GEOTHERMAL ENERGY PROJECTS
IN IMPERIAL COUNTY

WHO KEEPS TRACK?

The following article carefully describes the agencies and regulations
governing geothermal development in Imperial County. It remains
for the public, however, to watch that implementation of these pro-
cedures are responsibly carried out. The September 2017 issue of the
Desert Report contains an article by the same author on the basics of
the geothermal system that is background for this article. - Editor

Worldwide, geothermal energy fields that have a high enough
temperature to be used for electrical production are commonly
found in geologically active areas. The Salton Sea geothermal
field is in Imperial County, California, at the southern end of the
Salton Sea lake. This is a known geologically active area of frequent
natural small seismic activity and ground subsidence.

At this field, generally using wells over 5,000 feet deep, hot
salty brine is withdrawn from the reservoir and taken by pipeline
to a power plant. Steam is produced in the plant to run a turbine,
making electricity. The cool spent brine is taken by pipeline to
injection wells and injected back into the reservoir.

Imperial County officials have been frontrunners in planning
for and permitting of geothermal power facilities. In 1971, the
County Board of Supervisors adopted the “Terms, Conditions,
Standards, and Application Procedures for Geothermal Develop-
ment” outlining measures to minimize impacts to productive ag-
cultural lands and environmental resources. In 1975, the Board
also adopted the “Imperial County Goals” to “… encourage geo-
thermal exploration and development projects and development
projects to increase knowledge of this resource and development
of minerals and other uses and ensure development is compat-
ible with agriculture and our environment.” In 1977, the Imperial
County Board of Supervisors adopted the Geothermal Element of
the Imperial County General Plan.

The Element was the first of its kind in the United States, and
spelled out policies to enable rapid development of geothermal
energy production, while preserving agriculture, health and safety,
and other concerns. The Element has been used as a template
to manage geothermal development by many counties across
California, in other States, and in other countries. The Element
has been updated several times, the last being in 2015 as part
of the Renewable Energy and Transmission Element - County of
Imperial General Plan. This Plan can be found at the following
website: http://www.icpds.com/?pid=833. The Element provides
that the County of Imperial is the lead permitting agency for geo-
thermal developments up to 49.9 megawatts net generation.
Above that size limit, the California Energy Commission, a Califor-
nia State agency, retains the permitting jurisdiction for all power
plants 50 megawatts net generation and above.

The Element is a comprehensive document that provides a
framework for review and approval of geothermal projects in the
County of Imperial. The Element also lays out a matrix of rela-
tionships with other regulatory and permitting agencies for new
and/or ongoing projects. Some of the other agencies that have
jurisdictional and oversight responsibility on geothermal proj-
cts are the Imperial County Air Pollution Control District (APCD),
California Regional Water Quality Control Board (RWQCB), Cali-
fornia Department of Toxic Substances Control (DTSC), California
Department of Conservation – Division of Oil Gas and Geother-
mal Resources (DOGGR), and the Imperial Irrigation District (IID)
electrical balancing authority. Other agencies that may have ju-
risdictional oversight, depending on where a project is located,
include the California State Lands Commission (for State Owned
Lands), US Bureau of Land Management (for Federal Lands), US

A closer view of a geothermal plant
Department of Defense (for projects near Military Lands) and Local Native American Tribal Councils (for sensitive cultural areas and Tribal Lands).

As part of the Element, the County of Imperial Planning and Development Services Public Works Department (PDSPWD) develops and issues a Conditional Use Permit (CUP) for operation of the geothermal power plant and ancillary facilities. This document approves the layout of the geothermal well field and how it will be operated to minimize impacts on the surrounding area. Three special aspects of the CUP are the requirement for 1) subsidence monitoring, 2) seismic monitoring, and 3) regulating the amount of produced brine that must be injected back into the subsurface reservoir for each project.

The CUP requires that an active seismic monitoring array is installed around the perimeter of each facility, including the area of the well fields. The CUP also requires that a subsidence benchmark array be approved and established. Data on this is collected annually, or more frequently, if required by the County. An annual report on subsidence and seismic data for each geothermal field is submitted to the PDSPWD and to the DOGGR for their review and comment. What these agencies are looking for is evidence of detrimental effects. For example, some of the farm fields are underlain with tile systems that are sloped to allow water to flow across the fields, after which the subsurface water is collected and disposed of in the Salton Sea. If there were ground subsidence or faulting, these fields would not drain properly. If detrimental evidence is found in the monitoring, then the agencies have the authority to request changes in how the field is operated.

