December 2022

Technical Report on Energy Communities

Federal rulemaking scenario analysis for Inflation Reduction Act tax credit opportunities

The following report is an extension of CRA's August 2022 whitepaper regarding coal-retirement energy communities: https://www.crai.com/insights-events/publications/coal-retirement-energy-communities/

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1. Introduction

As the process for implementation of the Inflation Reduction Act gets underway, a key portion of the law remains uncertain: location-based tax incentives for the power sector. The IRA offers significant tax credit bonuses to areas with historical ties to traditional energy industries, but many of the qualifying geographies are unclearly defined and rely on novel data categories not systematically tracked at the federal level.

In this report, we break down key implementation decisions that could affect the final geographic extent of these incentives. Additionally, we identify key data sources that are likely to be used in the rulemaking process and highlight major points of clarification that are needed prior to program implementation.

Though many components of these location-based incentives are unpredictable, a thorough understanding of IRA energy community definitions can help developers identify high likelihood sites prior to the release of federal government guidance.

2. What Is an energy community?

As described in **CRA's August *Insights* piece**, an energy community is a specific geographic location that has historical ties to traditional fossil fuel industries. Clean energy and energy storage projects developed in areas qualifying as energy communities will receive a "bonus" credit as part of their overall eligibility for either the investment or production tax credit (see Table 1 for details).[1] This will apply to all qualifying renewable electricity projects placed in service after 2022 and extend to all projects that commence construction by the end of 2032 (or later if US power sector greenhouse gas emissions are not at or below 25% of today's levels).

Table 1: Credit amounts for energy communities[2]

	Construction Start Date	Examples of Qualifying Technologies	Energy Community Bonus Credit Amount
Production Tax Credit (PTC)	Through 2024	Wind, Solar, Geothermal	• A 10% increase in the PTC rate, which would currently amount to $2.6/MWh (PTC grows w/ inflation) • Reduced to $0.5/MWh if wage standards are not met
	2025-2032	Electricity-producing resources with net zero GHG emissions	
Investment Tax Credit (ITC)	Through 2024	Solar, Energy Storage, Clean Hydrogen	• An additional 10% of initial project investment is credited • Reduced to 2% if wage standards are not met
	2025-2032	Any qualifying energy property with net zero GHG emissions	

[1] In addition to the investment and production tax credits, 40% of the $10 billion clean energy manufacturing tax credit is reserved specifically for coal-retirement energy communities. The incentive will credit back 30% for each qualified investment, though projects must apply and be approved to receive this benefit. Refer to section 48C(e) for a full list of qualifying facilities and a complete view of the qualification standards and application process for manufacturing facilities.

[2] Credits phase out after the later of 2032 and the time at which US power sector greenhouse gas emissions are at or below 25% of today's levels.

The IRA defines three geographic categories that will qualify as energy communities:

1. **Coal-retirement census tracts**: Areas near retired coal mine or power plant infrastructure.
2. **Fossil fuel employment statistical areas**: Regions with historical employment in fossil fuel industries and where unemployment is high relative to the national average.
3. **Brownfield sites**: Properties with the potential presence of hazardous substances.

In the following sections, we summarize the precise IRA definition of each category, identify potential data sources used to determine geographic extent, highlight key points of uncertainty in existing data and definitions, and attempt to identify the potential geographic extent of energy community qualification based on a variety of implementation outcomes.

3. Coal-retirement energy communities

3.1 IRA definition

In an **August *Insights* piece**, CRA analyzed the extent of coal-retirement energy communities and concluded that over 16% of all continental US land area will likely qualify under the definition. The IRA defines a coal-retirement energy community as a census tract in which either:

a. "after December 31, 1999, a coal mine has closed;

b. after December 31, 2009, a coal-fired electric generating unit has been retired; or

c. is directly adjoining to any census tract as defined in (a) or (b)."[3]

To understand the key qualification uncertainties under this provision, this report addresses coal-fired electric generating units and coal mines in separate sections. Ultimately, we find that coal mine datasets are generally less maintained than those for electric generating units, but key uncertainties exist within both categories that could lead to large changes in total qualifying area.

3.2 Retired coal-fired electric generating units

3.2.1 Existing datasets

The primary government dataset that tracks generator-level infrastructure is the EIA's Electric Generator Inventory, which is sourced from Form EIA-860.[4] Available publicly, this dataset provides a detailed view of the technology, fuel source, location, and years of operation for all major electric plant operations. Due to the high quality of EIA electric generation infrastructure data, it is likely that energy communities associated with coal generating unit retirements (Figure 1) will have the highest level of certainty and can be identified immediately.[5] However, details will need to be further defined through IRS and Treasury Department rulemaking for key edge cases, which we discuss below.

While the Treasury Department has not yet clarified the meaning of the term "coal-fired electric generating unit," several considerations may alter the final extent of the law's applicability. CRA

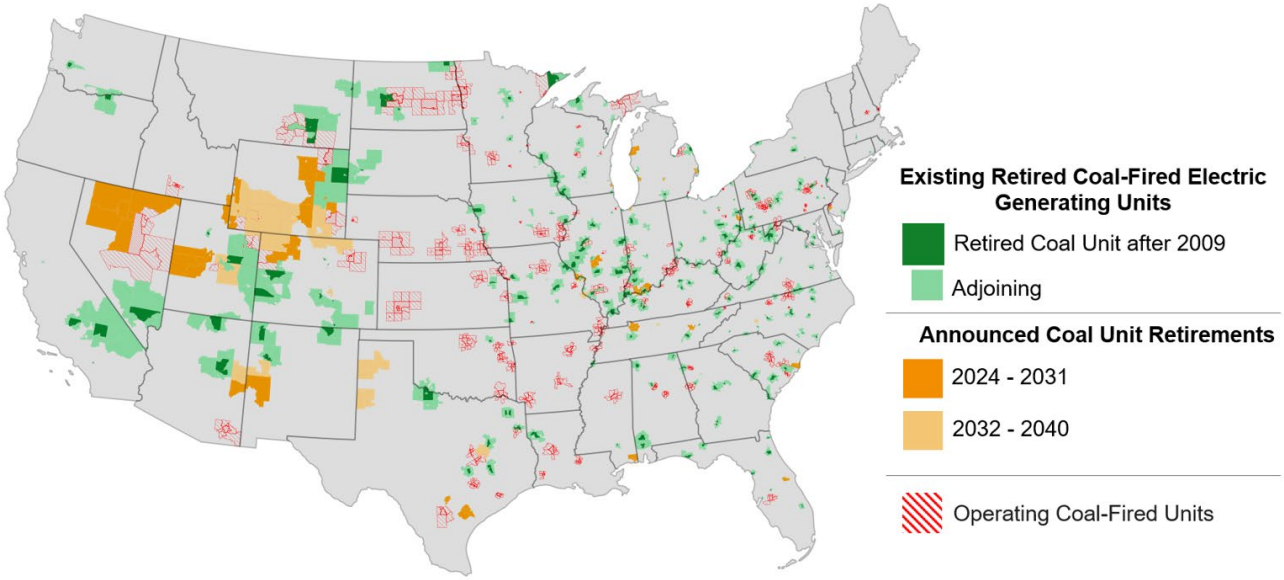
[3] Section 45(b)(11)(B)(iii) of the Internal Revenue Code of 1986.

[4] Form EIA-860 collects data from electric power plants with 1 MW or greater of combined nameplate capacity. CRA sourced data as of August 2022 for this analysis, though future changes to retirement dates may occur.

