COAL TO SOLAR:

Development of Mine Lands, Site Planning, & Engineering Considerations

What do we know about the mine site, and why do we care?

Every mine site has unique characteristics which will dictate whether it is suitable for solar development. Understanding mining operations is crucial to identifying sites that can be developed economically and in a timely manner.

The typical process to determine the status and critical scope development considerations for a coal to solar project includes the evaluation and answers to the following questions:

- **Was the site previously mined or is it currently being mined?**
- **What type of mining occurred, surface or underground?**
- **How long ago was the site mined?**
- **When was the site reclaimed?**
- **How deep was the mining?**
- **Is documentation of the reclamation available? If not, is there an approved reclamation plan?**
- **What phase of bond release has the site obtained or achieved?**
- **What is the post mining land use (PMLU) for the development area?**
- **Is the site considered abandoned mine lands?**
- **Is the site eligible for BIL funding for reclamation?**

How does coal mining impact solar development, and what are the challenges?

According to a summary from the U.S. Bureau of Land Management, there are an estimated half a million abandoned mines across the U.S. According to a summary from the Environmental Protection Agency, as of 2021, more than 459 renewable energy projects have been installed on reclaimed land in 46 states and territories providing 1.9 gigawatts of energy, with 92% of the projects being categorized as photo voltaic solar. No matter where these potential abandoned mine site to solar conversion projects are located, a prominent key pattern of the following engineering and logistical challenges has emerged across the industry in recent years.

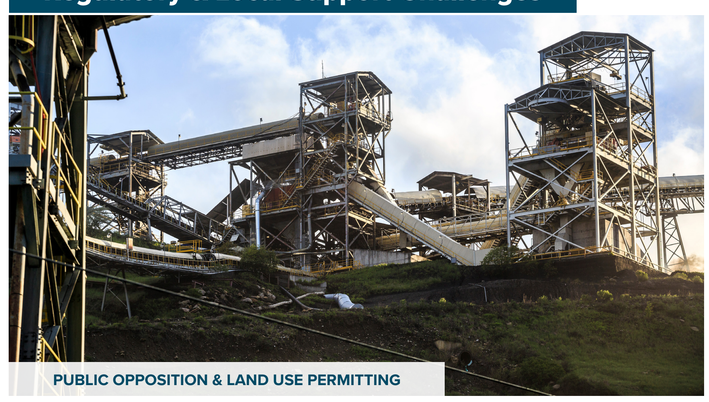
Geotechnical Challenges

Mining activities present a wide range of impacts and challenges to solar development. From a **geotechnical perspective**, unconsolidated mine pit backfill and **u**nderground mine voids present the risk of **intolerable settlement and subsidence**. The presence of pyrite in mine spoils can increase the **corrosivity** of the soils. Large boulders or other unsuitable material in the mine pit backfill can impact **driveability**.

Environmental Challenges

Potential **environmental impacts** include **regulatory restrictions** associated with **water filled mine pits**, **ponding and wetlands** associated with the mine activities, and the **impact of dust** associated with active mining operations.

Regulatory & Local Support Challenges

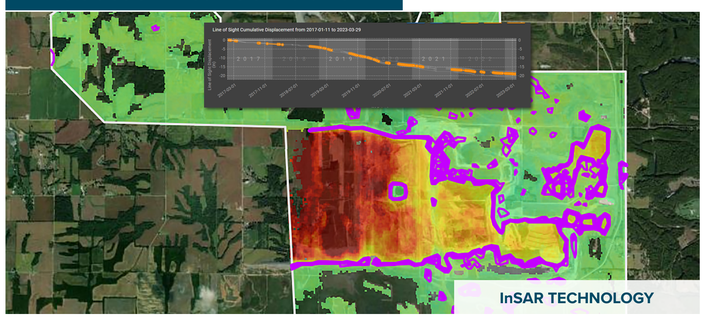


For permitted mine land, changing to the permitted post mining land use to allow solar development will often require major **permit modifications**. These permits sometimes meet public opposition from the community that can be a potential threat to gaining approvals.

How do we overcome these challenges? What solutions can be provided?

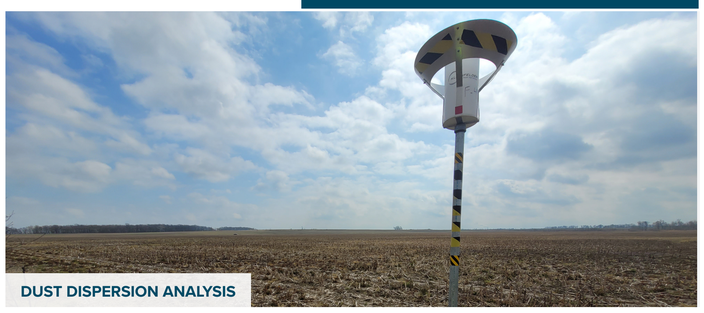
To overcome the unique challenges mines sites present, a multidisciplinary assessment including the civil, environmental, geotechnical, and planning perspectives, should be conducted which develops an integrated technical approach for addressing each of the challenges. Some effective and innovative approaches include the following tools and solutions.

Geotechnical Solutions



Understanding the settlement or subsidence risk is critical to assessing whether the site is feasible to developable within the project timeline. Backfill of surface mine pits can have significant settlements over a number of years. Monitoring of the backfill to determine when and if the settlement has stabilized is rarely if ever complete, so having a tool which can provide historic data related to the settlement of the backfill is invaluable in identifying land which is stable enough to support solar development. Fortunately, historic data related to ground surface displacement can be obtained through **InSAR (Interferometric Synthetic Aperture Radar) technology**. InSAR analysis of the site can identify areas where historic surface displacements have or are occurring including total displacement as well as displacement velocity. Using InSAR as an initial screening tool can enable a more focused geotechnical and settlement monitoring program as well as helping focus the land acquisition strategy away from areas which may be problematic.

Environmental Solutions



Surface mining creates dust, not only from the mining operations, but also along haul roads which are generally gravel covered. A **dust dispersion analysis and report** should be developed to determine if excessive soiling of the panels will occur as a result of mining activities. The collection of dust samples and local meteorological data across the seasons is necessary to refine the accuracy of the model, so initiating this work in the early stages of project development will enable informed decisions in final design and O&M plan development.

Regulatory & Local Support Solutions

As with any development, solar developments can cause concern for local stakeholders and local opposition can present obstacles to gaining project approval. Fortunately, converting former mine land to solar is a good story to tell, so early **engagement with key local stakeholders** is critical to gaining the trust of communities.

Successful coal to solar conversion projects require thorough investigation and analysis of site-specific challenges that inform collaborative solutions customized to each community.

Connect with the poster authors to learn more about **Coal to Solar Site Conversions.**

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