Another aspect of the CUP is to dictate how much produced brine is required by the DOGGR to be injected back into the subsurface reservoir. This is to help control ground subsidence. Generally, the permitted amount is about 75% of the amount of brine that is being produced. The remainder of the liquid produced is mainly lost to evaporation in the cooling tower process. Shallow groundwater, Colorado River water, or Salton Sea lake waters are not injected into the subsurface reservoir. The RWQCB, Palm Desert office, is the regulatory agency for monitoring and protecting both surface and subsurface waters in the County. The leaders in Imperial County were very proactive in requiring seismic and subsidence monitoring for all geothermal power plants.

As per State regulation, the DOGGR has jurisdiction over geothermal wells, including the design of the wells, plans for drilling, maintenance, operating conditions, monitoring, and abandonment of the wells. All well work and work plans must be approved by the DOGGR, and they have on-site oversight authority to inspect the well operations. Additionally, each plant operator must submit to the DOGGR monthly data on the amount of production and injection associated with the wells. This well production and injection data, as well as data on permitting, drilling, and maintenance, is open to the public. The well data can be found on the DOGGR website listed below. The Salton Sea area is in District 2 and the office is in Cyprus, California: https://tinyurl.com/ycbmmymu.

The DOGGR sets limits on the injection pressure that can be applied to each injection well. The fracture gradient has been determined for each geothermal field. This is the pressure in the wellbore that is required to hydraulically fracture (“frack”) the natural subsurface formation. Injection pressure limits are set by the DOGGR such that the pressure is always less than the fracture gradient for the shallowest exposed formation in each wellbore. Thus, production and/or injection at the Salton Sea geothermal reservoir do not “frack” the subsurface formation. In fact, due to the high number of natural fractures in the subsurface formation, the production and injection wells often can produce or take abundant flow with little effort. The injection helps sustain and recharge the geothermal reservoir to avoid subsidence of adjacent IID irrigation canals, drains, and farmlands.

As mentioned earlier, other agencies have permitting and regulatory jurisdiction over aspects of the geothermal power plants. The RWQCB requires that shallow groundwater monitoring wells are installed around any areas where brine is stored in approved aboveground tanks and concrete-lined ponds. These monitoring wells have an annual schedule for monitoring of chemistry and water level data. The Air Pollution Control District requires that appropriate air pollution control equipment be permitted, installed, and maintained. They inspect the operations to assure the equipment is operating as designed and permitted. The DTSC oversees the disposal of any hazardous materials generated during the process. These products include brine scale, silica, and other substances. These byproducts are disposed of at designated, permitted, and regulated off-project disposal sites.

Land within the Salton Sea geothermal field includes both private mineral interests and private surface ownership. Less than 10% of the land located inside the defined limits of this geothermal field is either State or Federal public land. Many times, the relationship between the subsurface mineral interest and surface ownership is split. However only the subsurface mineral interest owner earns a royalty from the production of geothermal fluids or minerals. Each lease that will be used for geothermal development must have an approved lease agreement between the geothermal developer and the subsurface mineral interest holder. This agreement dictates the terms, compensation, and length of time the lease is in effect. The surface owner also is compensated for any land that is taken out of service for well pads, roads, pipelines, power plants, and other such ancillary items.

Finally, each geothermal facility pays property taxes to the County of Imperial. Operating geothermal power plants are the highest tax revenue producers in the County, providing essential funding for infrastructure, fire and police protection, and public schools for the residences and communities of Imperial County.

In closing, the Salton Sea geothermal projects in Imperial County have numerous levels of permitting, regulation, and oversight by many agencies. This oversight allows for the safe operation of an important source of this reliable renewable “green” energy for the citizens of California and environmental protection of the adjacent farmland, surface water delivery systems, and the Salton Sea lake.

With bachelor’s and master’s degrees, Alex Schriener has been a geologist for nearly forty years, most of it in geothermal energy development and exploration. For twenty years he worked as geologist and Resource Manager at the Salton Sea geothermal field. He is a California Licensed Professional Geologist.
FINDING COMMON GROUND

BY HILARY CLARK

NATIONAL MONUMENTS BELONG TO US ALL

After a strenuous three-and-a-half hour hike, I reach the top of Telescope Peak, Death Valley's highest point at over 11,000 feet. I watch the sun set over Mount Whitney to the distant west. To the east, I see the expansive shades of desert brown. Bristlecone pines surround me like twisted works of art. I feel a sense of gratitude to those who fought for conserving our public lands. Had Death Valley and other national parks not been first established as national monuments, they may never have been protected. I thought of the many national monuments that I had seen: ancient cliff dwellings and vast volcanic fields out west to the marine ecosystems and historic sites back east.

These sites don't have the iconic reputations of Grand Canyon, Yosemite, or Yellowstone. Yet, they have the power to unite people from disparate backgrounds and differing beliefs. There are over 140 national monuments that range from historic icons like the Statue of Liberty in New York to natural wonders like Giant...

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