[5] The EIA-860 dataset is not without limitations, and minor errors in location or generator details exist. Because IRA definitions depend upon precise infrastructure location data, manual verification of each site will likely need to be conducted to ensure that each listed location aligns with satellite imagery or other supporting documents. CRA's analysis identified several latitude and longitude coordinates that were misplaced. Additionally, not all electric generating units are captured if the owner is not obligated to report to the EIA. For instance, the Clear Air Force Station in Alaska decommissioned a 22.5 MW coal-fired generator in 2016, but the EIA does not currently capture this retirement in its generator inventory.

conservatively displays conventional steam coal generating units in Figure 1; it is likely that the true extent may be larger if federal rulemaking incorporates additional definitions.

Figure 1. EIA 860 coal-fired electric generating unit census tracts



3.2.2 Areas for clarification

Coal-to-gas conversions and boiler replacements

According to the EIA, more than 100 coal-fired plants have been replaced or converted to natural gas since 2011, as shown in Figure 2.[6] Almost all of these plants are in the eastern half of the United States, though a handful in the West may provide significant opportunities due to their rural locations.

Complete replacements of coal-fired generators with natural gas-fired combined-cycle turbines were most common among plants with greater than 1GW capacity. However, the most common type of conversion was a boiler replacement, where the same generating unit was converted to burn other types of fuel. While complete replacements seem to align with the IRA definition, converted boilers represent a gray area as they often maintain the same EIA generator identification number, making them difficult to detect within the generator inventory. The key uncertainty to be clarified is whether a plant converted from coal to natural gas must cease operations to satisfy the definition or whether the conversion itself can qualify the site.

[6] The EIA provides full coverage of coal plant conversions in a **2020 article**.

Figure 2. US coal-to-natural gas conversions by conversion type and capacity (2011-2019)

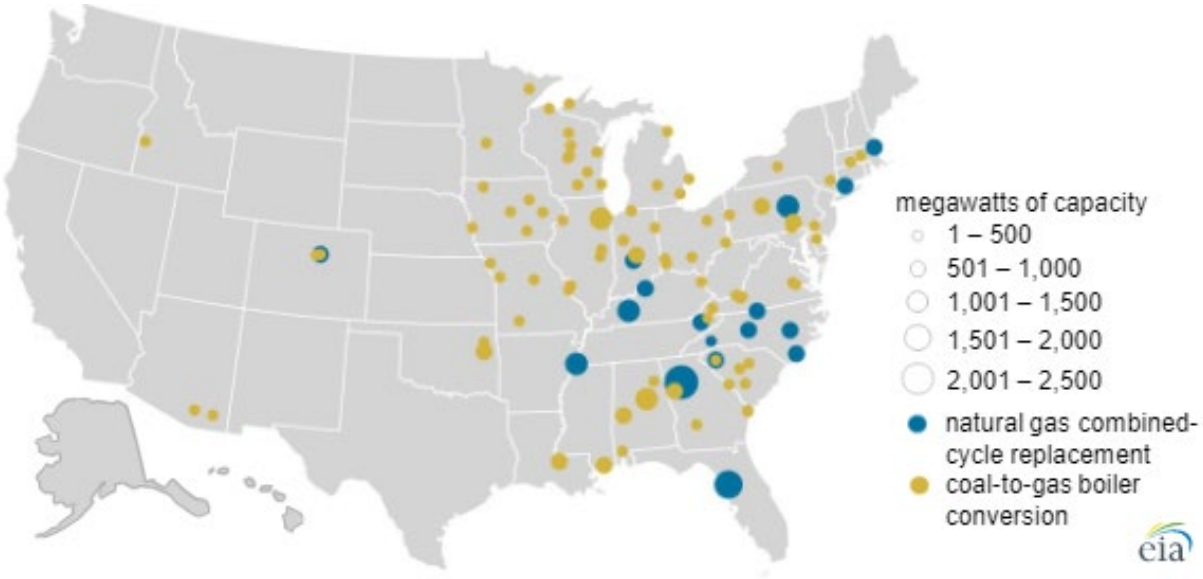


Image Source: EIA[7]

Retirement of multi-fuel generating units

Beyond natural gas conversions, many retired electric generating units once burned multiple fuel sources. It is unclear whether multi-fuel generators that used coal will meet IRA definitions once retired. For instance, a multi-fuel power plant in Manitowoc County, Wisconsin is listed as a petroleum coke plant by the EIA, although it is also using coal, wood waste, and natural gas in its three generating units.[8]

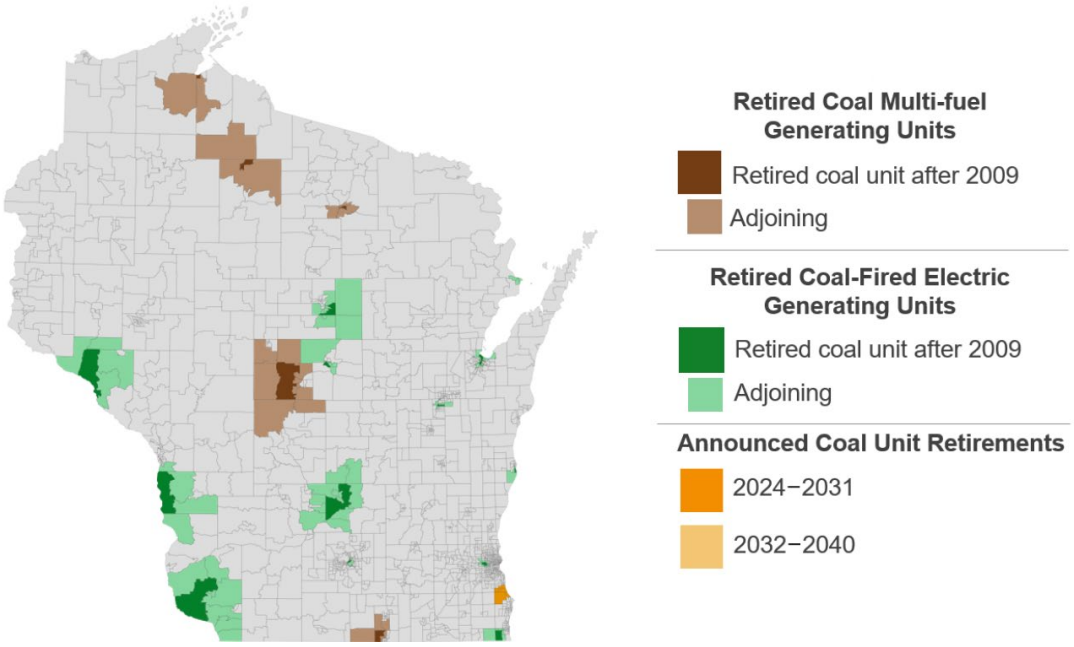
It is likely that many multi-fuel plants relied heavily on coal in the past and began incorporating other fuels to diversify operations.[9] Fuel flexibility is often incorporated into coal plants to reduce costs, so it is possible that multi-fuel generating units could be considered under the purview of the law. Using Wisconsin as a case study, we find that an additional 5% of the state's land area would qualify as an energy community if multi-fuel generating units are considered (see Figure 3). Due to the significant presence of multi-fuel plants, further guidance will be needed to determine the status of regions containing them.

[7] **https://www.eia.gov/todayinenergy/detail.php?id=44636**

[8] EIA Plant ID 4125.

[9] A more detailed survey of fuel flexibility and its benefits for coal plants can be found in a 2015 Power Mag article, **"Leveraging Fuel Flexibility for Coal Power Plant Survival."**

Figure 3. Retired coal plant communities in Wisconsin: Multi-fuel generating units



Mothballed and out-of-service plants

Most coal-generating units have definitive retirements, but some coal plants that are considered "mothballed" or out of service are not officially retired according to the EIA database.[10] Unlike a retired facility, a mothballed unit may have the potential to enter back into service, but like a retired facility, its status may result in negative economic consequences for its local region. Thus, very specific guidance on the definition of a retirement and its associated reporting status will be needed.

