer, etc.

Regardless of the approach taken, the interview findings suggest that the Initiative may want to strike a balance between full regional coverage vs. a more targeted focus. For example, funding studies in regions that have their own interagency agreement with NREL – or where the region already conducts its own studies – may no longer be necessary. Instead, RE-Powering could focus its resources on regions that are less active in this area.

- **Focus efforts to address significant barriers that fall within EPA's mission.** As summarized in Chapter 3, Exhibit 9, the evaluation identified several areas where the Initiative can initiate, continue, or enhance its efforts to address barriers. Some important areas include:
  - Continue to address liability concerns. RE-Powering has taken significant steps to address liability issues, but concerns remain. EPA should continue to clarify and communicate its position with respect to liability, including any safe-harbor provisions under CERCLA. The Initiative could address concerns about protecting the site remedy and maintaining institutional controls by providing information and examples of best practices. In addition, the Initiative could engage with project financiers to increase their understanding of liability risks and help them become more comfortable financing these types of projects.

[29] While EPA has followed up with some sites, IEc is envisioning a more systematic process to collect information, at regular intervals, on the status of every site that receives a feasibility study. This type of tracking would provide the data required to systematically assess progress, barriers, and outcomes at sites for which EPA has invested in a feasibility study.

  - Summarize and facilitate access to key site data in a streamlined digestible format. As discussed above, interviewees requested more information about key site characteristics, which would help address concerns and uncertainties about technical feasibility and contamination. The Initiative could provide such information through its existing resources – including screening tools, mapping tools, decision trees, and feasibility studies – by adding and/or facilitating access to complete site history records and cleanup activities/status.
  - Clarify permitting framework. Developers cited the lack of a clearly defined permitting process as a potential cause of delays and significant cost. RE-Powering could help developers understand the permitting process and milestones, including EPA/state roles, to help avoid unexpected delays and costs. In addition, the Initiative could research and communicate permitting best practices and examples of a successful process.

- **Partner with other agencies and organizations to address barriers and capitalize on opportunities.** As noted above, EPA may wish to undertake some activities in partnership with other, external parties. For example, while the Initiative cannot provide financial and policy incentives, it could provide contacts, and facilitate federal and state support, to identify project incentives. In addition, EPA should continue to monitor market, industry, and policy developments and seek opportunities to leverage its resources. For example, the Initiative (including regional EPA staff) could work with communities to steer community solar projects away from undisturbed sites and toward CLs. EPA could also explore opportunities to work with other federal agencies, such as the Departments of Energy and Defense, to promote RE on CLs within the context of sustainability requirements for federal facilities.