



Blue Mountain Geothermal Plant, Nevada Geothermal Power, Humbolt County, Nevada. Photo by Dennis Schroeder, NREL

Pathways To Overcome Geothermal Deployment Barriers

Report Details Opportunities To Speed Project Timelines and Coordinate Environmental Reviews

Geothermal resources represent a vast domestic energy supply that can provide a flexible and reliable source of electricity as well as contribute to clean energy goals. In the United States, geothermal exploration and development are subject to numerous permits, authorizations, and other regulatory requirements at the federal, state, and local level. These are necessary to address potential environmental and resource impacts at geothermal project sites, but may act as barriers to geothermal deployment, slowing timelines and raising costs. The 2022 NREL report, *Non-Technical Barriers to Geothermal Development in California and Nevada*, presents findings of a study on non-technical barriers that may influence geothermal project development.

State-Specific Findings

The report found that geothermal project development timelines in California and Nevada may be impacted by dual federal and state environmental review processes, duplicative

permitting requirements, and coordination efforts between federal, state, and local authorities including agencies and tribes. For example, geothermal projects in California are potentially subject to environmental review processes at the federal (i.e., National Environmental Policy Act [NEPA]) and state (i.e., California Environmental Quality Act [CEQA]) level at each stage of geothermal development (leasing, exploration, drilling, utilization).

In addition, geothermal projects in California and Nevada may encounter site-specific natural and cultural resource complications that can lead to permitting and project delays. These may include issues associated with protecting water quality and water resources, sensitive and endangered species, and cultural sites.

Ultimately, protracted geothermal development timelines caused by delays in acquiring necessary permits and conducting environmental reviews may raise project costs and increase economic uncertainty. For example, delays in project construction and completion timelines may result in loss of generated electricity revenue, additional financing costs, and penalties incurred for failure to deliver electricity pursuant to power purchase agreements.

Best Practices To Reduce Delays

Implementation of best practices identified in this report may reduce overall geothermal project development timelines, costs, risks, and uncertainties. Examples include:

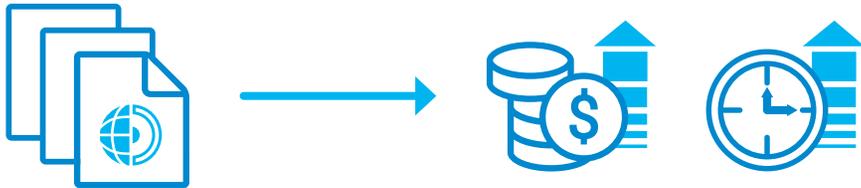
- Tiering to (i.e., building upon) existing environmental review documents, which may create cost and time efficiencies for agency staff and project developers.
- Development of interagency memorandum of understanding (MOUs), which may decrease project permitting delays through increased interagency coordination and communication.
- Development of comprehensive and agency-integrated permitting and review processes, which may decrease project development delays by reducing duplication of efforts and streamlining existing procedures.

Learn More:

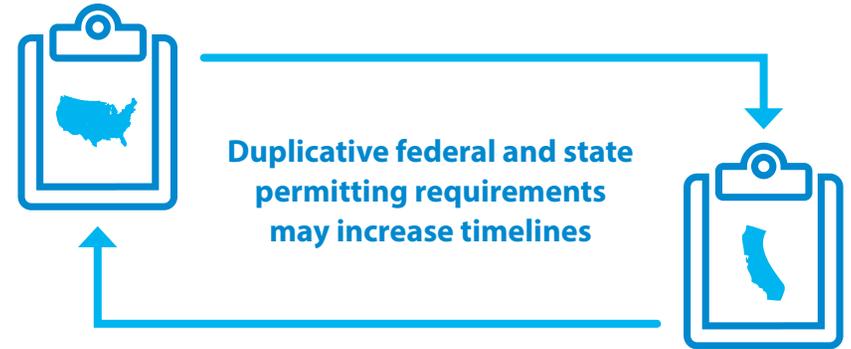
<https://www.nrel.gov/docs/fy23osti/83133.pdf>



Regulatory and permitting requirements may create non-technical barriers to geothermal development

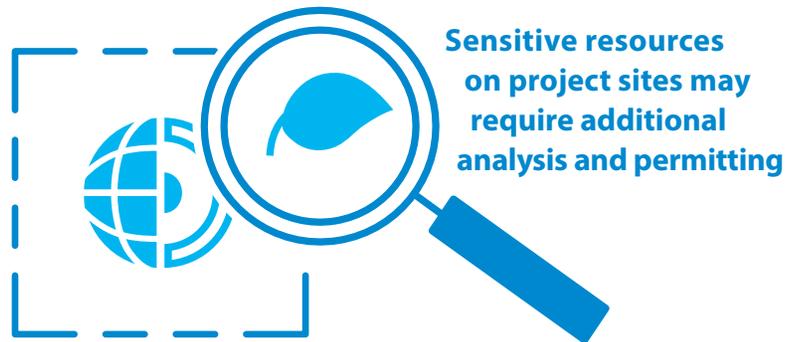


 Project development delays resulting from regulatory requirements and acquisition of necessary permits may drive up geothermal project costs and increase economic uncertainty.



Duplicative federal and state permitting requirements may increase timelines

 Dual federal and state permitting and environmental review requirements in California and Nevada may increase project permitting timelines through lengthy, duplicative, and/or compartmentalized processes.



Sensitive resources on project sites may require additional analysis and permitting

 Geothermal projects in California and Nevada may face site-specific challenges due to the presence of sensitive resources, which may cause permitting and project development delays and increase project costs and risks.



Numerous authorities may play a role in approving geothermal project development

 Streamlining and consolidating agency processes and increasing coordination and communication between federal, state, tribal and/or local authorities may decrease project development delays and lower costs and risks.