3.3 Closed coal mines

3.3.1 Existing datasets

The two primary datasets identified by CRA that contain detailed coal mine information are the "Mines Dataset #13" of the Mine Safety and Health Administration (MSHA) and the Abandoned Mine Land Inventory System (AMLIS) hosted by the Office of Surface Mining Reclamation and Enforcement.[11] The AMLIS dataset is thorough, but it primarily covers mines reclaimed before 2000 and focuses on reclamation processes while omitting official mine closure dates. It may be a useful resource for verifying the location of a mine, but the MSHA dataset more comprehensively tracks mine attributes most relevant to the IRA definition, including mine type, mine status, and closure dates.

[10] The EIA lists such plants as "Out of Service" (OS) and "Standby/Backup" (SB). Further guidance is required to determine the official retirement status of these plants.

[11] The E-AMLIS dataset can be accessed through the following link: **https://www.osmre.gov/programs/e-amlis.MSHA**. In general, federal reclamation efforts have focused on mines closed in the 20th century, making reclamation data less pertinent to the assessment of IRA eligible coal mines, which need to have closed after 1999 to qualify. MSHA data can be accessed through the **Mine Data Retrieval System**.

3.3.2 MSHA data limitations

While the MSHA Mines Dataset contains detailed information on coal mine attributes, it is error prone. Many mine entries were made before 2010, when electronic data management systems were not well established. While the majority of the mines are tracked accurately, small errors could have significant effects on final energy community qualification.

CRA has identified a variety of limitations and errors in the dataset, primarily in the following categories:

- Many latitude-longitude coordinates are misplaced. Approximately 5% of all qualifying coal mines were assigned to the wrong state, and a further 10% were listed in an incorrect county. Taken at face value, multiple mines in Georgia and South Carolina appear to exist, although no coal mining activity has occurred in either state in the past two decades.
- Certain mines are listed as abandoned despite the presence of coal mining activity. And in one case, a proposed strip mine in rural New Mexico was listed as abandoned although it never began operations.[12]
- Mines are listed as coordinates, complicating the process of identifying when a mine overlaps census tract boundaries (see section 3.3.6).

Due to the number of data limitations, it is unlikely that federal rulemaking will allow for direct use of this dataset, but corrections to it may help consolidate the mine-tracking process.

3.3.3 CRA updates to the MSHA dataset

Given the large number of errors in the MSHA dataset, CRA manually validated each mine to gain a more accurate view of the true extent of coal mine energy community qualification. All mines with a listed date after 1999 were selected to be reviewed. To ensure that only closed coal mines were considered, a filter was placed to select only mines with a status of "abandoned," "abandoned and sealed," or "non-producing."[13]

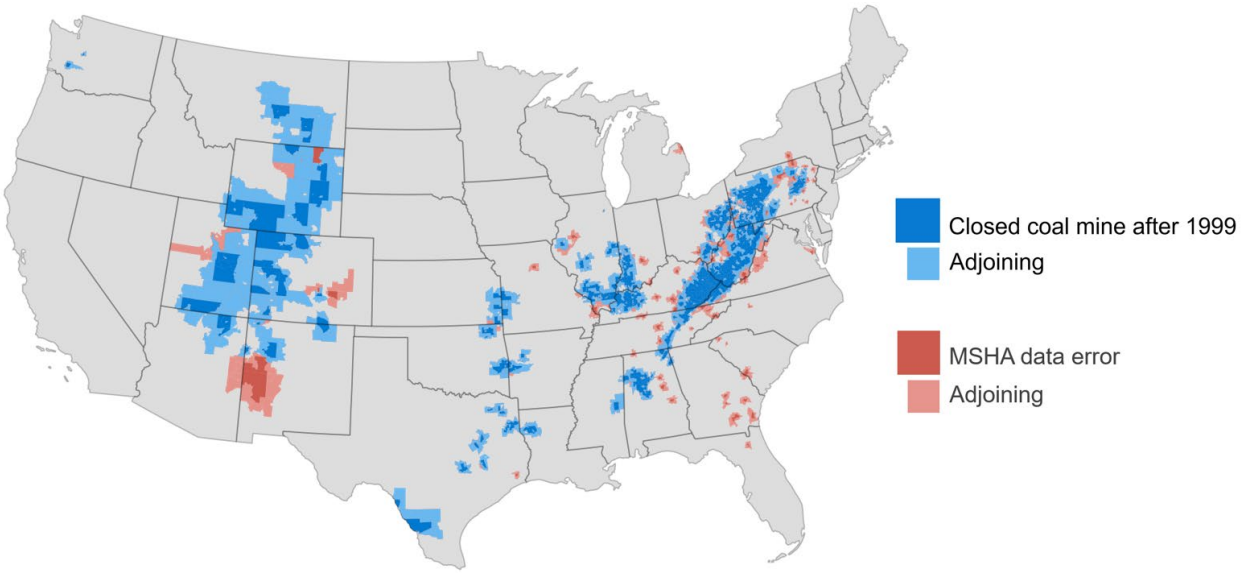
Manual inspection was performed using satellite imagery to verify the presence of a mine. When possible, coordinates were moved to the correct location using additional information provided in the dataset as a guide.[14] In some cases, not enough context was provided to accurately track the mine, and those sites were omitted from the review. Ultimately, CRA's manual inspection identified a 15% reduction in total qualifying extent (see Figure 4.)

[12] The Fence Lake Mine was a proposed coal strip mine Northwest of Quemado, New Mexico. According to a report by the **New Mexico Geological Study**, the mine was proposed in 1993 but listed as abandoned by the MSHA in 2006. These errors make the location appear to qualify as an energy community, despite existing documents proving otherwise.

[13] Further context on the MSHA dataset can be found in the **MSHA 2000-209** instruction sheet, which gives operators details about how to submit the mandatory Mine Information Form. In this sheet, "non-producing" mines are listed as having "some work" being performed at the mine/mill, although it could be as minimal as a yearly inspection. We discuss the impact of mine status on qualification in section 3.3.5.

[14] The MSHA lists the nearest town and often contains road directions that can be followed to identify the true site location.

Figure 4. Estimated coal mine energy communities after MSHA data validation



3.3.4 Types of coal mines

The MSHA dataset classifies mines into three categories: surface, underground, and facility. Surface and underground mines are sited at a point of extraction, but mining "facilities" may exist apart from extraction sites. While CRA's analysis limits the extent of mines to those shown to be located on a site of coal extraction, we note the possibility for non-extraction-site facilities to qualify pending future rulemaking.

Facilities include terminals, coal mills, and preparation plants and often consolidate and process coal from various mines.[15] The MSHA formally assigns each facility a "Mine Identification Number," which indicates that facilities could reasonably be construed as mines for IRA definitional purposes. Furthermore, the closure of a coal facility may have impacts on local employment rates similar to those of closure of a surface or underground mine, which supports the former's candidacy for qualification. As an example, we show a lignite coal-processing facility in Corpus Christi, Texas, which reportedly closed in 2006.[16] Shown in Figure 5, the facility is located in the industrial Port of Corpus Christi and is clearly not nearby a coal extraction site. Guidance is needed to determine if such sites should be considered "coal mines" under the IRA definition, given their presence in the MSHA dataset.

[15] According to **MSHA's Program Policy Manual, Volume III**, facilities correspond to preparation or milling plants that may or may not adjoin a site of extraction. CRA omits facilities that are not in neighboring proximity to a coal extraction site.

[16] Star Fire Port Services (MSHA ID 4104049) is listed in the MSHA dataset as an abandoned coal facility. It appears to have served as a collection point for coal before it is transported farther, potentially by barge.

Figure 5. Coal facility example: Star Fire Port Services

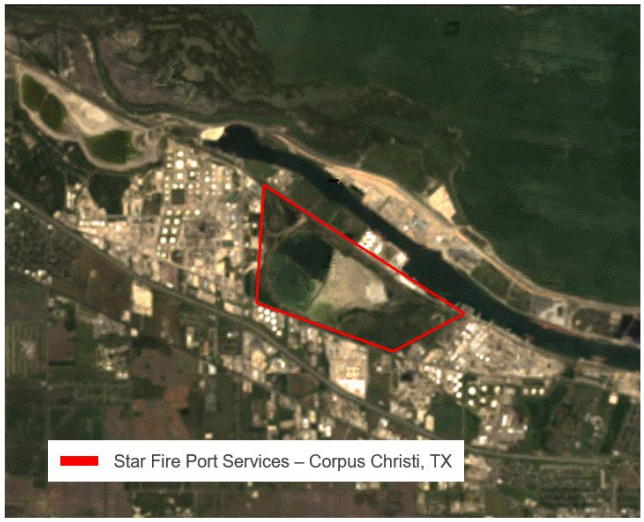


Image Source: NASA Landsat, CRA Analysis

3.3.5 Types of mine closures

Tracts where "a coal mine has closed" after 1999 should qualify under the IRA definition, although it is unclear what exactly constitutes a mine closure. To address this, we inspect the "current mine status" variable provided by the MSHA dataset, which is summarized in Table 2.[17]

Table 2: MSHA mine status definition summaries

MSHA Mine Status	Definition	Qualifies as Closed?
New Mine	A mine that has been assigned a Mine ID number, but no work has begun at the mine site.	No
Active	A mine that operates on a full-time basis.	No
Intermittent	Operations that can reasonably be expected to operate sometime during the year.	No
Non-producing	Operations where production has not yet begun or has ceased, but employees perform some work at the mine/mill.	Yes
Abandoned	Mines that will be abandoned for the foreseeable future	Yes
Temporarily idled	The work of all miners has been terminated and production-related activity has ceased. The mine still has recoverable reserves and it is anticipated that this is a temporary condition and the mine will reopen in the future.	Case-by-case assessment
Abandoned sealed	Same as abandoned, with underground openings or auger holes sealed.	Yes

We identify that "abandoned," "abandoned sealed," and "non-producing" mines are highly likely to correlate with mine closure. While "non-producing" and "temporarily idled" designations indicate the potential for reopening, the statuses of many of these mines have not been updated in several years, indicating that they are in effect abandoned. In general, a mine that has been listed as "non-producing" or "temporarily idled" for an extended period of time should likely be considered closed.

[17] Mine status information was drawn from the MSHA Mine Identification Form Instruction Sheet (pages 3-4).

3.3.6 Other considerations for coal mines

Surface vs. underground mining at the same site

CRA identified certain properties that have or had separate mining sites at the same location. For example, three coal mines were listed at the same location in Roundup, Montana; two were abandoned and one is still active.[18] While satellite imagery of the site appears to show an active mine, nearby sites appear to be closed. In cases where a "campus" of extraction sites comprises a mix of active and closed mines, it should be clarified whether individual MSHA entries can be used to determine if at least one registered mine has closed since 1999.

Tract boundary overlaps

It is also unclear which regions should directly qualify as an energy community if a closed mine overlaps multiple census tracts. Because mines are stored as a single point coordinate by the MSHA, determining tract overlap using existing datasets is difficult. This suggests that further manual work will have to be done to successfully quantify coal mine energy communities. Such a scenario is particularly relevant to strip mines, which often comprise a large extent of total land area and can be physically present within multiple census tracts. The Three Oaks Mine, which closed in 2018, provides a useful case study of this phenomenon, as it physically crosses both census tract and county boundaries (see Figure 6). Additional guidance is required to determine whether both census tracts should qualify.

Figure 6. Three Oaks Mine overlap in Bastrop and Lee Counties

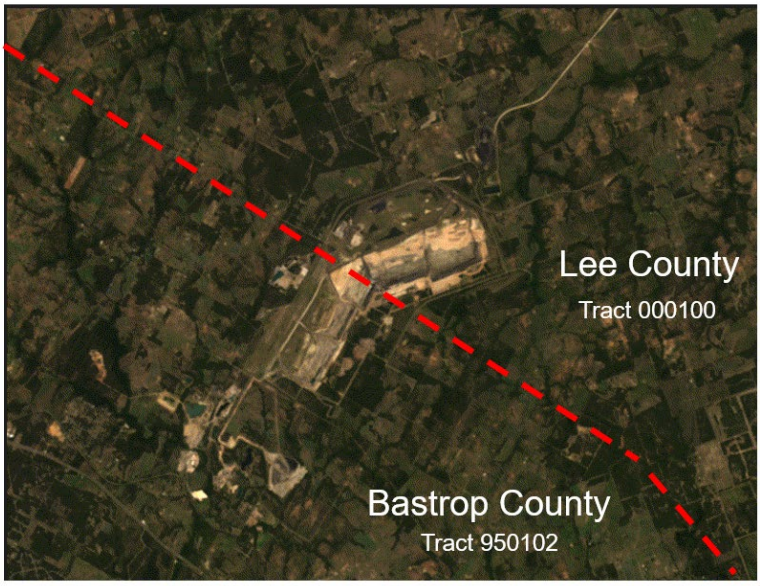


Image Source: NASA Landsat, CRA Analysis

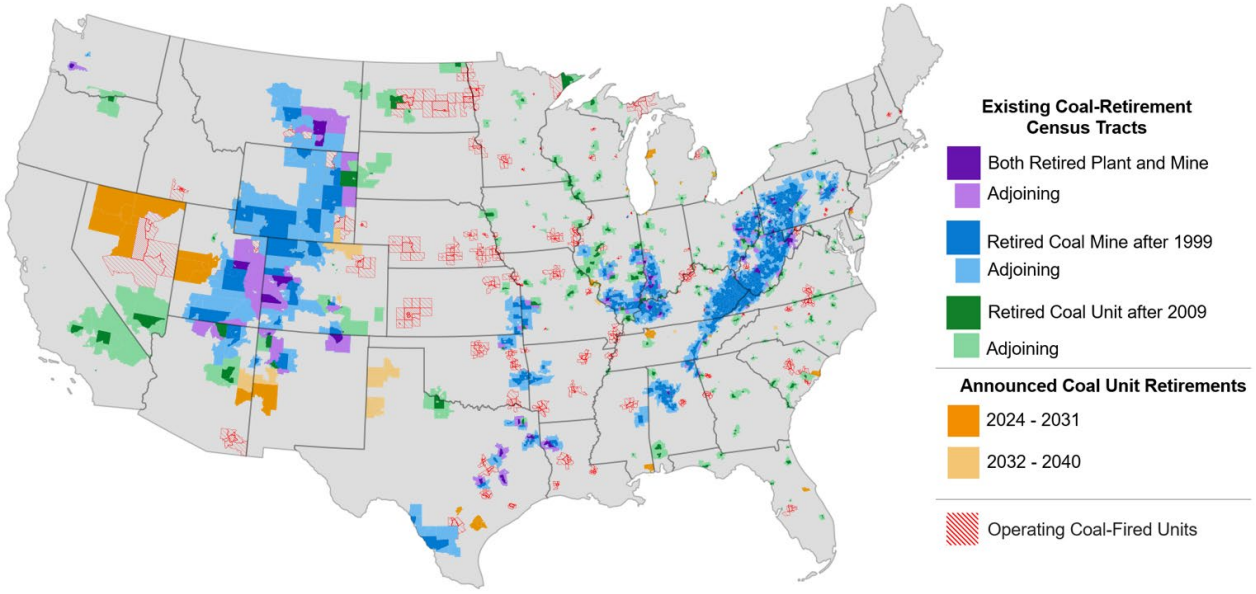
[18] Adele Mine No 1 and Bull Mountain Mine No. 1 were listed as abandoned, although an active mine operated by Signal Peak Energy LLC still exists in the area.

3.4 Summary of coal-retirement community data assessment

Figure 7 presents CRA's final estimate of likely coal-retirement energy communities. Public datasets can be used to track coal mines and plants, but determinations for significant edge cases may change the final extent of land eligible to be an energy community. Coal-fired electric generating unit communities stand to gain territory if multi-fuel and coal-to-gas conversions are deemed qualifying, while coal mine communities may see a reduction in qualifying land if data issues from the MSHA dataset are corrected.

Government datasets can provide comprehensive coverage of existing coal infrastructure, but some qualifying mines and electric generating units may still be omitted. Due to the lack of consolidated data, an application process may exist to allow for additional sites to be reviewed on a case-by-case basis. While such a process has not yet been disclosed, it may need to be considered, given the lack of comprehensive datasets for coal mine infrastructure in particular.

Figure 7. Final estimation of coal-retirement energy communities



4. Fossil fuel employment communities

4.1 IRA definition

According to the IRA, a fossil fuel employment community (FFEC)[19] is a metropolitan or non-metropolitan statistical area that:

a. "has (or at any time during the period beginning after December 31, 2009, had) 0.17 percent or greater direct employment or 25 percent or greater local tax revenues related to the extraction, processing, transport, or storage of coal, oil, or natural gas," *and*
b. "has an unemployment rate at or above the national average unemployment rate for the previous year."

Because the FFEC definition relies on multiple metrics, we assess the various subcomponents of this clause before merging the data to present an estimate of the total likely geographic extent. We pay

[19] CRA is using this term to refer to 26 U.S.C. § 45(b)(11)(B)(ii).

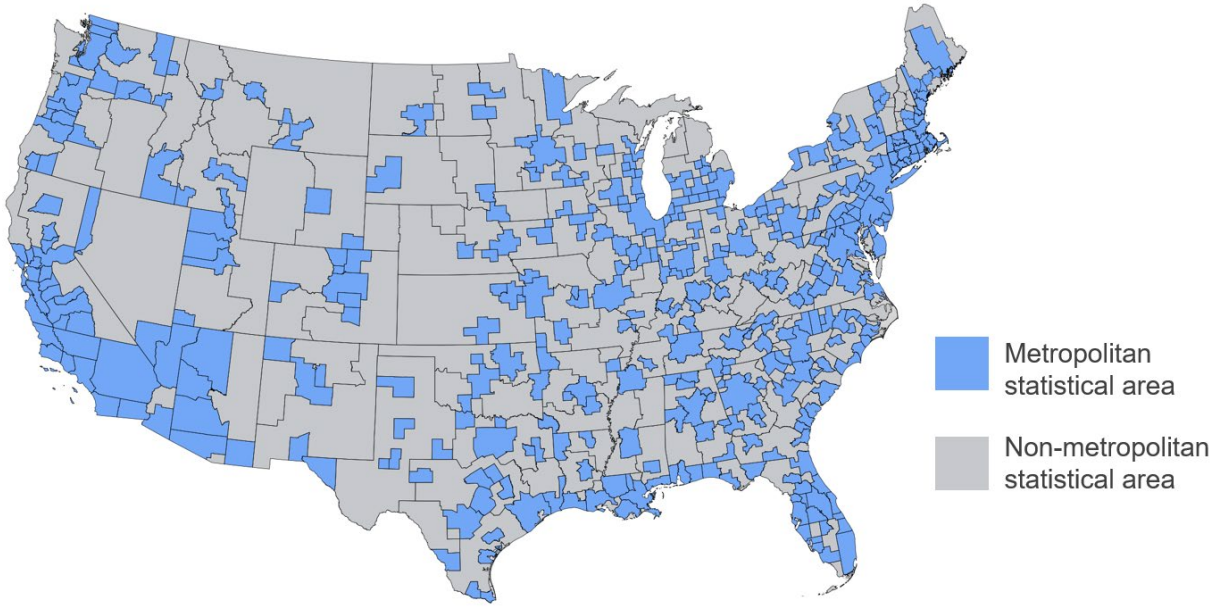
particular attention to the "direct employment clause," as minor rule-making choices could have major impacts on the final extent of energy communities.

4.2 Metropolitan and non-metropolitan statistical areas

FFECs are calculated using data aggregated to represent metropolitan and non-metropolitan statistical areas (MSA and NMSAs), as illustrated in Figure 8. The only current identifiable usage of "non-metropolitan statistical area" can be found in the Occupational Wage and Unemployment Statistics dataset maintained by the Bureau of Labor Statistics (BLS). MSAs are collections of counties associated with an urban center. All counties outside an urban sphere are aggregated into non-metropolitan statistical areas, which at times can comprise most of a state's land area.[20]

This unique choice in geographic scope complicates several implementation processes, as county-level data may at times need to be aggregated to develop custom MSA or NMSA totals for fossil fuel direct employment and unemployment rates. Additionally, MSAs in New England correspond to townships rather than counties, complicating the process of allocating employment numbers in these regions.

Figure 8. OEWS metropolitan and non-metropolitan statistical areas



4.3 Fossil fuel direct employment

To identify MSA and NMSAs that have historical employment in traditional fossil fuel industries, the IRA requires qualifying regions to have had greater than 0.17% direct employment in the extraction, processing, transport, or storage of coal, oil, or natural gas for some period of time since 2010.[21]

[20] Kansas, Nevada, and Montana all contain examples of NMSAs with large total land areas. Larger NMSAs are more commonly located in the western United States.

[21] 26 U.S.C. § 45(b)(11)(B)(ii)(I)

4.3.1 Direct employment datasets

We identify three primary datasets that track industry-level employment with sufficient granularity to determine MSA and NMSA eligibility. Occupations are tracked differently across the three datasets, which may complicate the process of determining eligibility.

Occupational Employment and Wage Statistics[22]

The Occupational Employment and Wage Statistics (OEWS) dataset tracks employment estimates for approximately 800 occupations, which are labeled with unique occupation codes (OCCs).[23] OCCs can cover specific fossil fuel-related jobs, such as "petroleum engineers" and "oil and gas derrick operators." The OEWS dataset also provides employment numbers at MSA and NMSA granularity, allowing for a one-to-one correlation with IRA definitions.

However, because OCCs are mapped to specific occupations rather than generalized industries, many jobs associated with the transportation and storage of fossil fuels are not available in this dataset, which is problematic because such jobs are highly relevant to the "transport" and "storage" of coal, oil, and natural gas.

Additionally, the OEWS dataset appears to track a smaller number of total employees than other sources. In 2019, the OEWS identified 18 million fewer jobs than a more generalized BLS employment dataset.[24] This suggests that data loss may be prevalent across OEWS metrics, and alternative data sources may be needed to reconcile these differences.

County Business Patterns

The County Business Patterns (CBP) dataset, maintained by the US Census Bureau, sources data from the Business Register, which tracks business establishments and employment metrics annually. According to the program website, CBP statistics provide the only annual source of complete and consistent county-level data for US establishments with industry detail.[25] Industry-level employment data is tracked using the North American Industrial Classification System (NAICS).[26] CRA's review of the NAICS codes suggests that those summarized in Table 3 are most likely to correspond to IRA verbiage and support FFEC qualification.

While these codes provide a preliminary view of possible direct employment calculations, several additional NAICS codes could be chosen based on partial involvement in the fossil fuel industry. On the other hand, a strict interpretation of the IRA definition may see the removal of some of the listed codes.[27] This is particularly relevant to identifying jobs involved with the "transport" of oil, coal, or natural gas.[28]

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[22] OEWS data can be found at the BLS website, using the following link: **https://www.bls.gov/oes/**

[23] Occupation code definitions were last updated for the 2021 OEWS release and can be found on the **BLS website**.

[24] OEWS total employment was compared with the Local Area Unemployment Statistics (LAUS) dataset, which tracks labor force and employment totals at the county level. The aggregated sum of all employed persons in the US was 158 million in 2019, using LAUS data. The OEWS reported approximately 140 million employed persons from its tracked occupations for the same year.

[25] About this Program, US Census Bureau, **https://www.census.gov/programs-surveys/cbp/about.html**, accessed November 1, 2022.

[26] NAICS codes were developed by federal statistical agencies to standardize the classification of business establishments. Further information can be found at **https://www.census.gov/naics/**.

[27] "Support Activities for Mining," "Pipeline Transportation," and "Mining and Oil and Gas Field Machinery Manufacturing" all contain a small number of jobs not related to the coal, oil, or natural gas industry. However, inspection of the sub-codes found that less than 3% of total jobs corresponded to non-fossil fuel industries in most regions.

[28] The OCCs and NAICS codes share this limitation, although in general the industry-level information captured by NAICS codes makes them a more accurate representation of IRA verbiage.

Table 3: Potential NAICS codes for IRA direct employment classification

NAICS Code	Title	IRA Verbiage	Relevant Fossil Fuel	Total Jobs (2019)
211	Oil and gas extraction	Extraction	Oil, Gas	91,315
2121	Coal mining	Extraction	Coal	35,926
213	Support activities for mining	Extraction, Processing	Coal, Oil, Gas	267,184
2212	Natural gas distribution	Transport, Storage	Gas	73,004
23712	Oil and gas pipeline and related structures construction	Transport, Storage	Oil, Gas	175,440
32411	Petroleum refineries	Processing	Oil	27,760
486	Pipeline transportation	Transport	Oil, Gas	37,019
4247	Petroleum and petroleum products merchant wholesaler	Transport, Storage	Oil	84,625
221112	Fossil fuel electric power generation	Processing	Oil, Gas, Coal	36,884
45431	Fuel dealers	Transport, Storage	Oil, Gas	81,018
324	Petroleum and coal products manufacturing	Processing	Oil, Coal	77,859

Quarterly Census of Employment and Wages

The Quarterly Census of Employment and Wages (QCEW), maintained by the BLS, tracks employment and wage data at a quarterly level, reportedly tracking over 95% of US jobs. However, unlike the CBP dataset, county-level totals are often set to zero where data is limited, leading to high levels of data loss. Despite using NAICS codes, this dataset is less effective at capturing industry-level employment trends. Therefore, CRA does not consider QCEW data to be a primary source in its preliminary analysis of qualifying employment areas.

4.3.3 Calculating direct employment percentages

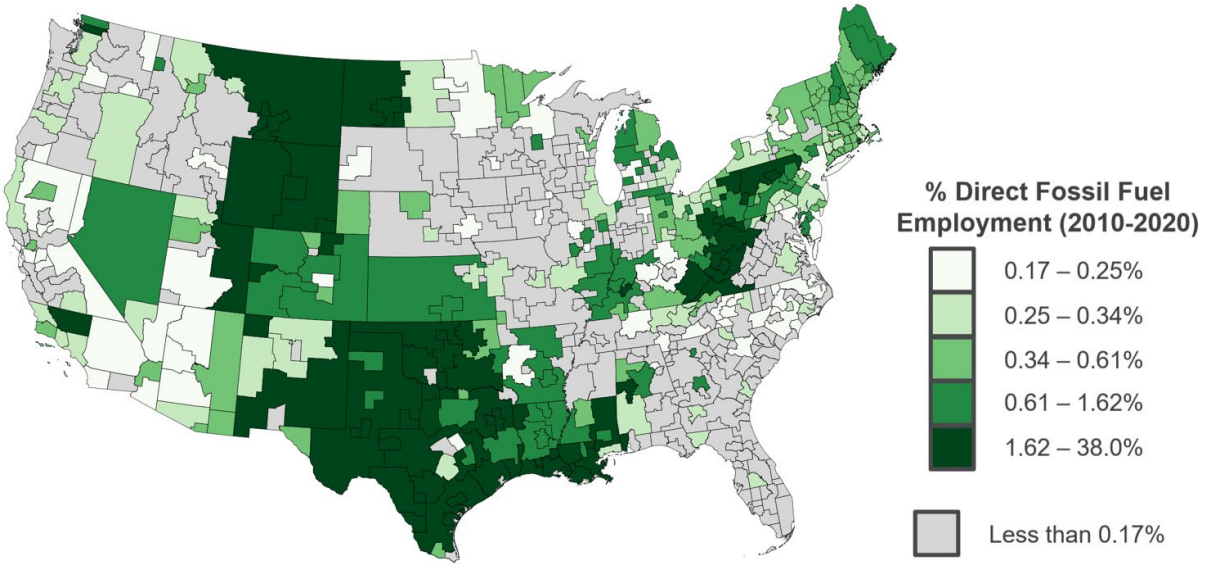
To calculate a direct employment percentage, it is necessary to identify not only fossil fuel jobs but also total employment. While several values could be used, CRA assessed total employment using the Local Area Unemployment Statistics (LAUS) county-level dataset, aggregating each to the MSA or NMSA level. Because the OEWS and CBP datasets undercount specific jobs, particularly among federal employees, the LAUS data source provides a clearer picture of the total employment in each region. Alternate methodologies that instead use OEWS or CBP total employment for the denominator in the employment percentage calculation may lead to a larger number of qualifying regions.

4.3.4 Fossil fuel employment results

The “direct employment” clause remains a source of uncertainty because the choice of NAICS or OCC codes to determine eligible regions has not yet been announced. However, several key areas can be identified as likely candidates for qualification based on employment figures well beyond the 0.17% threshold, as displayed in Figure 9. To arrive at this estimate, CRA assessed the percentage of direct employment using data from the CBP dataset taken between 2010 and 2020. All NAICS codes shown in Table 3 were used to develop the estimate, although regions were separated by quantile to view the range of direct employment percentages. While many regions lie close to the edge of the qualification threshold, clusters of high likelihood regions exist in Texas, the Rocky Mountains, Appalachia, and the Illinois Basin. At the high end, the metropolitan area for Midland, Texas, showed a maximum direct fossil

fuel employment rate of 38%. The employment distribution ultimately shows that certain regions can be deemed highly likely to qualify as energy communities, depending on annual local unemployment rates, before federal rulemaking outcomes.

Figure 9. Direct fossil fuel employment greater than 0.17%: CRA Estimation



4.4 Unemployment rates

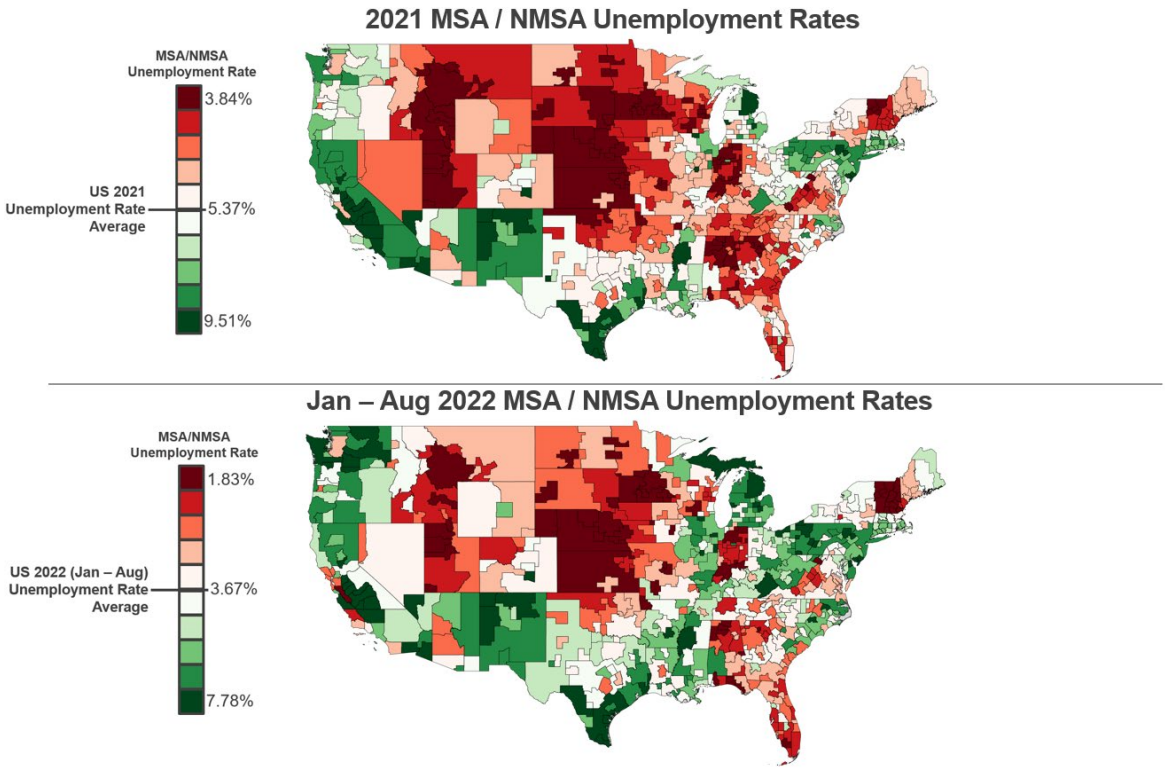
To identify MSAs and NMSAs that have "an unemployment rate at or above the national average for the previous year," CRA again used the LAUS dataset to aggregate county-level unemployment numbers to the MSA/NMSA level.[29] Calculating unemployment rates is straightforward, but the IRA language is unclear about the precise meaning of "previous year." Such a decision could have major consequences, as regional labor market dynamics may alter the final extent of qualifying land from year to year. Therefore, rule makers will need to:

- clarify whether "previous year" refers to the previous calendar year, any twelve-month rolling period, or something else; and
- determine how a project can secure eligibility when unemployment rates change and alter the qualification status during a project's development and construction period.

For example, regional unemployment rates have been volatile since the start of the COVID-19 pandemic, and when comparing data from 2021 with the first eight months of 2022, CRA finds that an additional 75 MSA/NMSAs could qualify based on 2022 data compared to 2021 data. This is illustrated in Figure 10.

[29] 26 U.S.C. § 45(b)(11)(B)(ii)(II)

Figure 10. Comparison of MSA/NMSA unemployment rates between 2021 and 2022



4.5 Tax revenue data

The IRA also allows MSA/NMSAs where more than 25% of their tax revenue is related to the extraction, processing, transport, or storage of coal, oil, or gas to be considered as energy communities.[30] However, no industry-level tax dataset exists at the federal level; therefore, attempts to evaluate this qualification pathway may require access to the Economic Census, which contains business-level information that may serve as a proxy for tax revenue.[31]

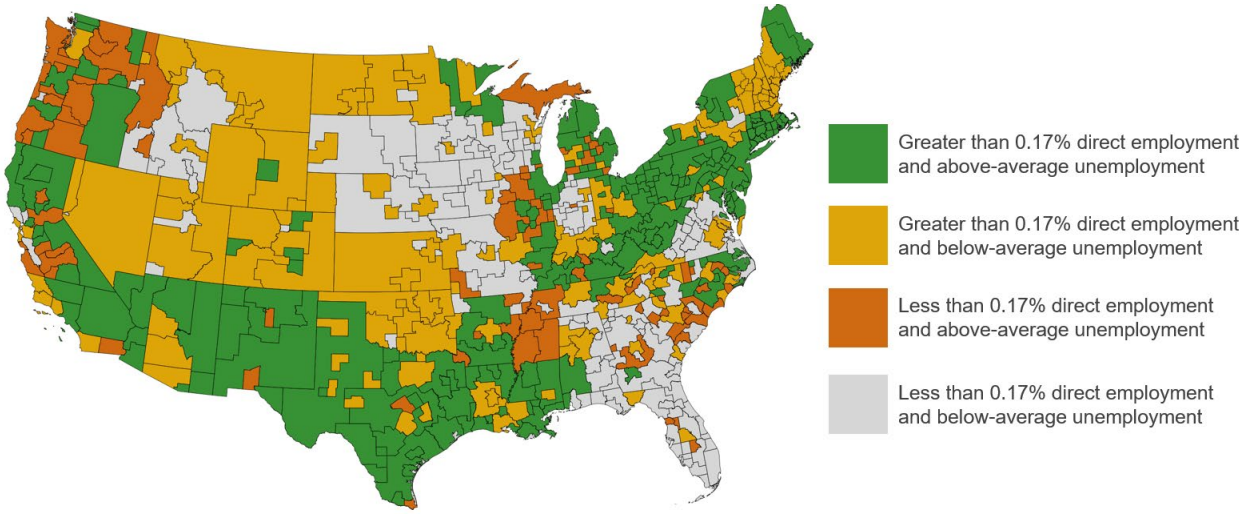
4.6 Summary of Fossil Fuel Employment Data Assessment

When accounting for regions with both above-average unemployment and greater than 0.17% fossil fuel employment, we find that almost 34% of the total US land area would qualify using our listed NAICS codes and unemployment criteria (see Figure 11). While it is less likely that an MSA that does not already have greater than 0.17% fossil fuel employment would meet the threshold in future years, unemployment rates for currently non-qualifying fossil fuel employment regions may exceed the national average at some point in the future, making qualifying geographies dynamic over time.

[30] 26 U.S.C. § 45(b)(11)(B)(ii)(I)

[31] The 2022 Economic Census will not be released until 2024. Previous years' versions may be accessed. Whether enough information is available in this survey to estimate MSA/NMSA tax revenue is unclear, but it may be a feasible public source. Coordination between the Census Bureau and Treasury would be required to implement such an analysis.

Figure 11. Employment-clause energy communities: Potential IRA qualifiers



Overall, the employment-clause pathway likely presents the highest degree of uncertainty for energy community qualification, since a number of conflicting datasets will need to be reconciled to reduce vagueness in the law's definition of qualifying job types. In addition, this qualification pathway will change annually, which could hinder development if a project has a lead time longer than a calendar year and specific qualification guidance as to timing is not provided. Recent employment trends suggest that close monitoring of unemployment trends will be necessary to determine qualifying areas in 2023. A thorough understanding of existing employment datasets and relevant NAICS and OCC categories can help identify which sites are most likely to qualify, even if federal rule makers define a limited view of fossil fuel employment.

5. Brownfield sites

5.1 IRA definition

Brownfield sites are formally defined through amendments to 42 U.S.C. § 9601 in the Small Business Liability Relief and Brownfields Revitalization Act of 2002.[32] The IRA selects only subparagraphs (A), (B), and (D)(ii)(III) of the "brownfield site" definition to determine which properties will qualify for the Energy Community 10% ITC/PTC bonus.

We briefly summarize the three subcomponent definitions below:

Subparagraph (A) – General Brownfield Definition:

- "The term 'brownfield site' means real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant."
- The inclusion of "potential presence" makes the ultimate scope of this definition unclear, although it generally refers to polluted industrial or commercial land.

Subparagraph (B) – Exclusions from Brownfield Definitions:

[32] See information about H.R.2869 - Small Business Liability Relief and Brownfields Revitalization Act, at **https://www.congress.gov/bill/107th-congress/house-bill/2869/text**.

- This subparagraph defines all property types that should be excluded from the brownfield site definition.
- Key facility types that are excluded include facilities listed or proposed to be on the National Priorities List for superfund sites.[33]
- Several other facility types, typically those with existing environmental remediation mandates in place, are excluded from the brownfield site definition. This may require developers to receive more information from property owners on a site-by-site basis to ensure energy community qualification is feasible.

Subparagraph (D)(ii)(III) – Mine-Scarred Land

- As a minor caveat, the IRA also allows "mine-scarred land" to qualify as a brownfield energy community.

5.2 Existing brownfield datasets

Data on brownfields, as defined above, is available in limited quantities; it is aggregated by the EPA and state-level environmental departments.[34] However, typically only sites that have qualified for a grant under the brownfield program are tracked by this law, and data collection varies greatly from state to state. In addition, the IRA definition will not correspond one-to-one with existing brownfield program datasets, as it permits only subparagraphs (A), (B), and (D)(ii)(III) to be considered.

Therefore, it is likely that either custom brownfield datasets will need to be developed based on the IRA definition, or each site will have to be assessed on a case-by-case basis. Because brownfields require only the "potential presence" of a contaminant, it is possible that novel definitions are considered without respect to existing EPA datasets.

Using current data, CRA maps the EPA-listed brownfield extent, which appears to include only properties that have applied to be listed for brownfield-related funding.[35] However, the EPA also hosts a variety of facility-level datasets through its Facility Registry Service (FRS) and may provide information about facilities with the potential presence of hazardous substances.[36] We also consider all facilities listed in the EPA's Toxic Release Inventory (TRI), as such sites are explicitly required to document the amount of harmful pollutants emitted each year.[37] Finally, we show National Priority List sites, locations that the IRA excludes from qualifying as a brownfield despite having the presence of hazardous waste.

[33] The National Priorities List (NPL) identifies sites "of national priority among the known releases or threatened releases of hazardous substances, pollutants, or contaminants," according to the EPA website. See **https://www.epa.gov/superfund/superfund-national-priorities-list-npl** for detailed tracking of all sites listed on the NPL.

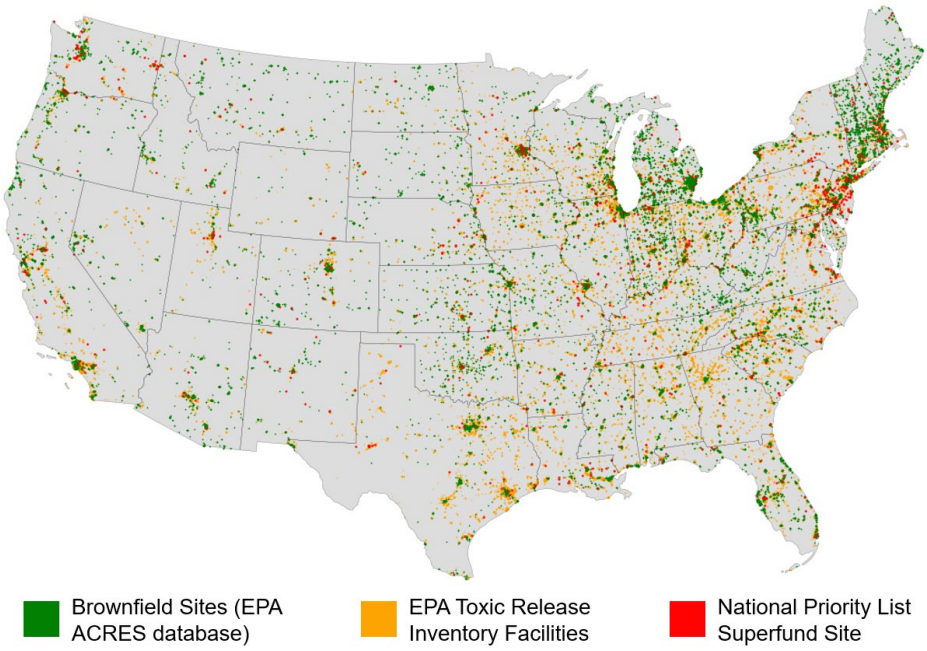
[34] The EPA ACRES database maintains information on brownfield grantees. Additional brownfield data has been aggregated by EPA and is available for view or download on the program website.

[35] Program data was accessed from the **EPA's Geospatial Download Service**.

[36] The FRS can be accessed through the following link: **https://www.epa.gov/frs.**

[37] We include TRI data to highlight an alternative distribution of sites with the potential presence of contaminants, although some TRI facilities may be explicitly excluded from brownfield qualification due to conflicts with the subparagraph (B) definition.

Figure 12. Current EPA datasets covering potential brownfield sites and exclusions



Sources: EPA Geospatial Download Service,[38] EPA TRI,[39] CRA Analysis

As can be seen in Figure 12, existing EPA datasets are heavily skewed by state-level reporting. The EPA dataset identifies more brownfields in Vermont than Georgia, despite the former having a far smaller population and industrial footprint. Such state-level disparities suggest that current data tracking is tied to historical brownfield program participation rather than the true extent of IRA-eligible locations. Furthermore, EPA datasets do not clearly identify which brownfield sites correspond to specific subparagraphs of the definition, complicating their relationship to the IRA definition.

5.3 Potential federal implementation scenarios

Due to the piecemeal legal definition and lack of existing datasets, it is unclear whether the federal government will release a consolidated inventory of IRA-compliant brownfield energy community properties or if developers will be required to determine qualification status on a case-by-case basis. We consider two distinct implementation methodologies but note that final rule-making decisions will likely vary from our presented scenarios.

Scenario 1: Brownfields by property use type

Because brownfields require only the "potential presence" of a hazardous substance, the IRA definition could be standardized to include all property use types where industrial or commercial activity is likely to have resulted in the presence of hazardous contaminants. Such property uses could be identified through analysis of past EPA brownfield grant recipients and the EPA TRI. Following this, an official list of brownfield property use types could be released. For instance, electric power plants, landfills, and paper mills were repeatedly listed in EPA TRI and brownfield grant datasets, so all properties related to these use types could be considered as qualifying, even if they are not included in existing EPA datasets.

[38] https://www.epa.gov/frs/geospatial-data-download-service

[39] https://www.epa.gov/toxics-release-inventory-tri-program/tri-data-and-tools

However, in this scenario, it is still likely that exclusions and outliers would need to be considered on a case-by-case basis to comply with subparagraph (B). Additionally, properties not associated with a listed brownfield property use type but with the potential presence of a pollutant will need to have a way to apply for qualification.

Scenario 2: Existing EPA data and application

An alternative scenario could see the release of a standardized dataset that relies only on existing EPA brownfields datasets. Additional locations could be added on a case-by-case basis to ensure compliance with the brownfield definition, and exclusions could be considered before the EPA's data release.

This would reduce the number of qualifying facilities relative to Scenario 1. This approach would standardize the extent of eligible areas and provide certainty for a small subset of existing brownfield sites. However, because current EPA datasets cover only a small number of total estimated brownfields, it is likely that a high volume of subsequent applications would need to be processed for additional sites seeking to qualify as a brownfield energy community.

5.4 Summary of brownfields assessment

Energy community brownfields present the greatest uncertainty among the three IRA qualification pathways, as a lack of clear tracking mechanisms and the high number of potential sites will complicate implementation. The IRA definition is distinct from historical brownfield interpretations, and it may be misleading to use existing brownfield datasets to project the current extent.

6. Conclusions

Our analysis concludes that as of today, many energy communities can already be identified using public data sources. However, small decisions made during the implementation process, such as the definition of a retired generating unit or the choice of NAICS codes associated with fossil fuel employment, may greatly affect the final extent of qualifying land. Clarifications provided during the rulemaking process could affect 10-20% of the total extent of energy communities, and clear guidance from federal rule makers will be needed to provide certainty to the development community.

About CRA's Energy Practice

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